



Introduction to TensorFlow 2.0

Kareem Negm

Solution Challenge

DSC AI-Azhar



TensorFlow

Deep Learning

Intro to TensorFlow & Colab

TensorFlow @Google Examples

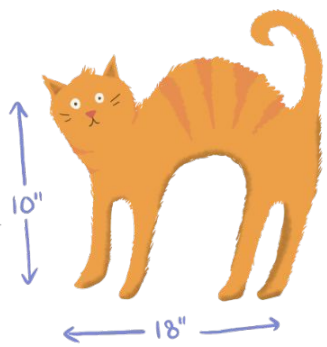
Why Tensorflow

Getting Started



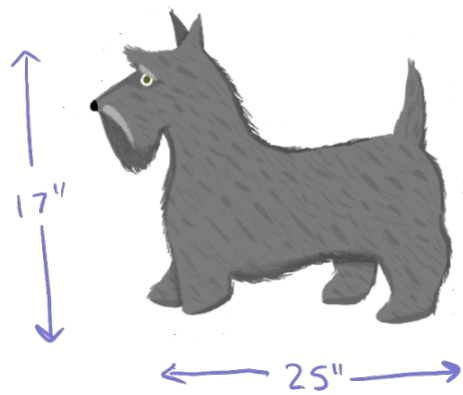
Deep Learning





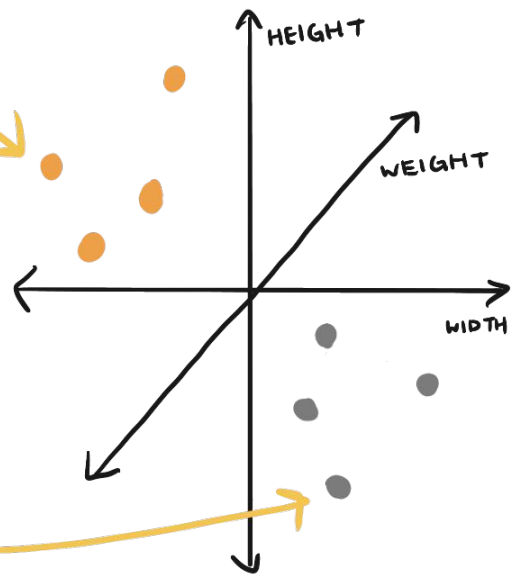
8.5 LBS

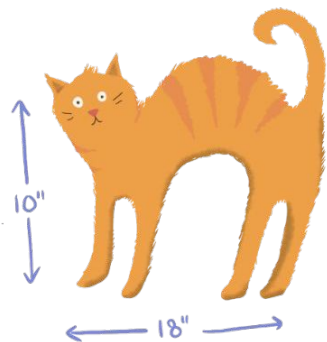
$$\begin{bmatrix} 10 \\ 8.5 \\ 18 \end{bmatrix}$$



30 LBS

$$\begin{bmatrix} 17 \\ 30 \\ 25 \end{bmatrix}$$

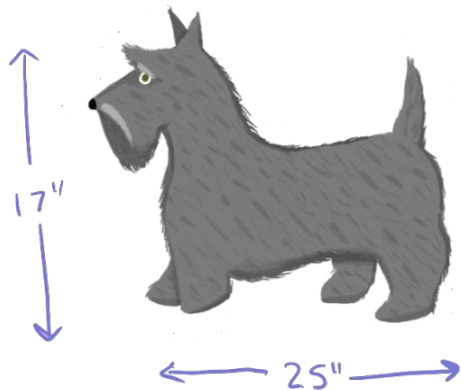




8.5 LBS



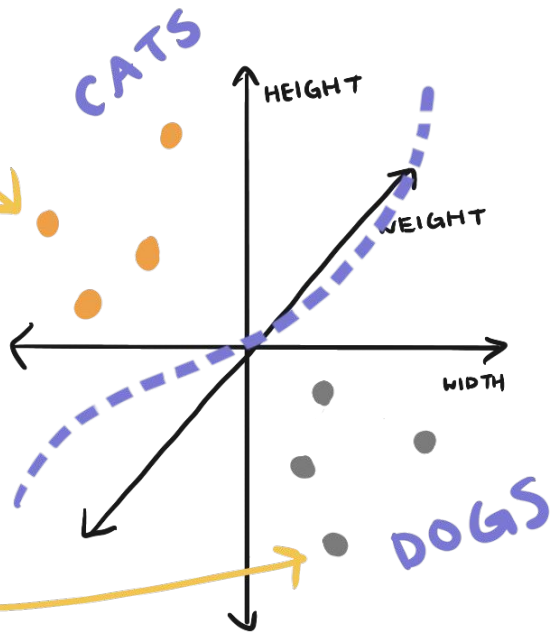
$$\begin{bmatrix} 10 \\ 8.5 \\ 18 \end{bmatrix}$$



