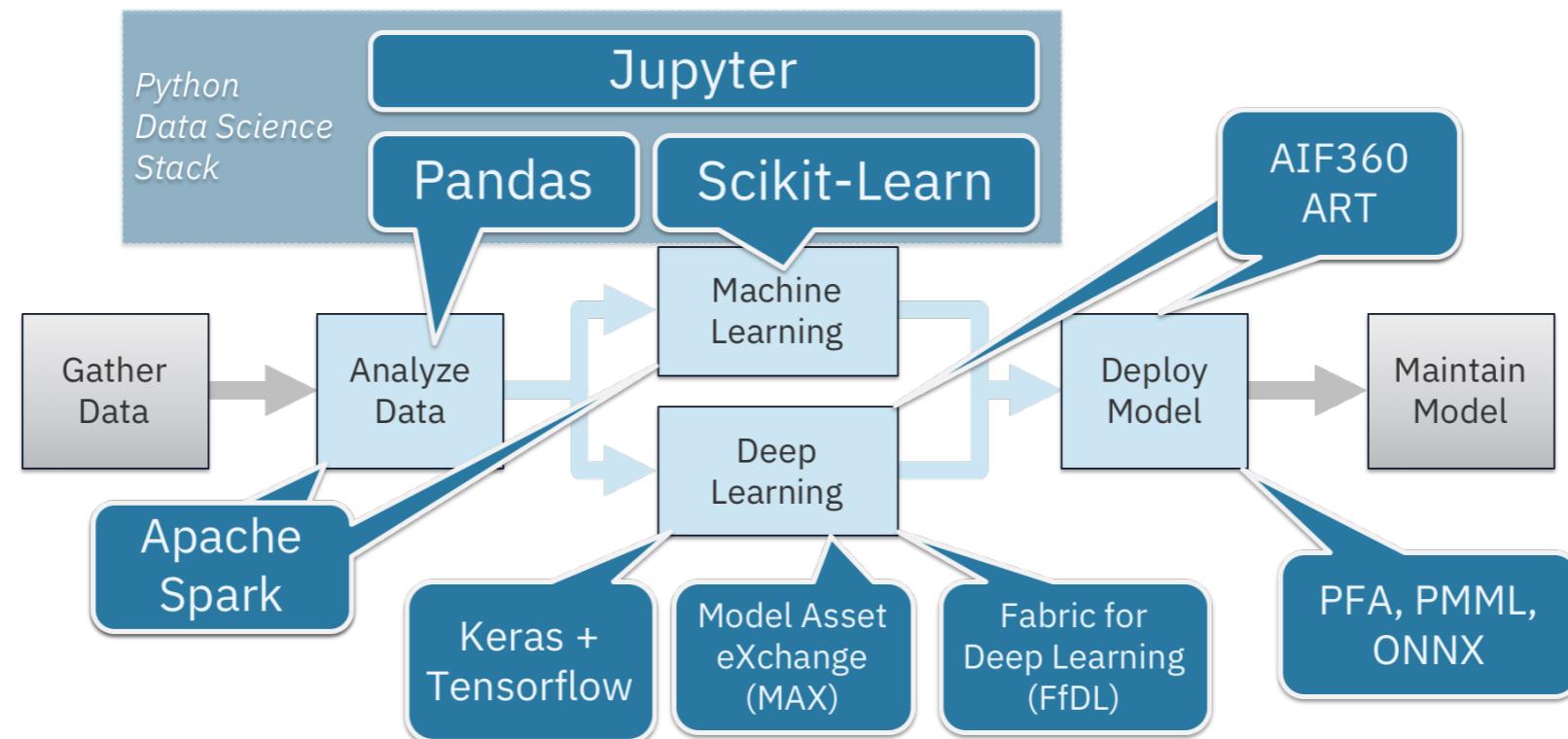


# Center for Open-Source Data & AI Technologies

Improving the Enterprise AI Lifecycle in Open Source



- contributes to over 10 open source projects
- 17 Apache committers, 100+ contributors
- 66,000+ LoC committed to Apache Spark
- 65,000+ LoC committed to Apache SystemML
- Over 25 product lines within IBM using Apache Spark
- #2 contributor to KubeFlow

# **What's new in TensorFlow 2.0?**

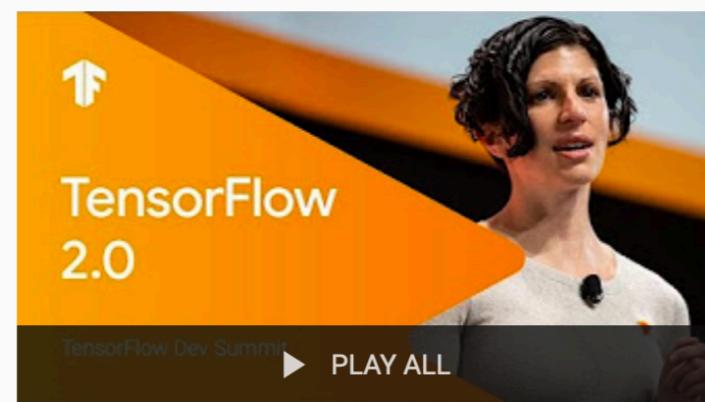
IBM Center for Open Source Data and AI Technologies (CODAIT)



- Home
- Trending
- Subscriptions
- Library
- History
- Watch later
- Liked videos
- Singularity
- Show more

## SUBSCRIPTIONS

-  Camera Conspira...
-  Fraser Gartsho...
-  Kanzlei WBS
-  TensorFlow
-  Vegetable Police
-  Christopher Fr...



