

What's new in TensorFlow 2.0?

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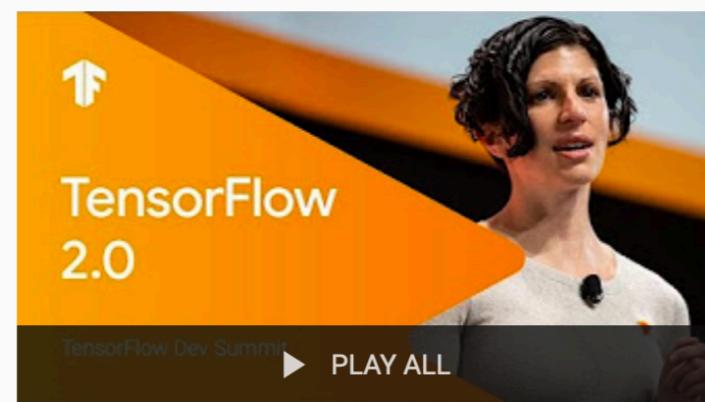
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- **#4 contributor to TensorFlow**
 - Google, DeepMind & nVidia
- **#2 contributor to Apache Spark (50,000 lines of code)**
- **Keras**
- **#1 contributor to Apache SystemML (65,000 lines of code)**
- **Apache Arrow**
- **Apache Bahir**
- **Apache Toree**
- **Apache Zeppelin**
- **Apache Livy**
- **Fabric for DeepLearning (FfDL)**



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TensorFlow Dev Summit 2019

35 videos • 80,358 views • Last updated on Mar 13, 2019



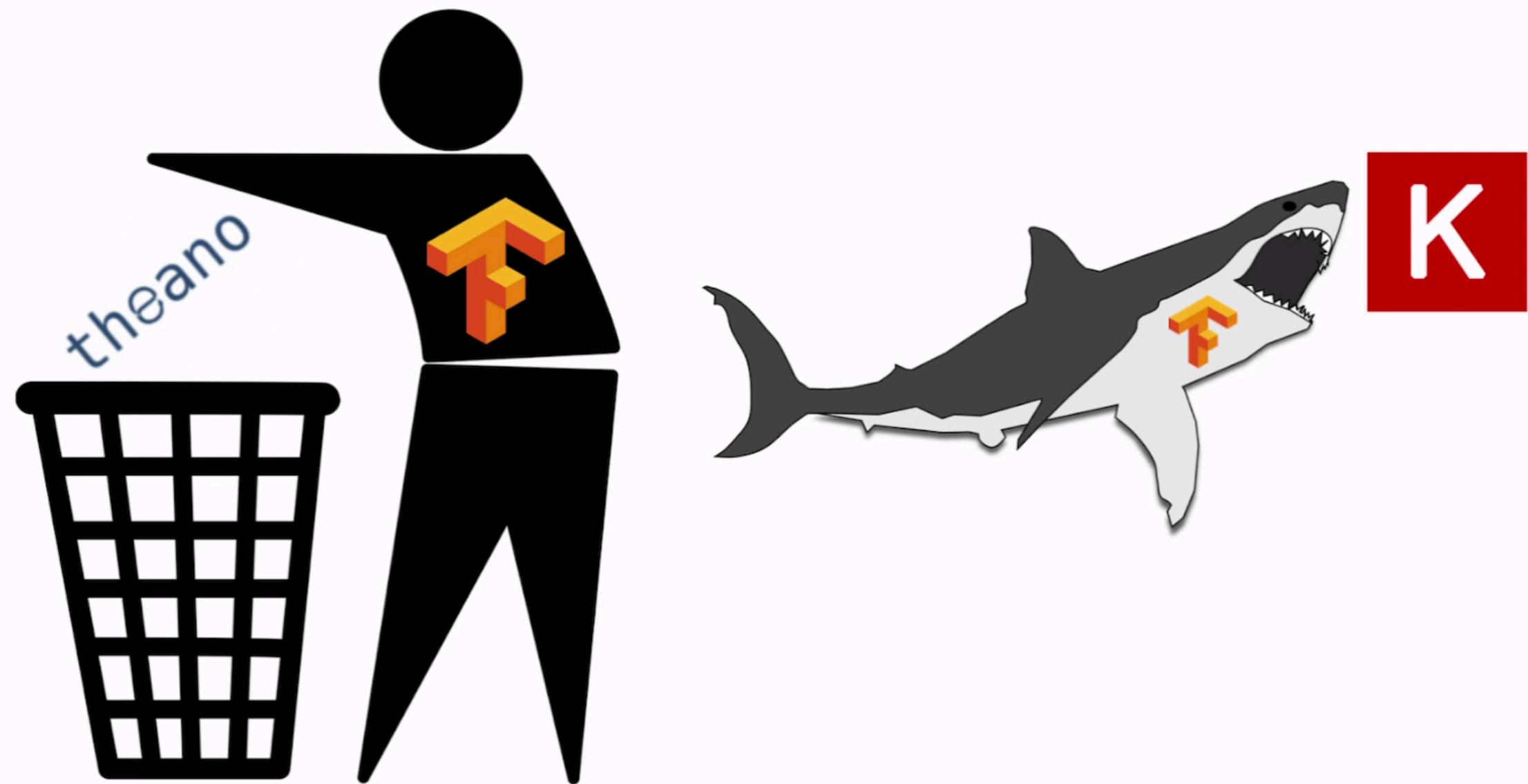
TensorFlow Dev Summit 2019 took place on March 6th and 7th at the Google Event Center in Sunnyvale, CA. Learn all about it → <http://bit.ly/TFDS19>

TensorFlow Dev Summit brings together a diverse mix of machine learning users from around the world for two days of highly technical talks, demos, and conversation with the TensorFlow team and community.

Get started at <https://www.tensorflow.org/>

#TFDevSummit

-  **TensorFlow Dev Summit 2019 Highlights #MachineLearning**
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TensorFlow
-  **Introducing TensorFlow 2.0 and its high-level APIs (TF Dev Summit '19)**
TensorFlow
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TensorFlow



TensorFlow 1.X

TensorFlow 2.X

How TensorFlow 2.0 is changing everything (eating Keras, kicking Theano)

118 views

118

3

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Romeo Kienzler

Published on Mar 20, 2019

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François Chollet

@fchollet

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When there's too much hype around something, it can lead people to become cynical about it and assume it's worthless.

But cynicism is not wisdom. It's laziness. If you think you already know all the answers, there's a lot you're going to miss. Keep an open mind and keep learning

5:07 PM - 20 Mar 2019

201 Retweets 913 Likes



18

201

913



François Chollet 
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As a Keras user, what implementation of the Keras API do you use most of the time?