30 LBS

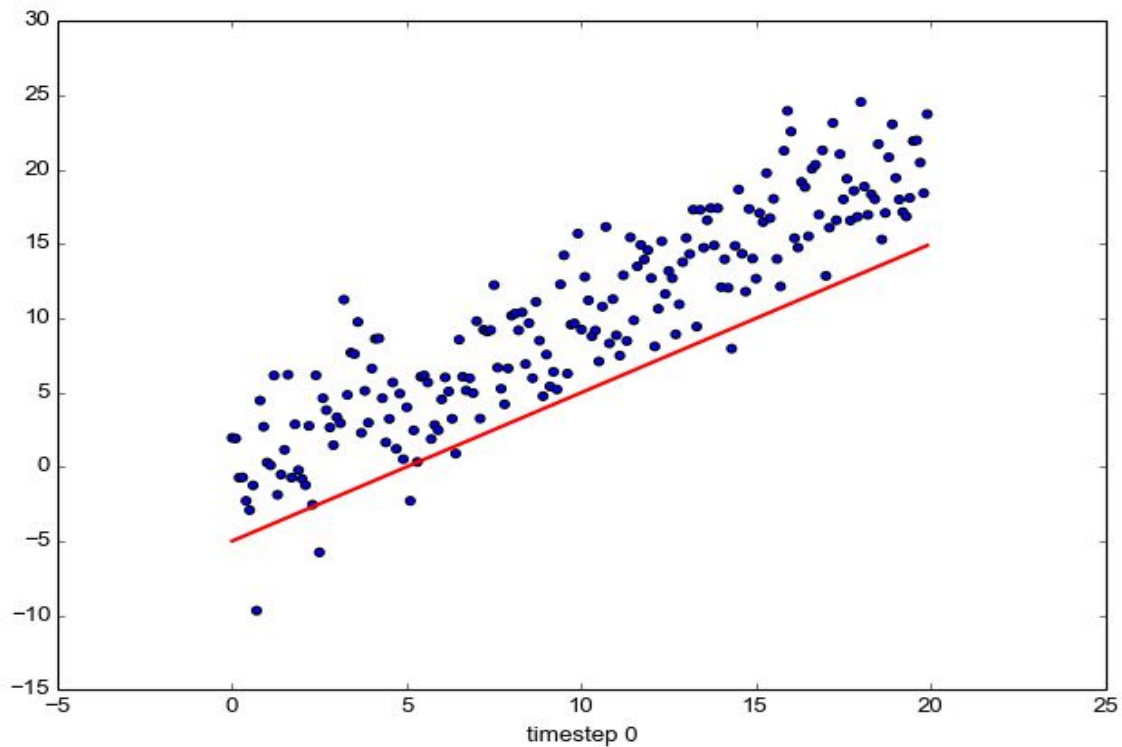


$$\begin{bmatrix} 17 \\ 30 \\ 25 \end{bmatrix}$$





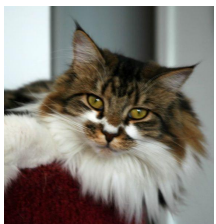
Weight



Height

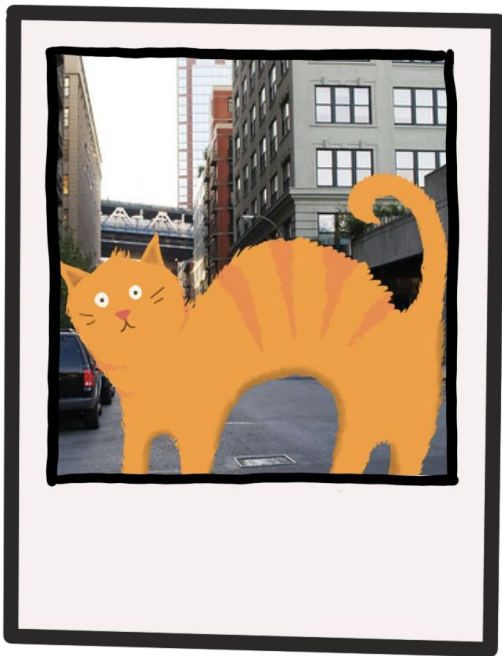


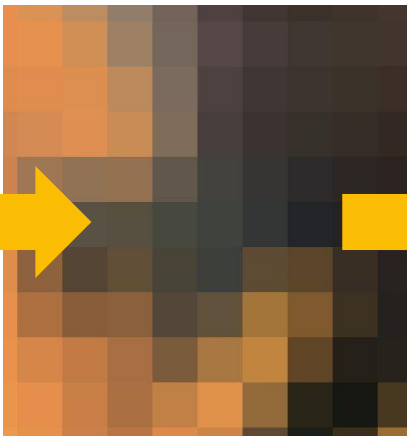
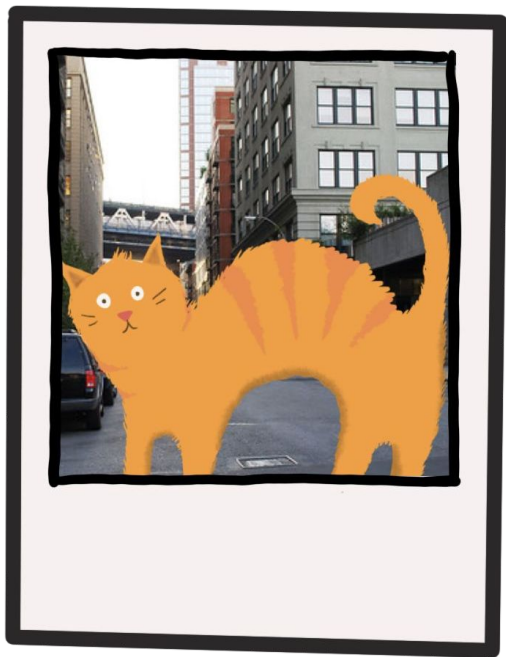
Examples of cats



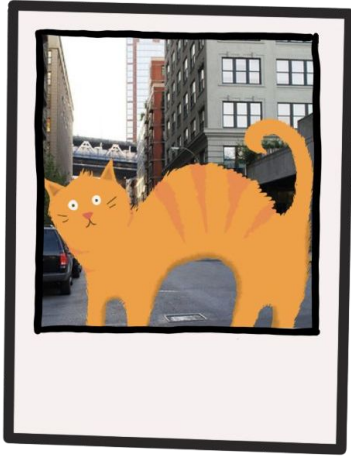
Examples of dogs





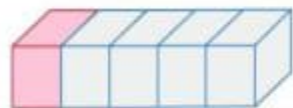


`rgb(89, 133, 204)`



28	51	7	9	8
19	22	.	.	.
18	.			
.	.			
.	.			
.	.			
.	.			

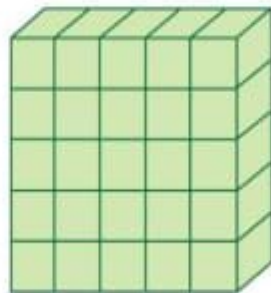
RED PIXEL VALUES



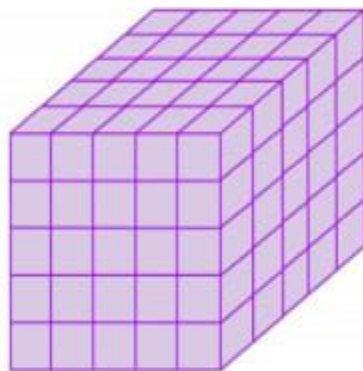
↑
scalar component
(rank 0)
(0-D Tensor)



vector
(rank 1)
(1-D Tensor)