## TensorFlow Dev Summit 2019

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



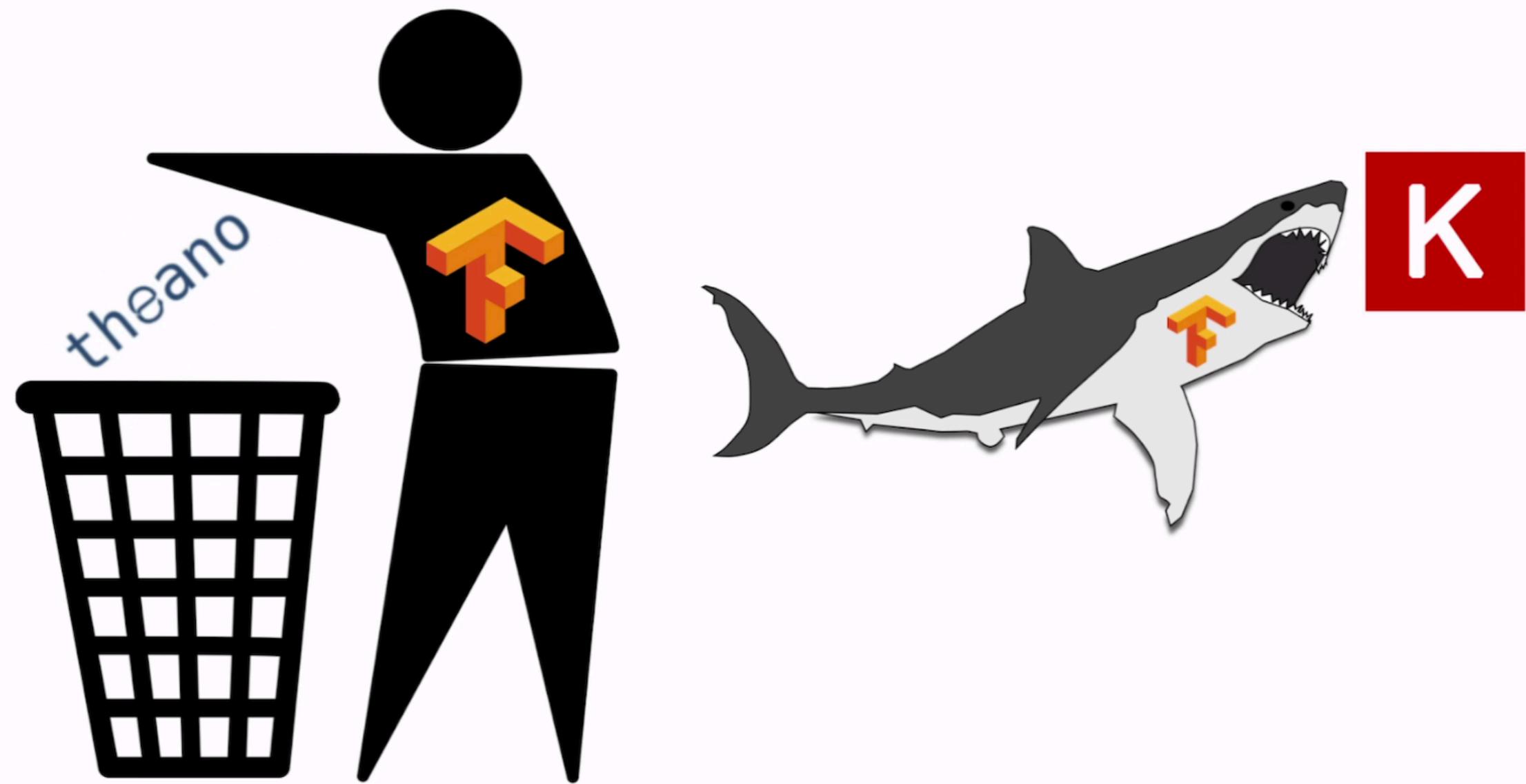
TensorFlow Dev Summit 2019 took place on March 6th and 7th at the Google Event Center in Sunnyvale, CA. Learn all about it → <http://bit.ly/TFDS19>

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**  
TensorFlow
-  **TensorFlow Dev Summit 2019 Keynote**  
TensorFlow
-  **Introducing TensorFlow 2.0 and its high-level APIs (TF Dev Summit '19)**  
TensorFlow
-  **Powered by TensorFlow: Airbnb uses machine learning to help categorize its listing photos**  
TensorFlow
-  **tf.function and Autograph (TF Dev Summit '19)**  
TensorFlow
-  **Top 5 takeaways from TensorFlow Dev Summit 2019**  
Google Developers
-  **TensorFlow Lite (TF Dev Summit '19)**  
TensorFlow



## TensorFlow 1.X

## TensorFlow 2.X

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

118 views

118

3

SHARE

SAVE

...



Romeo Kienzler

Published on Mar 20, 2019

SUBSCRIBE 1.2K



François Chollet

@fchollet

Follow



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 ✅  
@fchollet

Follow



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

1,655 votes • 6 hours left

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 a beard, wearing headphones, sitting in a car. He appears to be speaking or presenting.

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

49 views

1 like 5 dislike 0

SHARE

SAVE

...