- Standalone Keras package
- tf.keras
- Other (e.g. MXNet-Keras)
- Show results

Vote

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7:43 PM - 24 Mar 2019

12 Retweets 20 Likes



3

12

20



The screenshot shows a Firefox browser window with the URL <https://dataplatform.cloud.ibm.com/analytics/notebooks/v2/d94668e2-3d68-4ee2-bc87-...>. The browser has many tabs open, including WhatsApp, Riot, and various IBM-related sites. The main content is an IBM Watson Studio Jupyter notebook titled "My Projects / tf2 / tf2.keras". The notebook contains Python code for a neural network:

```
In [10]: train_images = train_images / 255.0  
test_images = test_images / 255.0  
  
In [ ]:  
#ps_strategy = tf.distribute.experimental.ParameterServerStrategy()  
#with ps_strategy.scope():  
  
    model = tf.keras.Sequential([  
        tf.keras.layers.Flatten(input_shape=(28, 28)),  
        tf.keras.layers.Dense(128, activation=tf.nn.relu),  
        tf.keras.layers.Dense(10, activation=tf.nn.softmax)  
    ])  
  
In [ ]: model.compile(optimizer='adam',  
                      loss='sparse_categorical_crossentropy',  
                      metrics=['accuracy'])  
  
In [ ]: model.fit(train_images, train_labels, epochs=5)  
  
In [ ]: test_loss, test_acc = model.evaluate(test_images, test_labels)  
print('Test accuracy:', test_acc)  
  
In [ ]:
```

On the right side of the notebook interface, there is a video player showing a man with long hair and headphones, sitting in a car and speaking. The video player has a green border around the code block where the model definition is located.

What's new in TensorFlow 2.0? Video Series - (2 of X) - Keras Distribution Strategy Integration

49 views

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Romeo Kienzler

Published on Apr 1, 2019

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romeokienzler Update distribute_strategy.ipynb