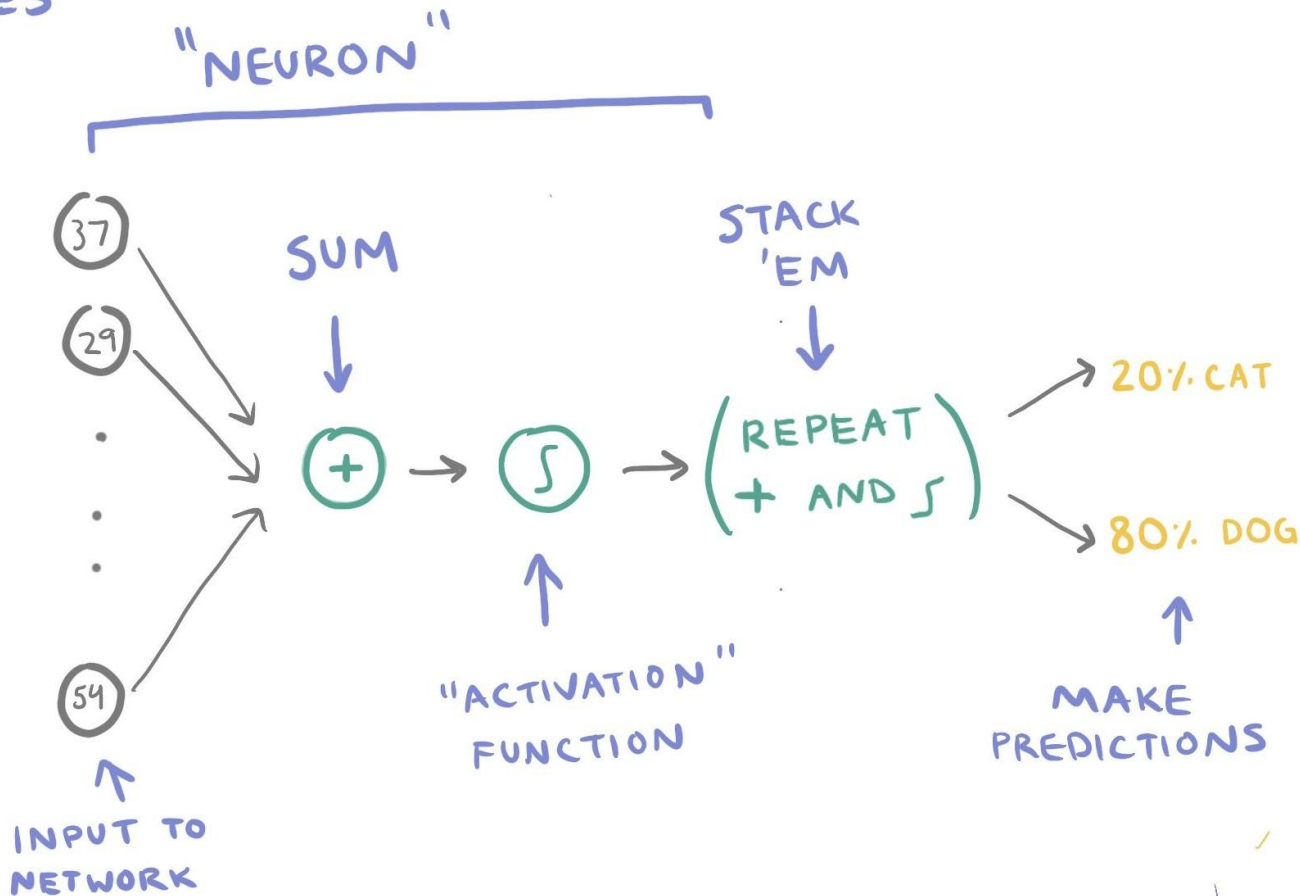
matrix
(rank 2)
(2-D Tensor)



3-D Tensor
(rank 3)

CAT PHOTO
PIXEL VALUES

↓
[37
29
54
⋮
11]

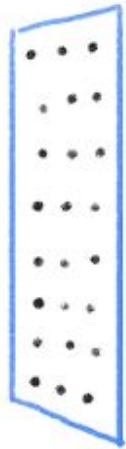
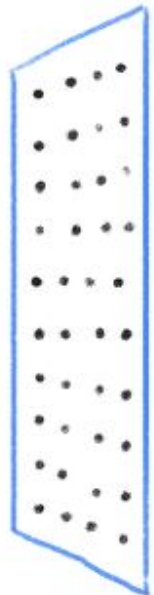
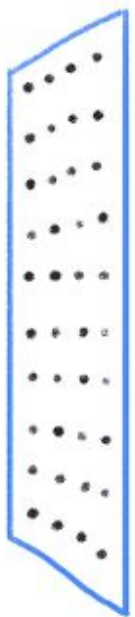




CAT

(Labeled
PHOTOS)

DOG



OUTPUT

CAT?