Romeo Kienzler

Published on Apr 1, 2019

SUBSCRIBE 1.2K

[Code](#)[Pull requests 22](#)[Insights](#)

Branch: master ▾

[docs / site / en / guide / distribute\\_strategy.ipynb](#)[Find file](#) [Copy path](#)

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");
# you may not use this file except in compliance with the License.
# You may obtain a copy of the License at
#
# https://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.
```

# 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](https://youtu.be/cc4rJvDepvg)

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

From: François Chollet <[notifications@github.com](mailto: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](mailto:keras@noreply.github.com)>  
Cc: Subscribed <[subscribed@noreply.github.com](mailto:subscribed@noreply.github.com)>

## Keras 2.2.5

Repository:

Keras 2.2.5 is

The next rele  
of multi-back

At this time,  
tf.keras is



It is th

**TensorFlow 1.X**

The 2

ed by: [fcho](#)

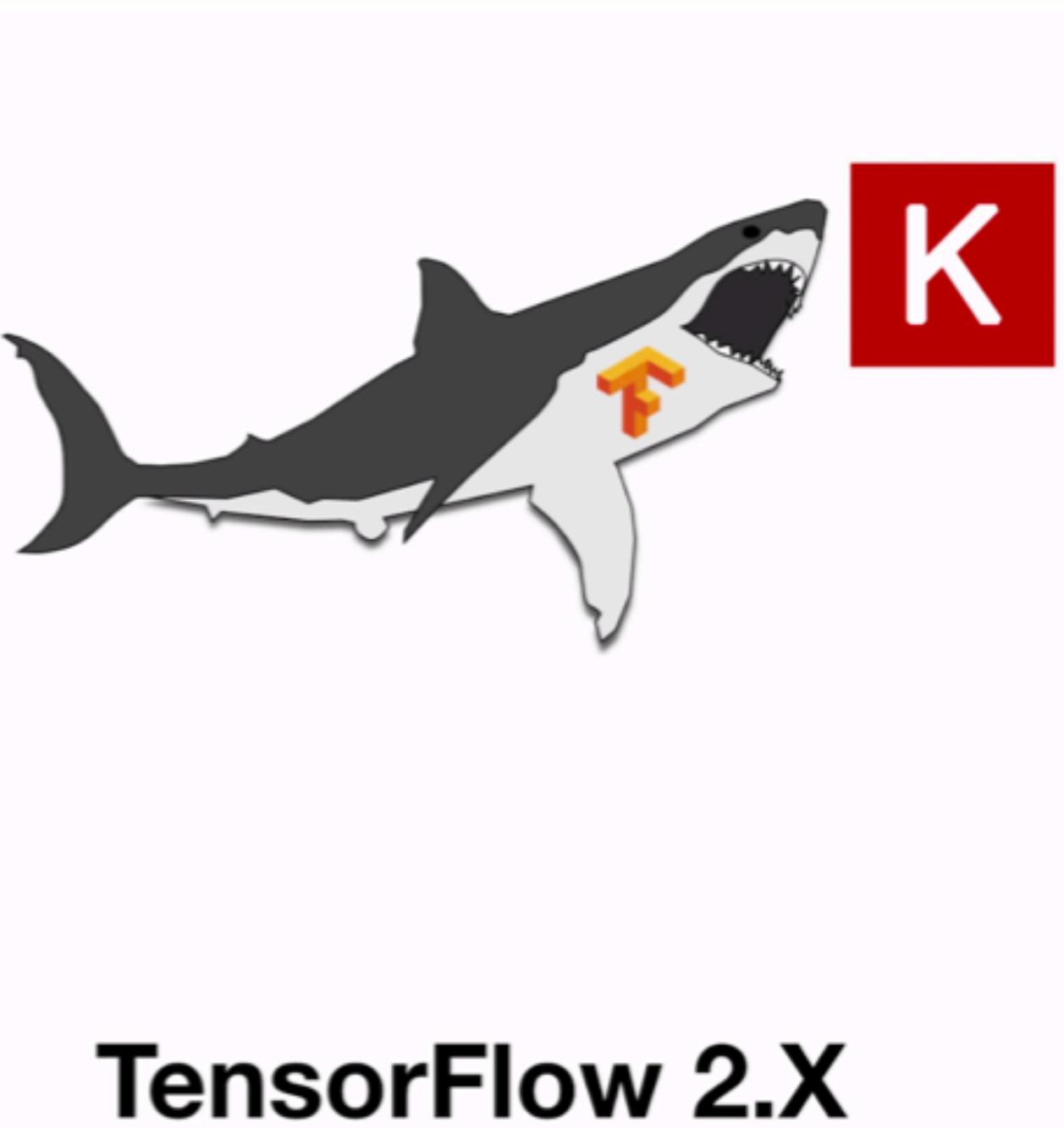
the last rele

ld support fo

s with the Te

ort Te

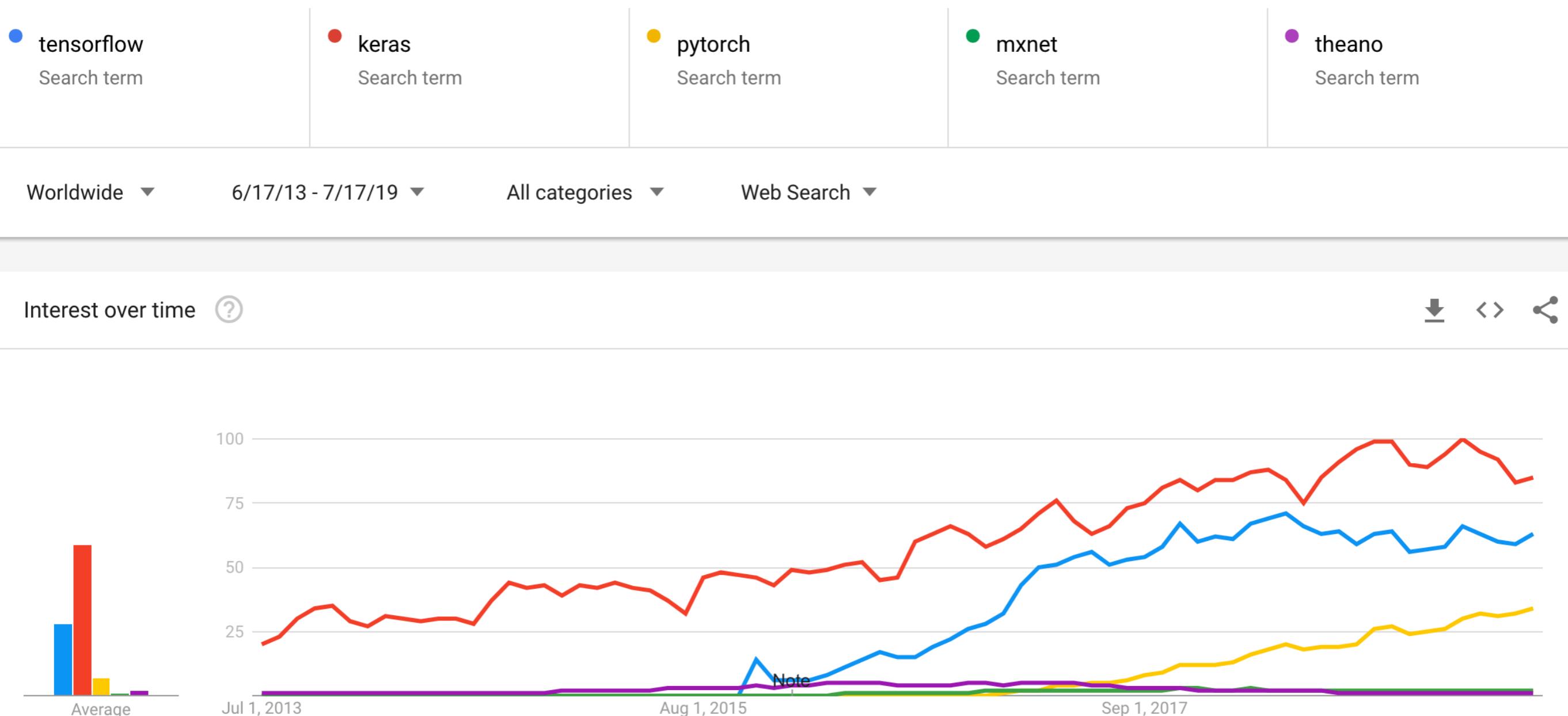
majo  
is su



# **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

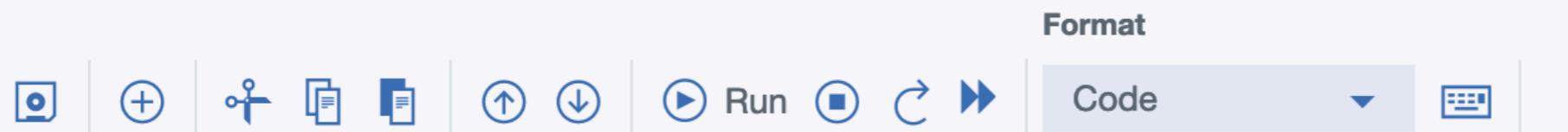


My Projects / ... / tf2.eagerexec



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

Upgrade 

Romeo Kienzler's Account

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 / tensorflow\_in\_notebooks.ipynb

◀       ▼                     

File Edit View Insert Cell Kernel Help

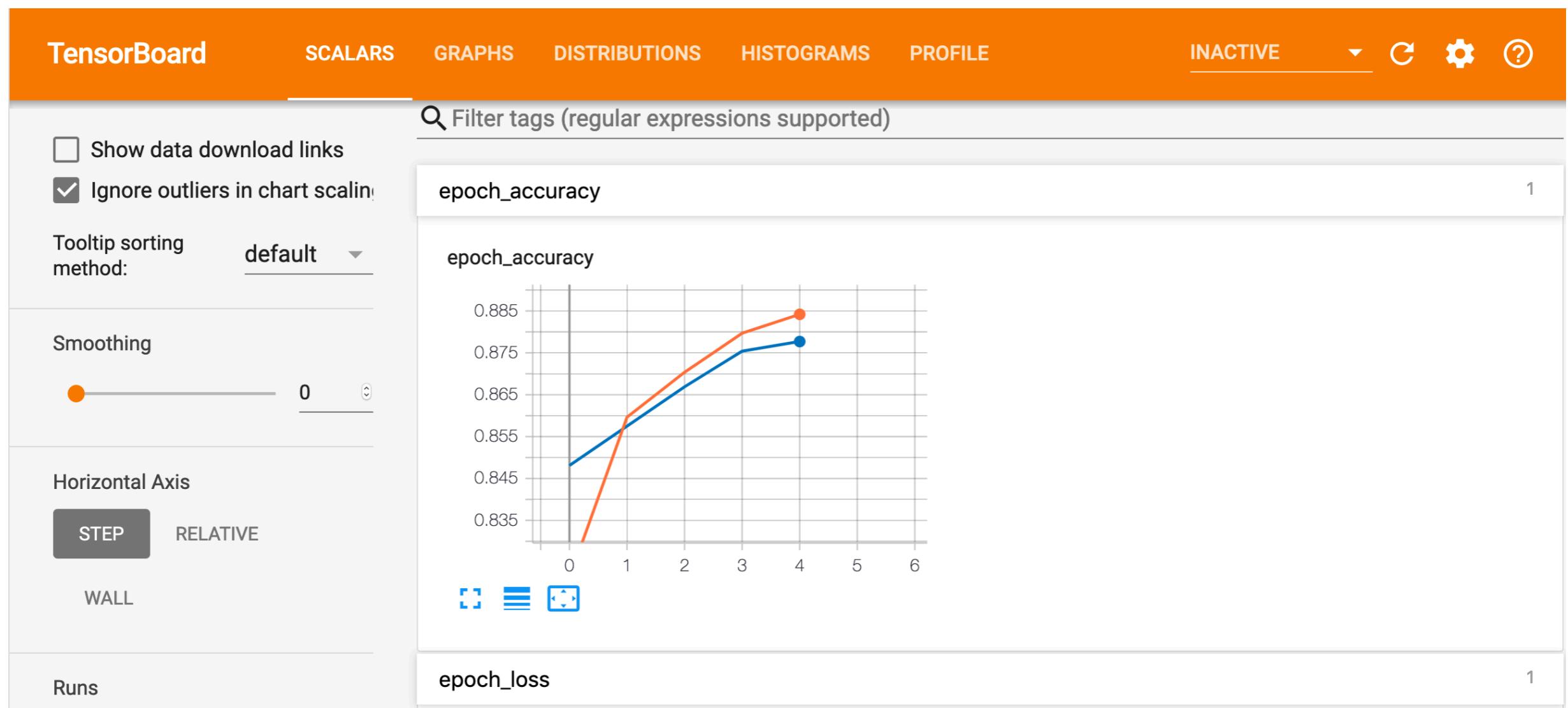
Not Trusted | Python 3.5