e9f193d 4 days ago

5 contributors

894 lines (893 sloc) | 40.9 KB

 [Raw](#) [Blame](#) [History](#) **Copyright 2018 The TensorFlow Authors.**

```
In [0]: #@title Licensed under the Apache License, Version 2.0 (the "License");
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```

Distributed Training in TensorFlow



François Chollet  liked your Tweet

@fchollet sorry for my negative video on #TensorFlow in March. Done my homework. Changed my opinion. Spoke about it at #oscon => youtu.be/cc4rJvDepvg

----- Forwarded message -----

From: François Chollet <notifications@github.com>
Date: Thu, Aug 22, 2019 at 6:46 PM
Subject: [keras-team/keras] Release 2.2.5 - Keras 2.2.5
To: keras-team/keras <keras@noreply.github.com>
Cc: Subscribed <subscribed@noreply.github.com>

Keras 2.2.5

Repository:

Keras 2.2.5 is

The next rele
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At this time,
tf.keras is



It is th

The 2
TensorFlow 1.X

ed by: [fcho](#)

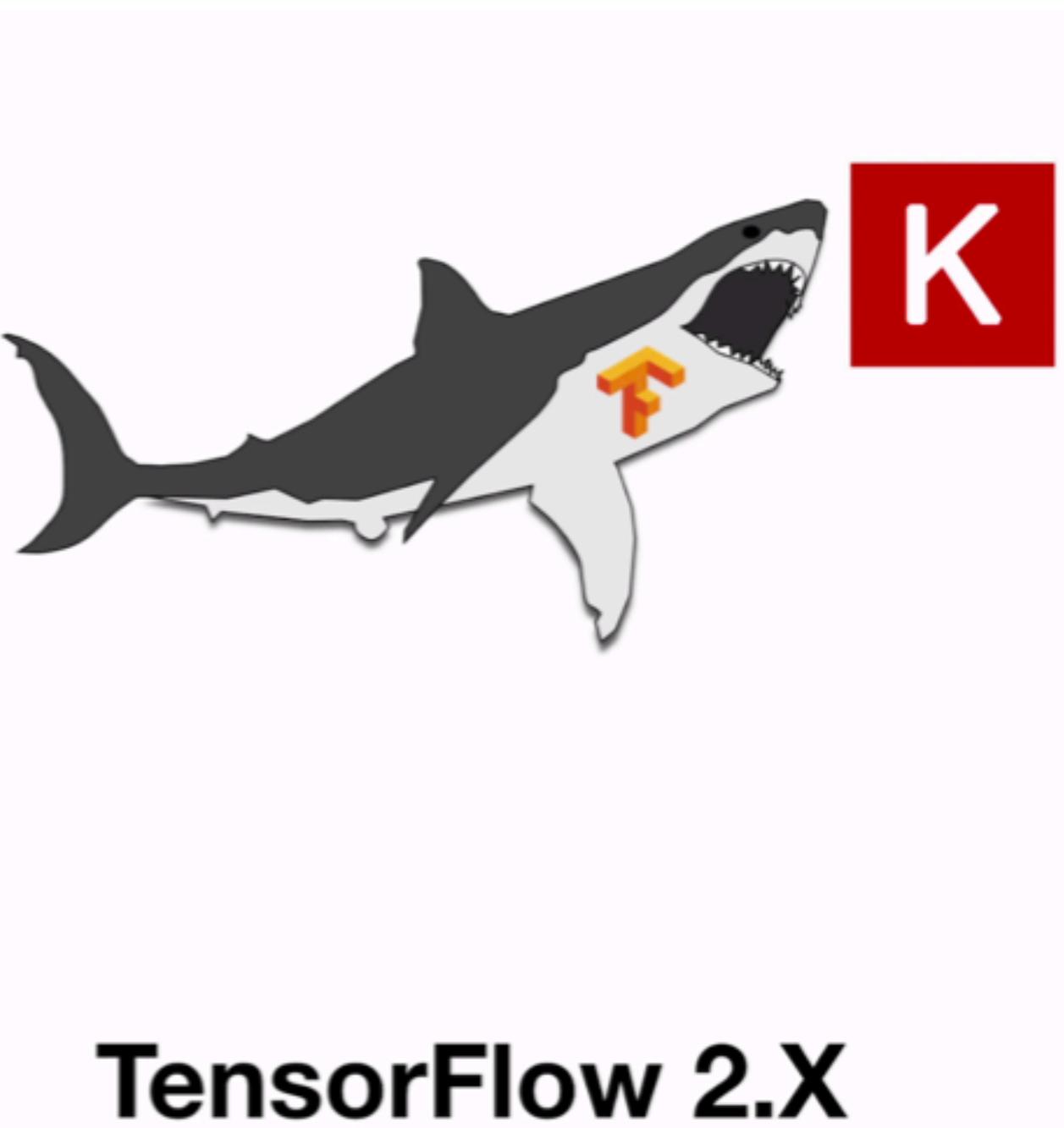
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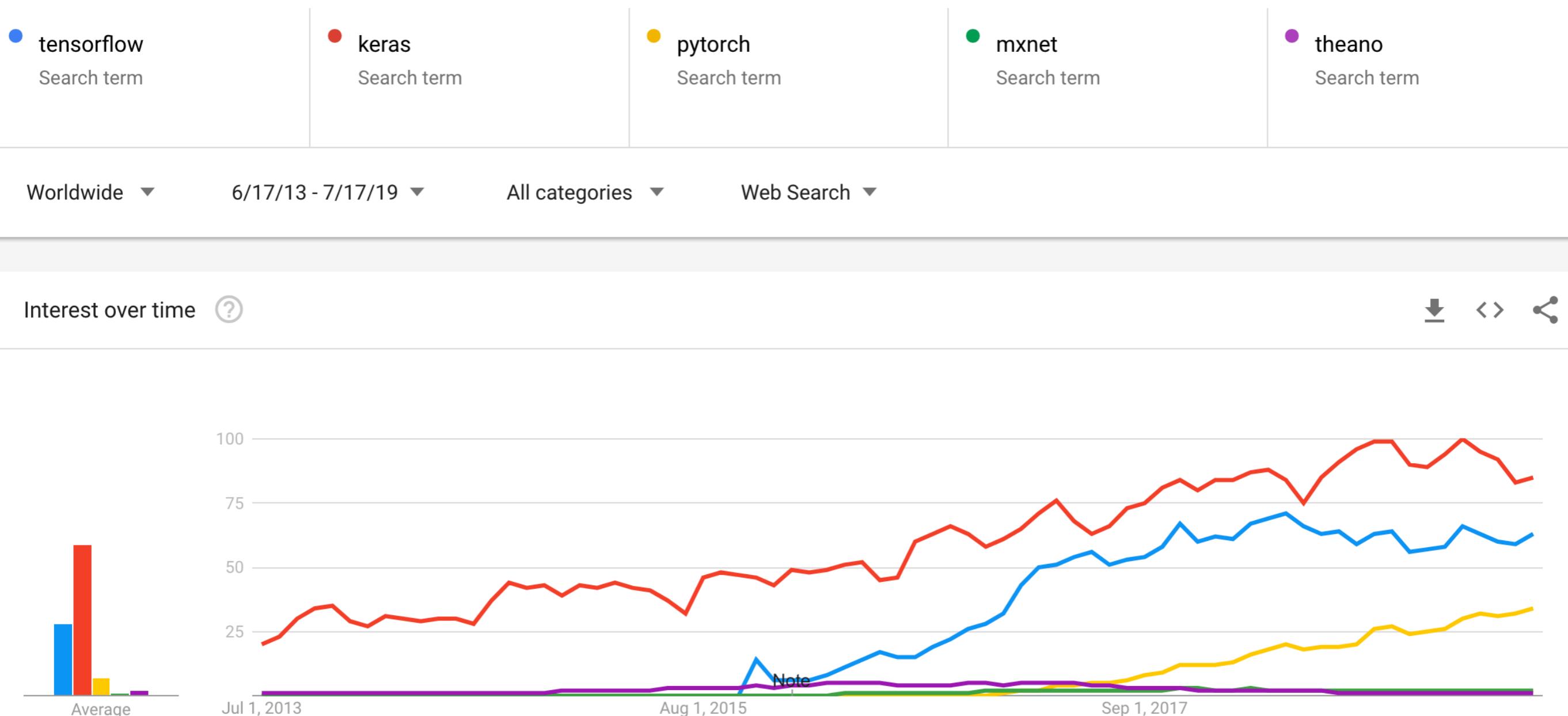


TensorFlow 2.X

What's DeepLearning?

What's Machine Learning?

What's old in TensorFlow 1.x?





My Projects / ... / tf2.eagerexec ▾



File Edit View Insert Cell Kernel Help

Not Trusted | Python 3.5

Format



Code ▾

In [2]: `tf.__version__`

Out[2]: '1.3.0'

In [3]: `import numpy as np`In [5]: `a = tf.constant(np.array([1., 2., 3.]))`
`type(a)`
`#print(a.numpy())`

Out[5]: tensorflow.python.framework.ops.Tensor

In [6]: `b = tf.constant(np.array([4.,5.,6.]))`
`type(b)`
`#print(b.numpy())`

Out[6]: tensorflow.python.framework.ops.Tensor

In [7]: `c = tf.tensordot(a, b,1)`
`type(c)`

Out[7]: tensorflow.python.framework.ops.Tensor

In [9]: `#print(c.numpy())`

32.0

In [8]: `session = tf.Session()`
`output = session.run(c)`
`print(output)`

32.0

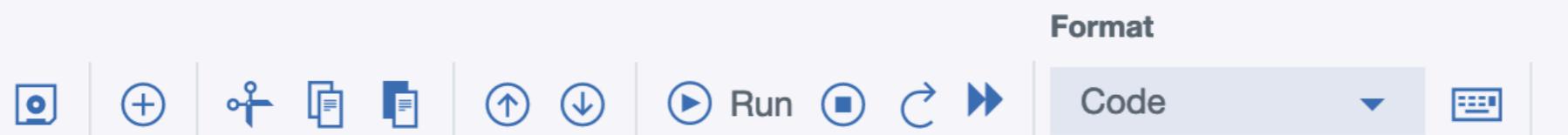


My Projects / ... / tf2.eagerexec



File Edit View Insert Cell Kernel Help

Not Trusted | Python 3.5

In [2]: `tf.__version__`

Out[2]: '2.0.0-alpha0'

In [3]: `import numpy as np`In [6]: `a = tf.constant(np.array([1., 2., 3.]))`
`print(type(a))`
`print(a.numpy())`

```
<class 'tensorflow.python.framework.ops.EagerTensor'>
[1. 2. 3.]
```

In [7]: `b = tf.constant(np.array([4., 5., 6.]))`
`print(type(b))`
`print(b.numpy())`

```
<class 'tensorflow.python.framework.ops.EagerTensor'>
[4. 5. 6.]
```

In [8]: `c = tf.tensordot(a, b, 1)`
`type(c)`Out[8]: `tensorflow.python.framework.ops.EagerTensor`In [9]: `print(c.numpy())`



```
In [19]: # Import `tensorflow`  
import tensorflow as tf  
import numpy as np  
  
@tf.function  
def f(x):  
    return x-(6/7)*x-1/7
```



My Projects / tf2 / ft2.function



```
In [19]: # Import `tensorflow`
import tensorflow as tf
import numpy as np

@tf.function
def f(x):
    return x-(6/7)*x-1/7
```



My Projects / tf2 / ft2.function