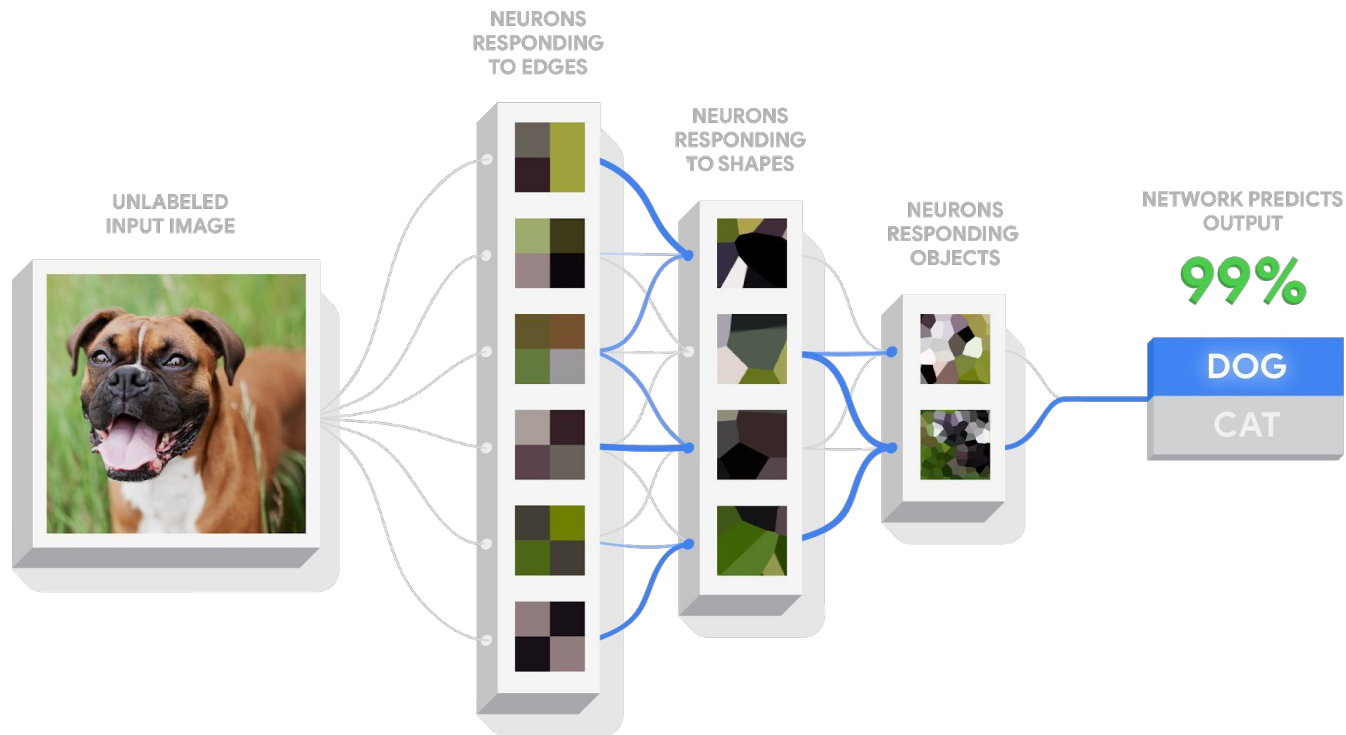


Output Layer

Activated
Neurons

Input Layer

DEEP
NEURAL
NETWORKS





Use Deep Learning When...

You have **lots** of data (~ 10k+ examples)



Use Deep Learning When...

You have **lots** of data (~ 10k+ examples)

The problem is “complex” - speech, vision, natural language



Use Deep Learning When...

You have **lots** of data (~ 10k+ examples)

The problem is “complex” - speech, vision, natural language

The data is unstructured



Use Deep Learning When...

You have **lots** of data (~ 10k+ examples)

The problem is “complex” - speech, vision, natural language

The data is unstructured

You need the absolute “best” model



Use Deep Learning When...

You have **lots** of data (~ 10k+ examples)

The problem is “complex” - speech, vision, natural language

The data is unstructured

You need the absolute “best” model

Powerful compute resources available (GPU acceleration)



Don't Use Deep Learning When...

You **don't** have a large dataset



Don't Use Deep Learning When...

You **don't** have a large dataset

You are performing sufficiently well with traditional ML methods



Don't Use Deep Learning When...

You **don't** have a large dataset

You are performing sufficiently well with traditional ML methods

Your data is structured and you possess the proper domain knowledge



Don't Use Deep Learning When...