```
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  
-infinityMax  
+infinity

- optimizer
- adam
- sgd

Metrics

- Accuracy

Min  
-infinity      Max  
+infinityStatus

- Unknown
- Success
- Failure
- Running

Sorting

Sort by

Direction

PagingNumber 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

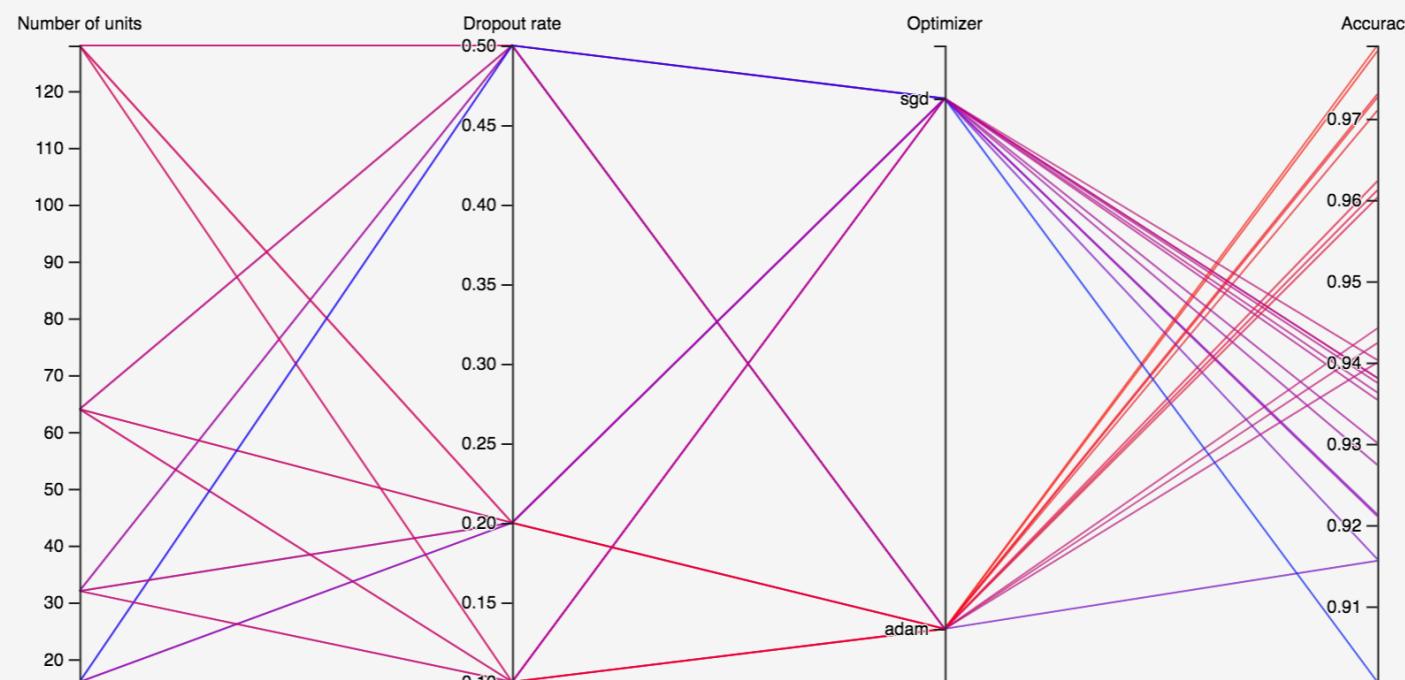
TABLE VIEW

PARALLEL COORDINATES VIEW

SCATTER PLOT MATRIX VIEW

Color by

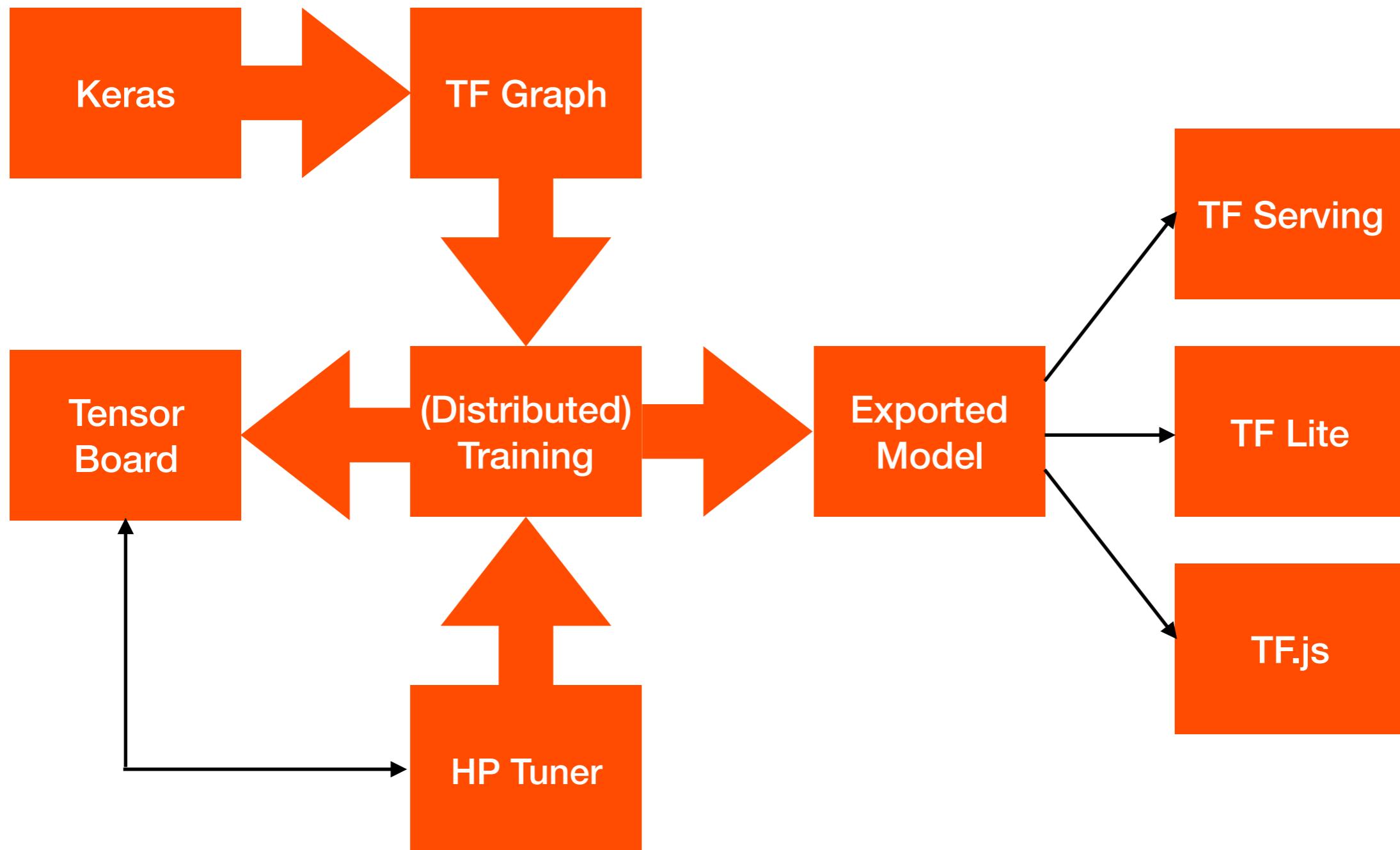
Accuracy

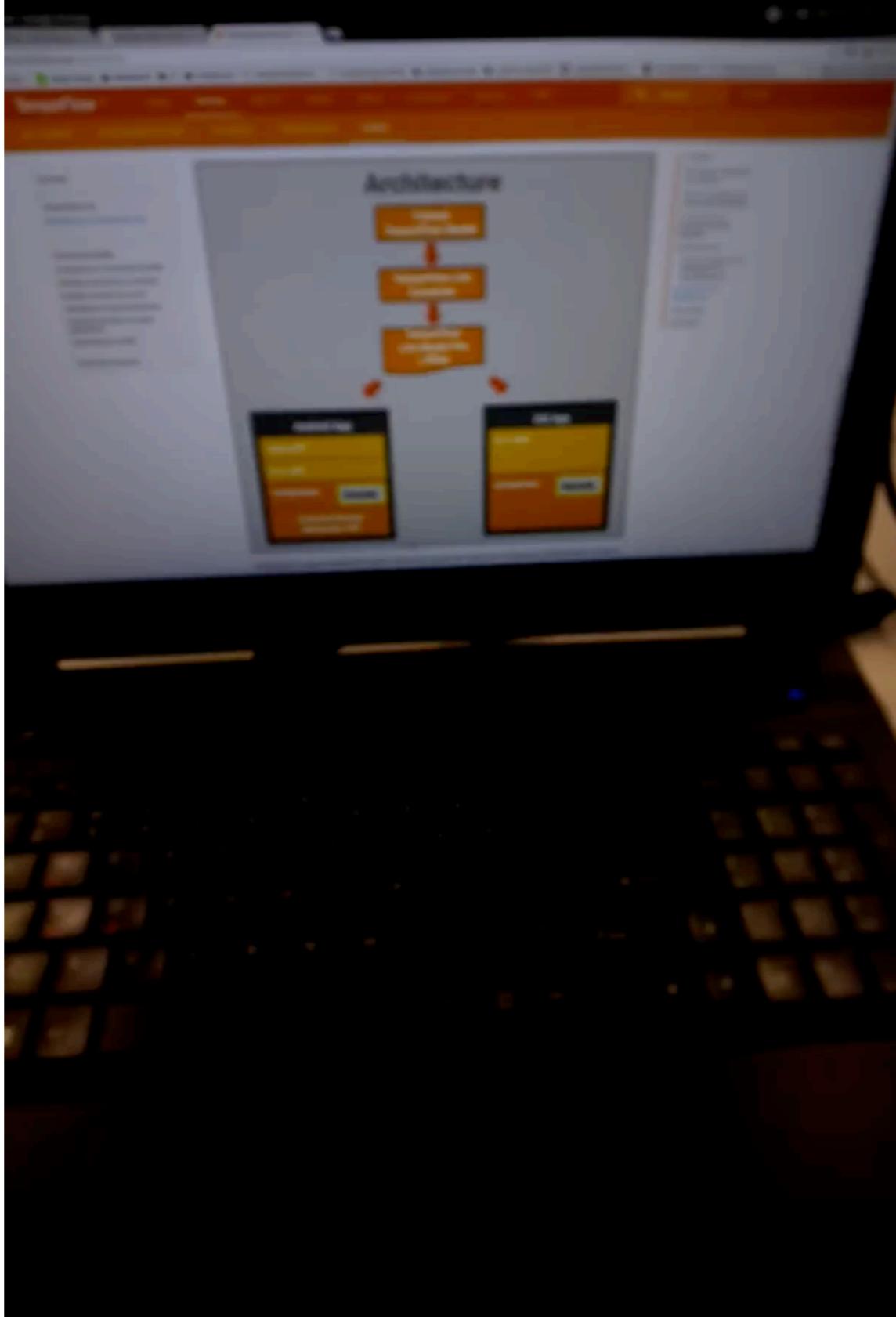


Click or hover over a session group to display its values here.