```
In [3]: print(tf.autograph.to_code(step.python_function))
```

```
def tf_step(x):
    do_return = False
    retval_ = ag_.UndefinedReturnValue()
    do_return = True
    retval_ = x - 6 / 7 * x - 1 / 7
    cond = ag_.is_undefined_return(retval_)

    def get_state():
        return ()

    def set_state(_):
        pass

    def if_true():
        retval_ = None
        return retval_

    def if_false():
        return retval_
    retval_ = ag_.if_stmt(cond, if_true, if_false, get_state, set_state)
    return retval_
```

IBM Watson Studio

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My Projects / tf2 / ft2.function

```
In [20]: x = tf.Variable(0, trainable=True, dtype=tf.float64)
y = tf.constant([0], dtype=tf.float64)

@tf.function
def g(x):
    return f(f(f(f(x))))


print(tf.autograph.to_code(compute.python_function))
```



My Projects / ... / tf2.keras



```
In [21]: from tensorflow.keras import Sequential
from tensorflow.keras.layers import Flatten, Dense

ps_strategy = tf.distribute.experimental.ParameterServerStrategy()
with ps_strategy.scope():

    model = Sequential([
        Flatten(input_shape=(28, 28)),
        Dense(128, activation=tf.nn.relu),
        Dense(10, activation=tf.nn.softmax)
    ])

    model.compile(optimizer='adam',
                  loss='sparse_categorical_crossentropy',
                  metrics=['accuracy'])

    model.fit(train_images, train_labels, epochs=5)
```

```
Epoch 1/5
1875/1875 [=====] - 11s 6ms/step - loss: 0.4952 - accuracy: 0.8246
```

My Projects / tf2 / tensorboard_in_notebooks.ipynb

◀   ▶       

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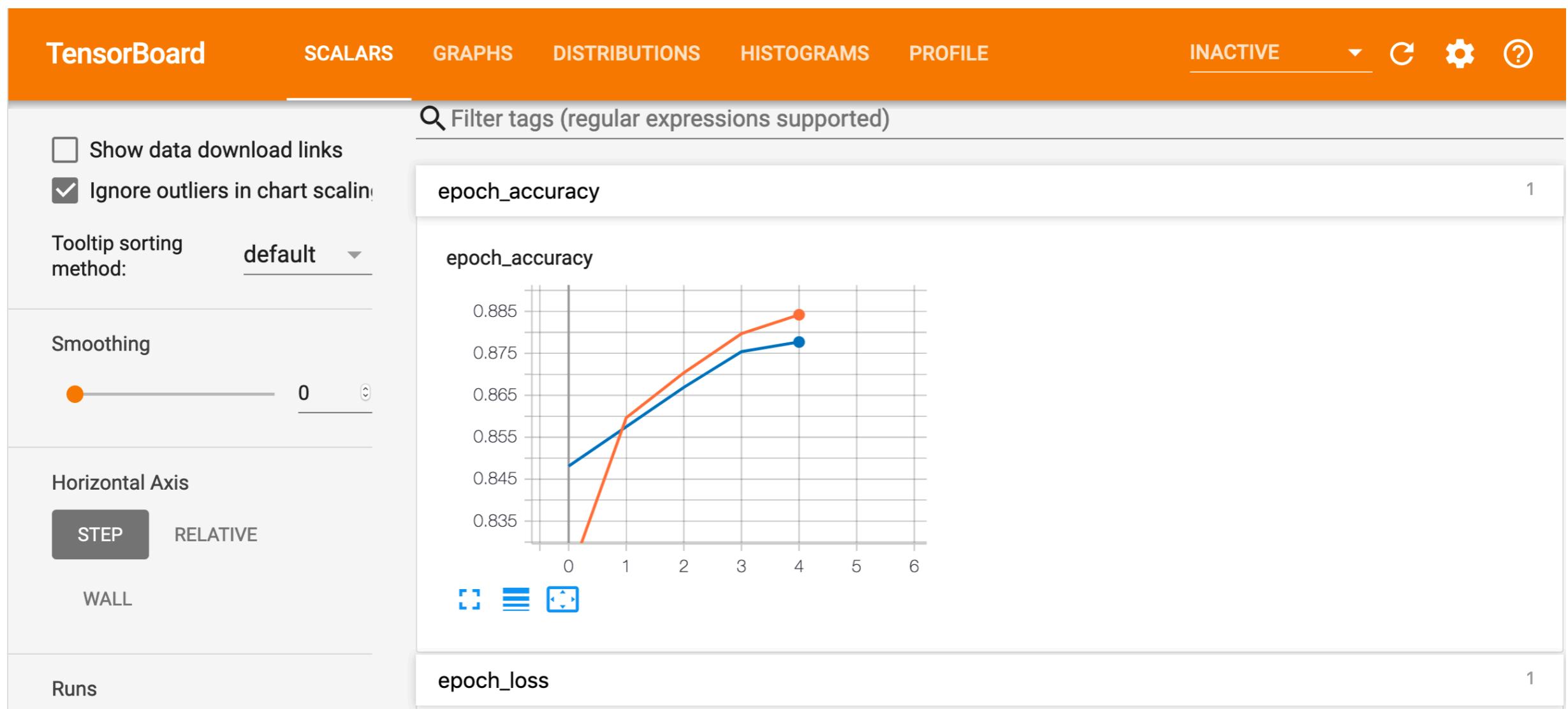
Not Trusted | Python 3.5



```
Train on 60000 samples, validate on 10000 samples
Epoch 1/5
60000/60000 [=====] - 20s 340us/sample - loss: 0.4965 - accuracy: 0.8218 - val_loss: 0.4201 - val_accuracy: 0.8446
Epoch 2/5
60000/60000 [=====] - 24s 401us/sample - loss: 0.3835 - accuracy: 0.8607 - val_loss: 0.3937 - val_accuracy: 0.8556
Epoch 3/5
60000/60000 [=====] - 24s 397us/sample - loss: 0.3476 - accuracy: 0.8719 - val_loss: 0.3732 - val_accuracy: 0.8665
Epoch 4/5
60000/60000 [=====] - 25s 418us/sample - loss: 0.3251 - accuracy: 0.8794 - val_loss: 0.3538 - val_accuracy: 0.8740
Epoch 5/5
60000/60000 [=====] - 24s 407us/sample - loss: 0.3118 - accuracy: 0.8847 - val_loss: 0.3356 - val_accuracy: 0.8791
```

Start TensorBoard within the notebook using [magics](#)

```
In [7]: %tensorboard --logdir logs
```



```
HP_NUM_UNITS = hp.HParam('num_units', hp.Discrete([16, 32]))
HP_DROPOUT = hp.HParam('dropout', hp.RealInterval(0.1, 0.2))
HP_OPTIMIZER = hp.HParam('optimizer', hp.Discrete(['adam', 'sgd']))