You **don't** have a large dataset

You are performing sufficiently well with traditional ML methods

Your data is structured and you possess the proper domain knowledge

Limited computational power



TensorFlow



TensorFlow

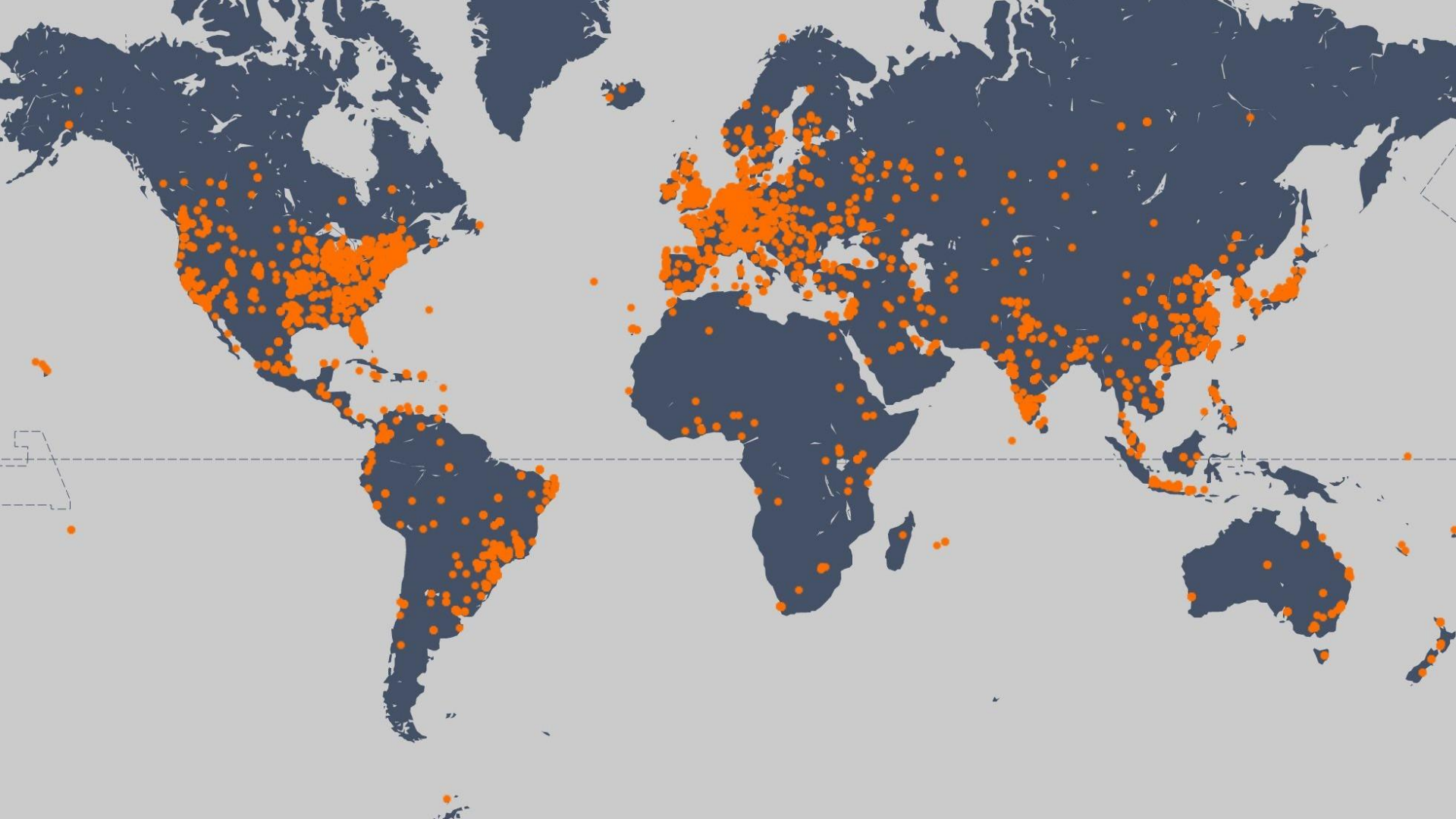
Open source deep learning library
Utilities to help you write neural networks