**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**



IBM CODAIT

WEB DEV

SERVERLESS

DATA SCIENCE

OBJECT STORAGE

CONTAINERS

| THE LAB

# Veremin — A Browser-based Video Theremin

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

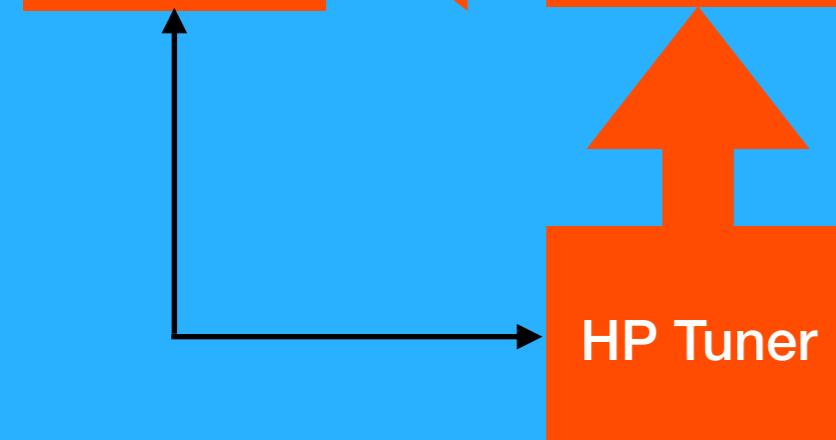
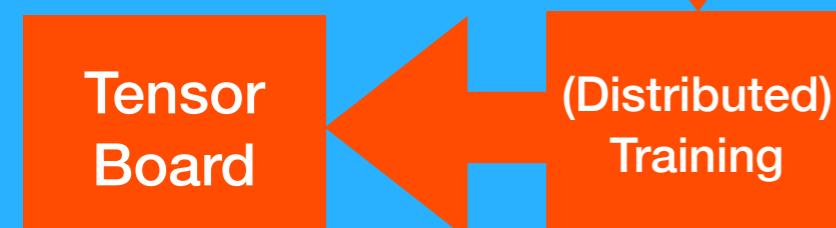
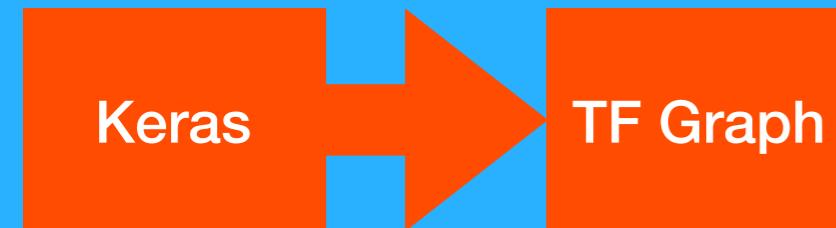


va barbosa

Feb 7 · 4 min read

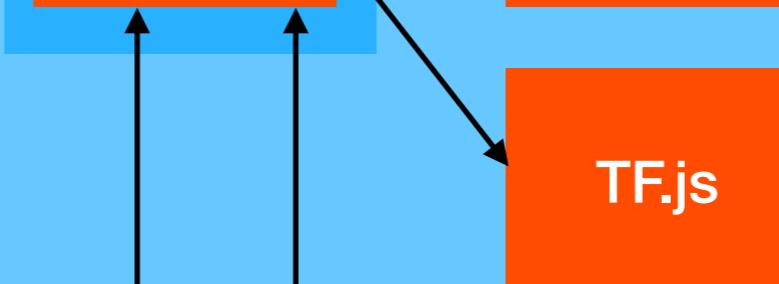
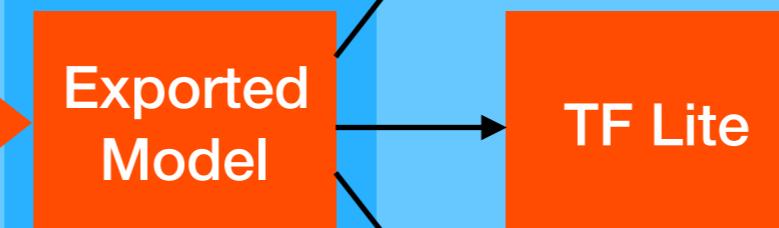
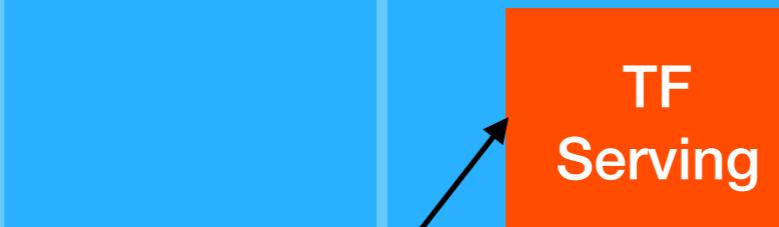
# IBM Watson Open Scale