METRIC_ACCURACY = 'accuracy'

with tf.summary.create_file_writer('logs/hparam_tuning').as_default():
    hp.hparams_config(
        hparams=[HP_NUM_UNITS, HP_DROPOUT, HP_OPTIMIZER],
        metrics=[hp.Metric(METRIC_ACCURACY, display_name='Accuracy')],  
)
```

```
def train_test_model(hparams):
    model = tf.keras.models.Sequential([
        tf.keras.layers.Flatten(),
        tf.keras.layers.Dense(hparams[HP_NUM_UNITS], activation=tf.nn.relu),
        tf.keras.layers.Dropout(hparams[HP_DROPOUT]),
        tf.keras.layers.Dense(10, activation=tf.nn.softmax),
    ])
    model.compile(
        optimizer=hparams[HP_OPTIMIZER],
        loss='sparse_categorical_crossentropy',
        metrics=['accuracy'],
    )

    model.fit(x_train, y_train, epochs=1) # Run with 1 epoch to speed things up for demo purposes
    _, accuracy = model.evaluate(x_test, y_test)
    return accuracy
```

```
model.fit(  
    ...,  
    callbacks=[  
        tf.keras.callbacks.TensorBoard(logdir), # log metrics  
        hp.KerasCallback(logdir, hparams), # log hparams  
    ],  
)
```

Hyperparameters

- num_units
- 16.000
- 32.000
- dropout

Min
-infinity

Max