GPU / TPU support 

Released by Google in 2015

2.0 released September 2019





41,000,000+

downloads

69,000+

commits

12,000+

pull requests

2,200+

contributors

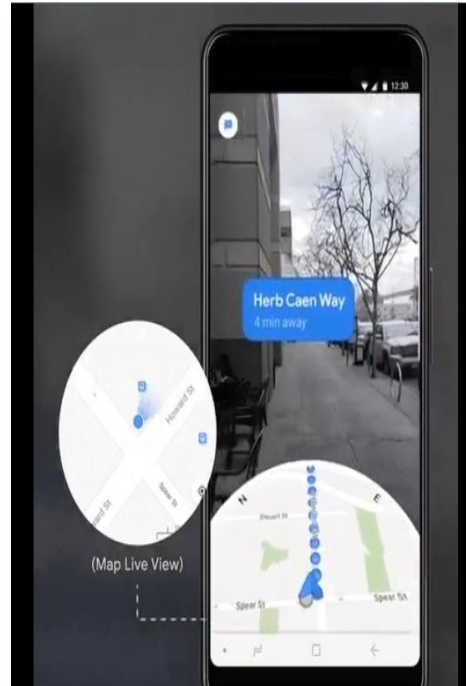


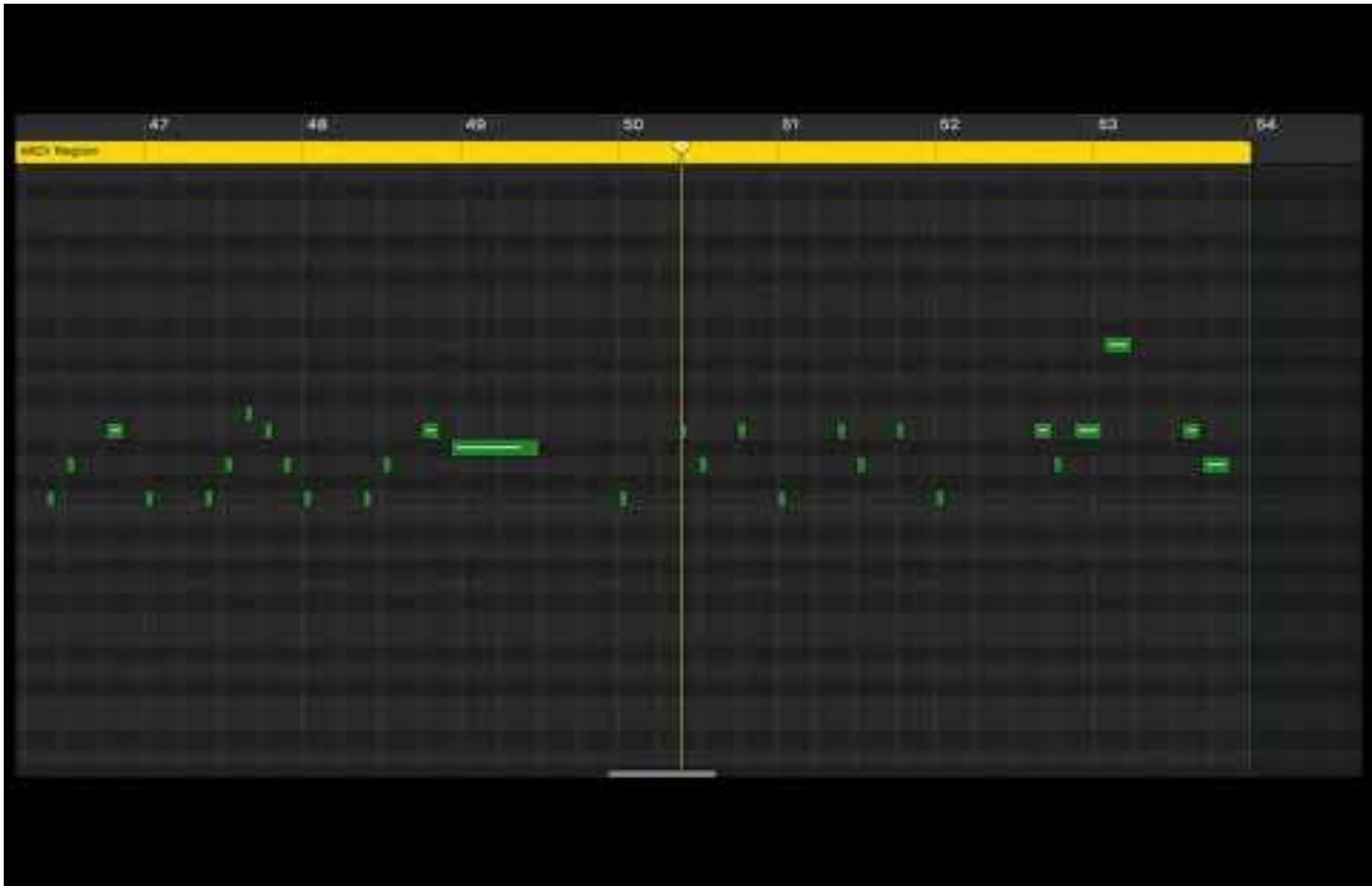
TensorFlow @ Google