## 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

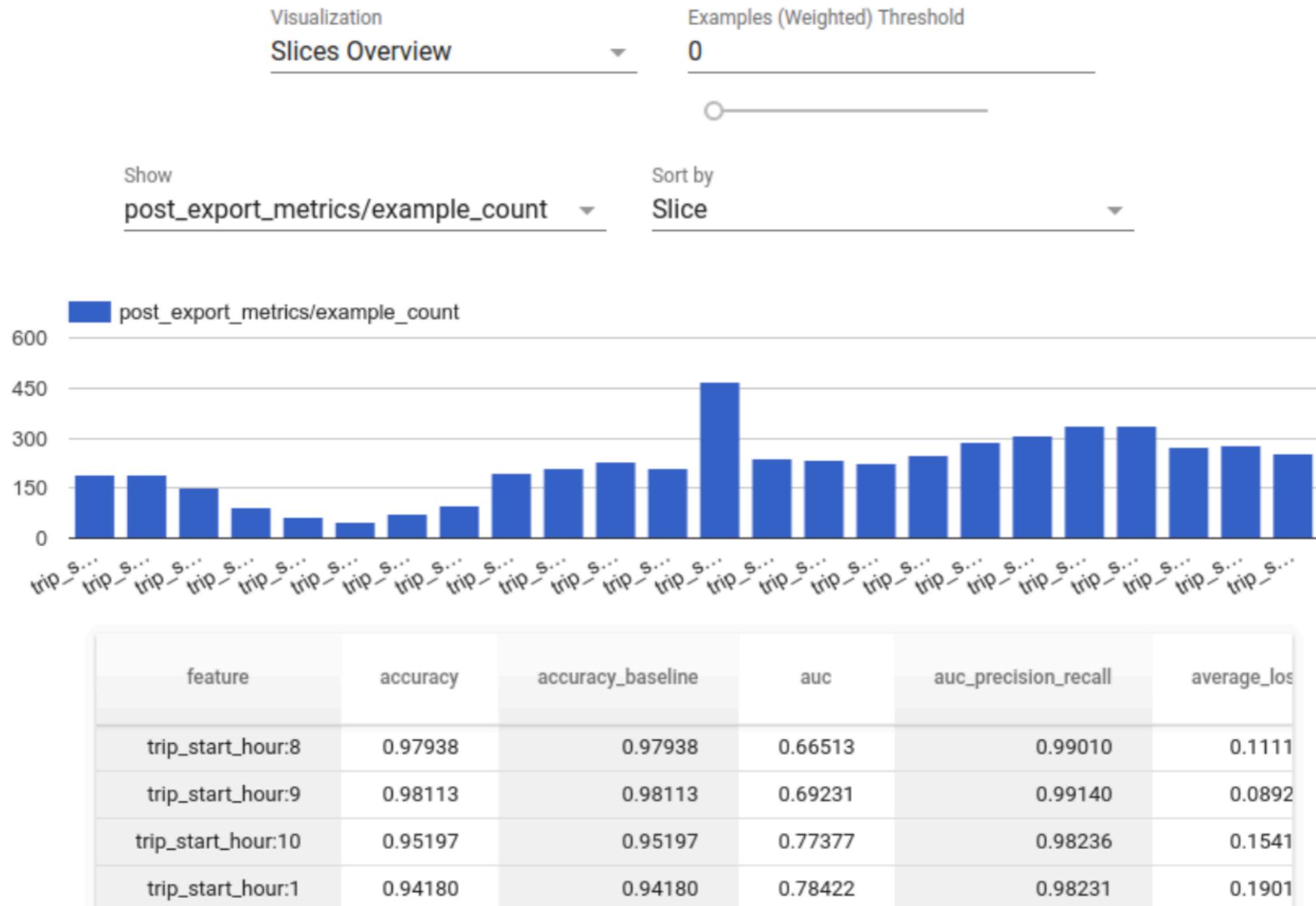
Shared Configuration Framework and Job Orchestration



Shared Utilities for Garbage Collection, Data Access Controls

Pipeline Storage

```
In [13]: # Show data sliced along feature column trip_start_hour.  
tfma.view.render_slicing_metrics(  
    tfma_result_1, slicing_column='trip_start_hour')
```



Romeo Kienzler

# Mastering Apache Spark 2.x

Second Edition

Scale your machine learning projects with SparkML, DeepLearning, and MLlib

Packt

Yu-Wei Chiu (David Chiu), Selva Prabhakaran, Tony Fischetti, Viswa Viswanathan, Shanthi Viswanathan, Romeo Kienzler

R

Computation

Actions

Solve complex problems using the most popular R techniques



Packt

Book Collection

## Learning Path Apache Spark 2: Data Processing and Real-Time Analytics

Master complex big data processing, stream analytics, and machine learning with Apache Spark

Romeo Kienzler, Md. Rezaul Karim, Sridhar Alte, Siamak Amaghodsi, Meenakshi Rajendran, Broderick Hall and Shuen Mei

Packt  
www.packt.com

<http://github.com/romeokienzler/TensorFlow>

## IBM Advanced Data Science Specialization Certificate on Coursera

### Fundamentals of Scalable Data Science

[www.coursera.org/learn/scalable-data-science](https://www.coursera.org/learn/scalable-data-science)

**ibm.biz/takeoff**

### Advanced Machine Learning and Signal Processing

[www.coursera.org/learn/machine-learning-signal-processing](https://www.coursera.org/learn/machine-learning-signal-processing)

**ibm.biz/getcertified**

### Applied AI

[www.coursera.org/learn/applied-ai](https://www.coursera.org/learn/applied-ai)

**ibm.biz/getcertified**

### Advanced Data Science Capstone Project

<https://www.coursera.org/learn/advanced-data-science-capstone>