+infinity

- optimizer
- adam
- sgd

Metrics

- Accuracy

Min
-infinity Max
+infinity

Status

- Unknown
- Success
- Failure
- Running

Sorting

Sort by

Direction

Paging

Number of matching session
groups: 8

TABLE VIEW

PARALLEL COORDINATES VIEW

SCATTER PLOT MATRIX VIEW

Session Group Name.	Show Metrics	num_units	dropout	optimizer	Accuracy
3df0d7cf35bec5a...	<input type="checkbox"/>	32.000	0.20000	sgd	0.77550
3ec2aed9e07589f...	<input type="checkbox"/>	32.000	0.20000	adam	0.82650
53bf5bece9190fa...	<input type="checkbox"/>	16.000	0.20000	adam	0.81540
5b97f3c2967245b...	<input type="checkbox"/>	16.000	0.10000	adam	0.83210
6826c7fa3322d82...	<input type="checkbox"/>	32.000	0.10000	adam	0.83950
7684dcc13358fd0...	<input type="checkbox"/>	16.000	0.20000	sgd	0.76830
7b29a731e3daca...	<input type="checkbox"/>	32.000	0.10000	sgd	0.78530
ae235909ec4e4d...	<input type="checkbox"/>	16.000	0.10000	sgd	0.77700

Hyperparameters Number of unitsMin
-infinityMax
+infinity Dropout rate 0.10000 0.20000 0.50000 Optimizer adam sgd**Metrics** AccuracyMin
-infinityMax
+infinity**Status** Unknown Success Failure Running**Sorting**

Sort by

Direction

Paging

Number of matching session groups: 24

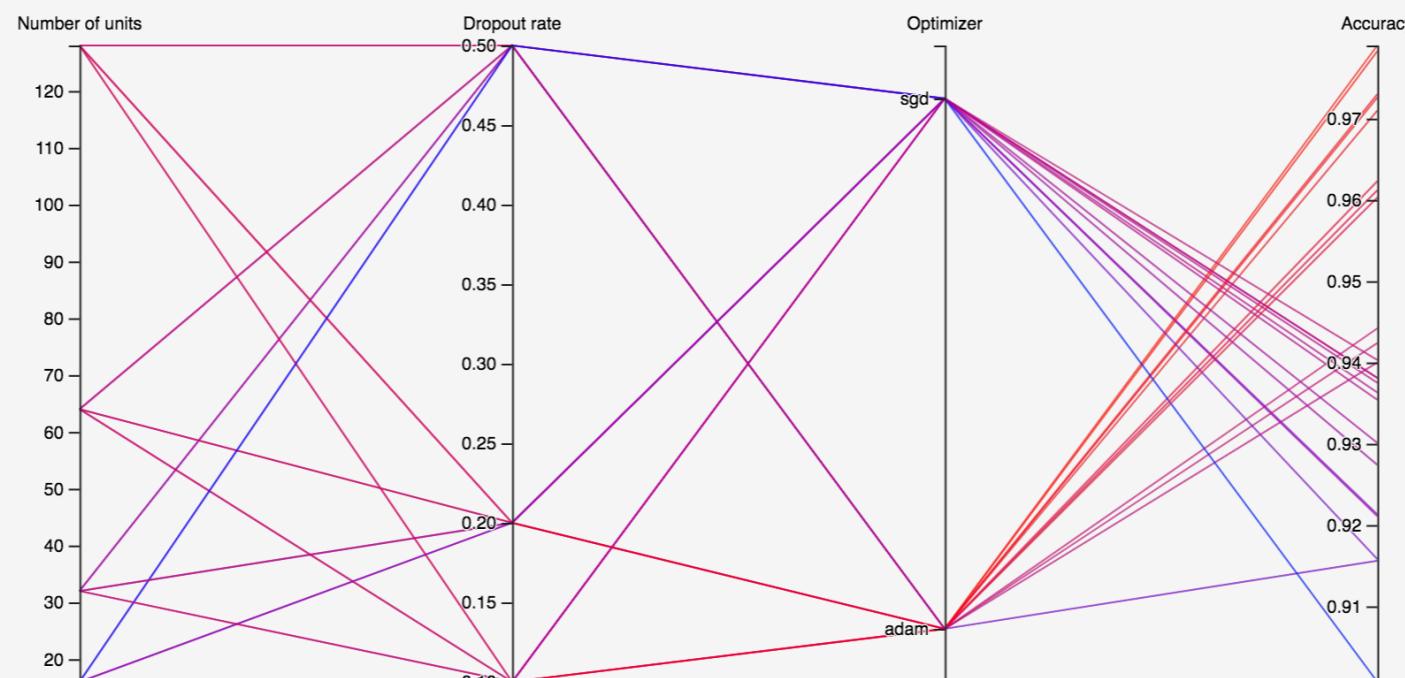
TABLE VIEW

PARALLEL COORDINATES VIEW

SCATTER PLOT MATRIX VIEW

Color by

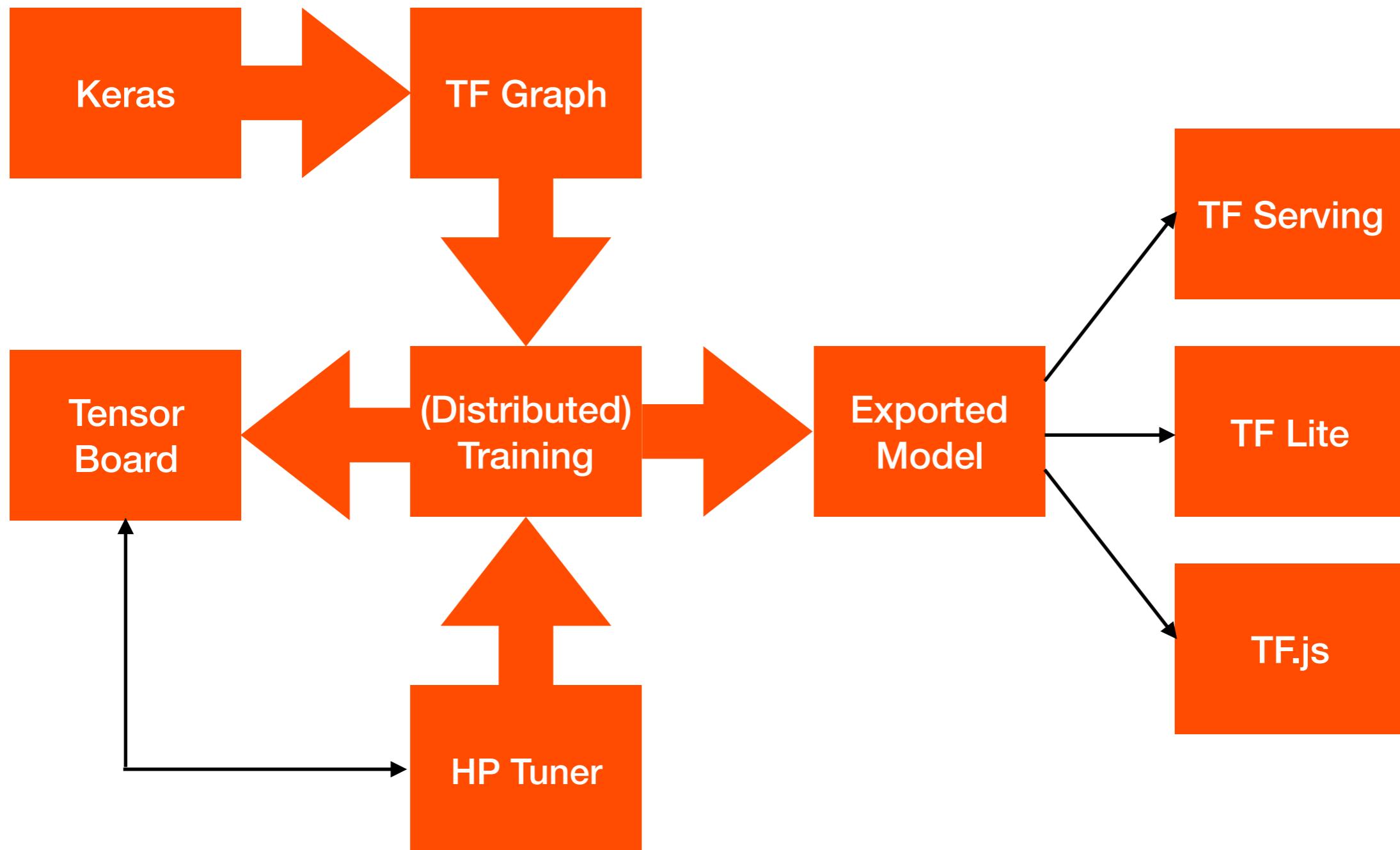
Accuracy

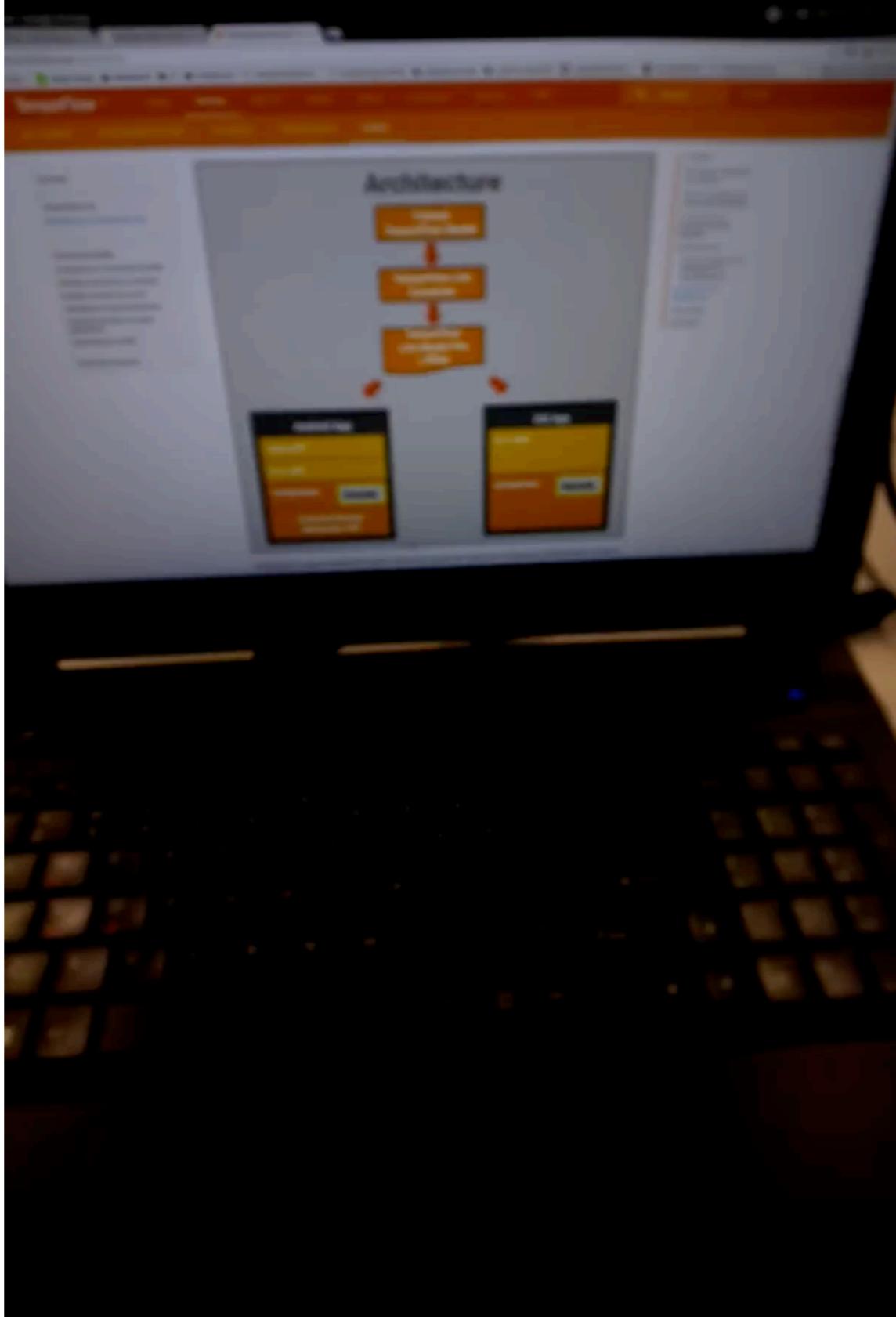


Click or hover over a session group to display its values here.

No session group selected

Please select a session group to see its metric-graphs here.





79ms
candle:0.07058824
otterhound:0.05882353
syringe:0.050980393



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Veremin — A Browser-based Video Theremin

Making music visually using TensorFlow.js, PoseNet, and the Web MIDI & Web Audio APIs

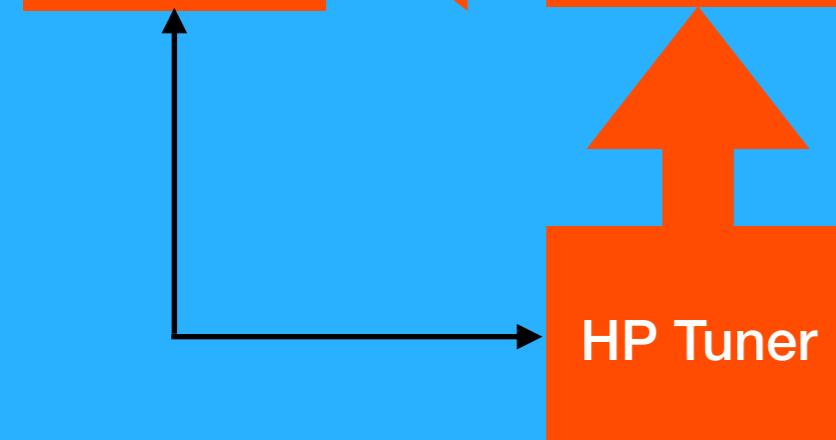
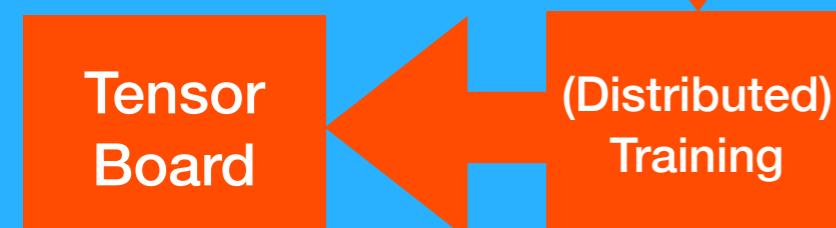
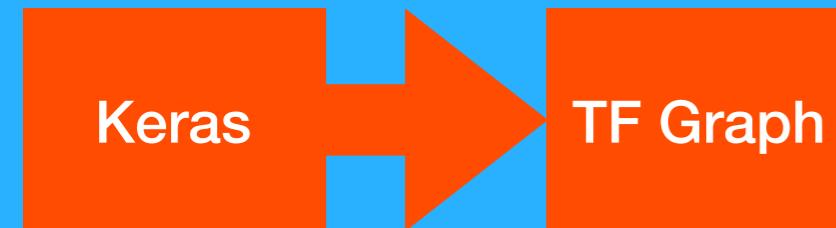


va barbosa

Feb 7 · 4 min read

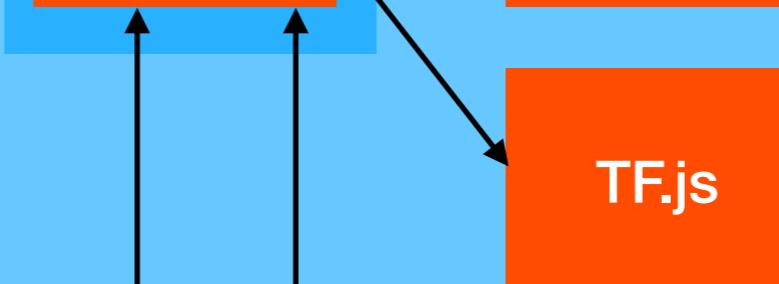
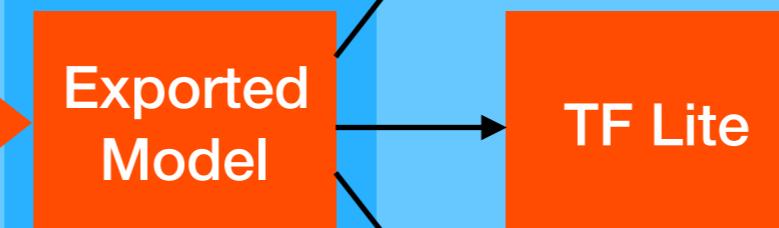
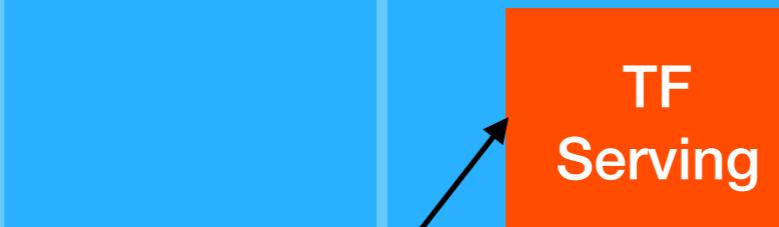
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IBM Watson Studio



Model Asset Exchange

Watson Machine Learning Fabric for Deep Learning



IBM
Fairness
360

Adversarial
Robustness
Toolbox

NeuNetS

TFX

Integrated Frontend for Job Management, Monitoring, Debugging, Data/Model/Evaluation Visualization

Shared Configuration Framework and Job Orchestration



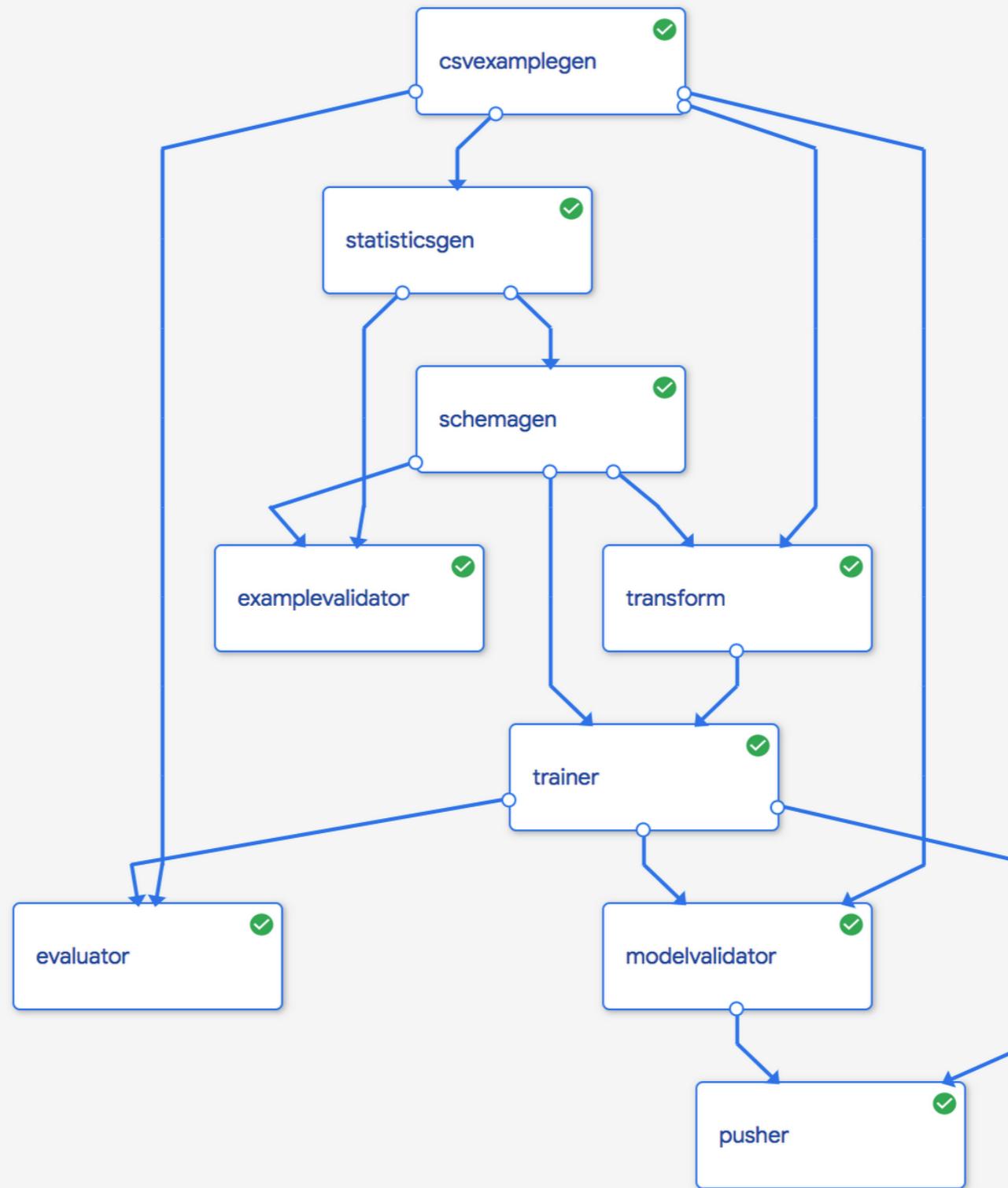
Shared Utilities for Garbage Collection, Data Access Controls

Pipeline Storage

Graph

Run output

Config



Romeo Kienzler

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We are also making these capabilities around Trusted AI available to businesses through

Watson OpenScale

Announced recently:

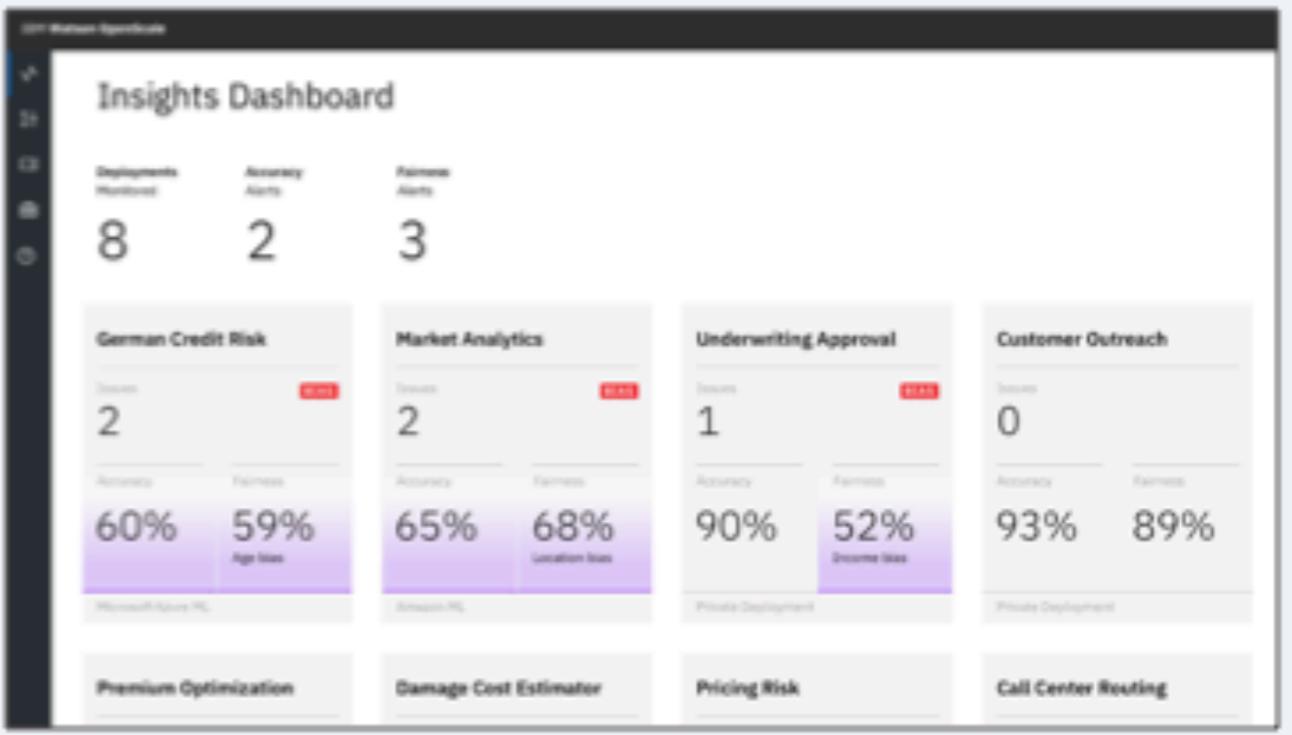
- ✓ A new capability called **Drift Detection** which detects when and how far a model "drifts" from its original parameters
- ✓ In line with our **Watson Anywhere** vision, the latest release of Cloud Pak for Data makes the world-class **Watson OpenScale** available in private, hybrid, and multi-cloud environments.

Watson OpenScale **tracks and measures trusted AI outcomes across its lifecycle**, and adapts and governs AI to changing business situations — for models built and running anywhere.

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***includes a tracking URL in favour of myself**