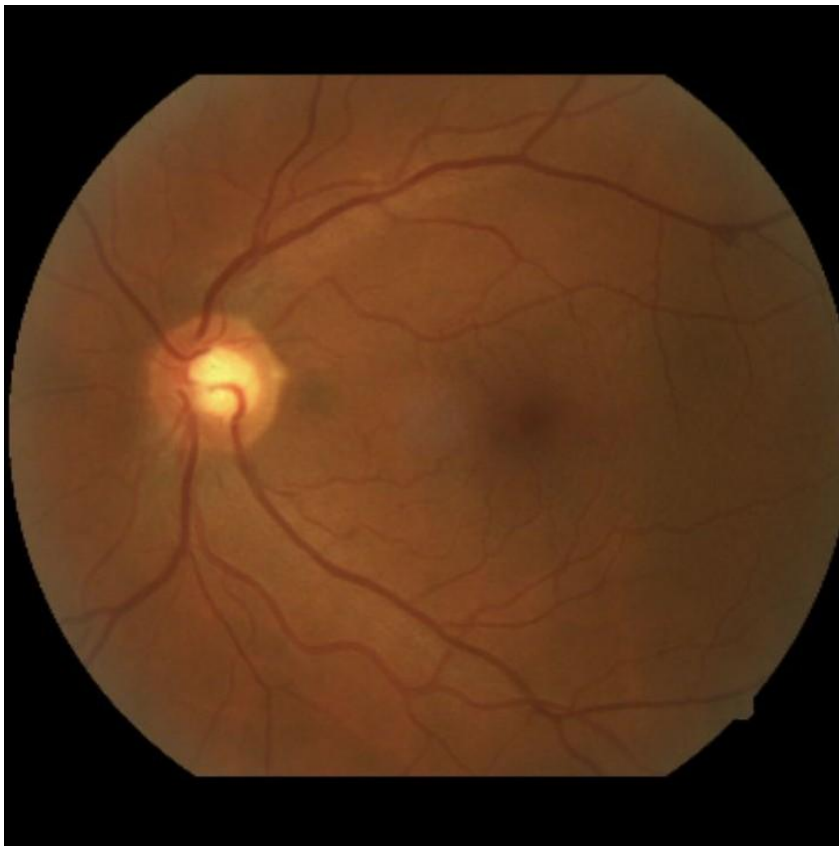
—



Global localization in Google Maps









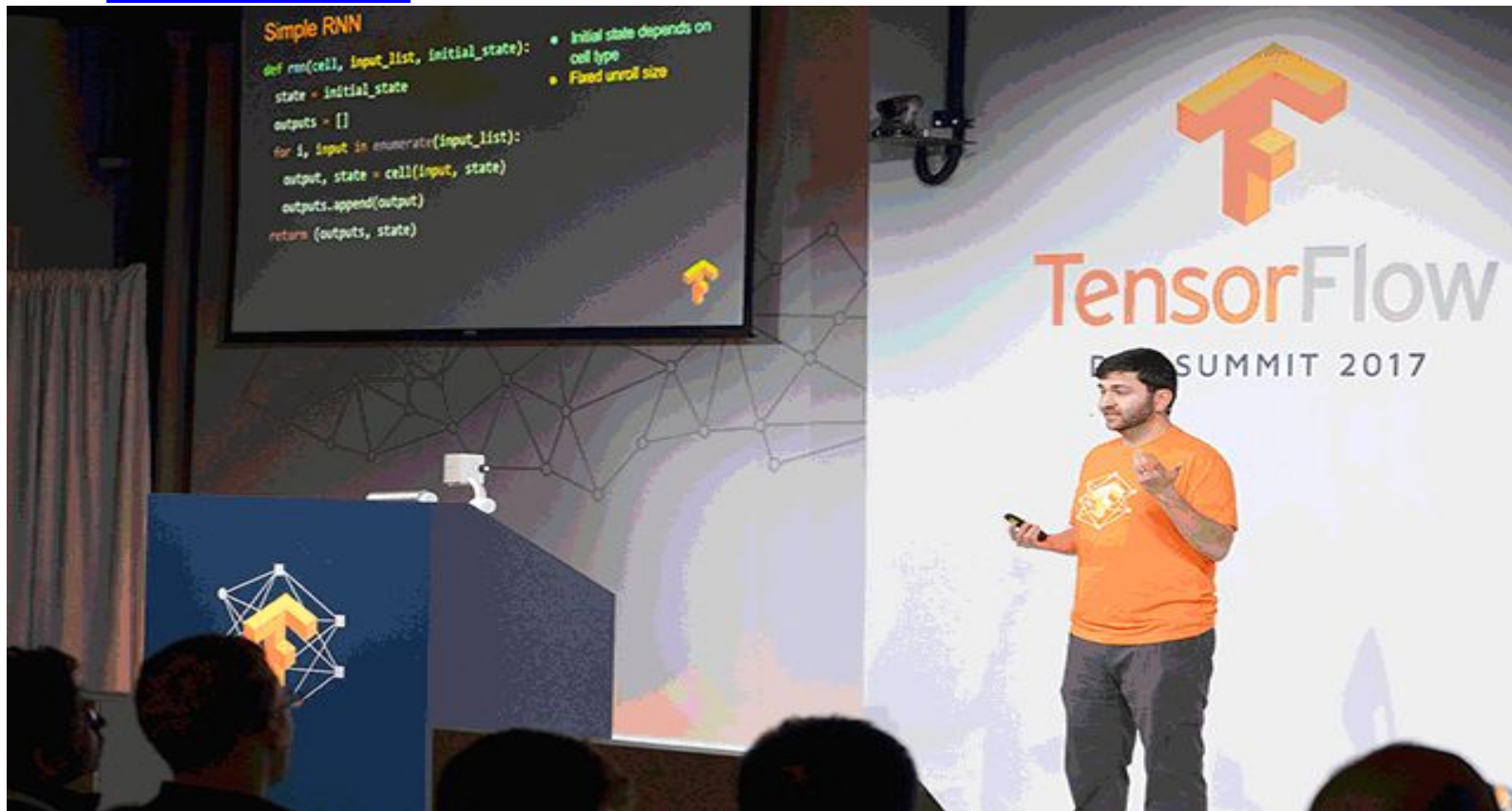
Sign Language Detector

Start AI

Keep us informed this session



The Magic Behind Google Translate: Sequence-to-Sequence Models and TensorFlow





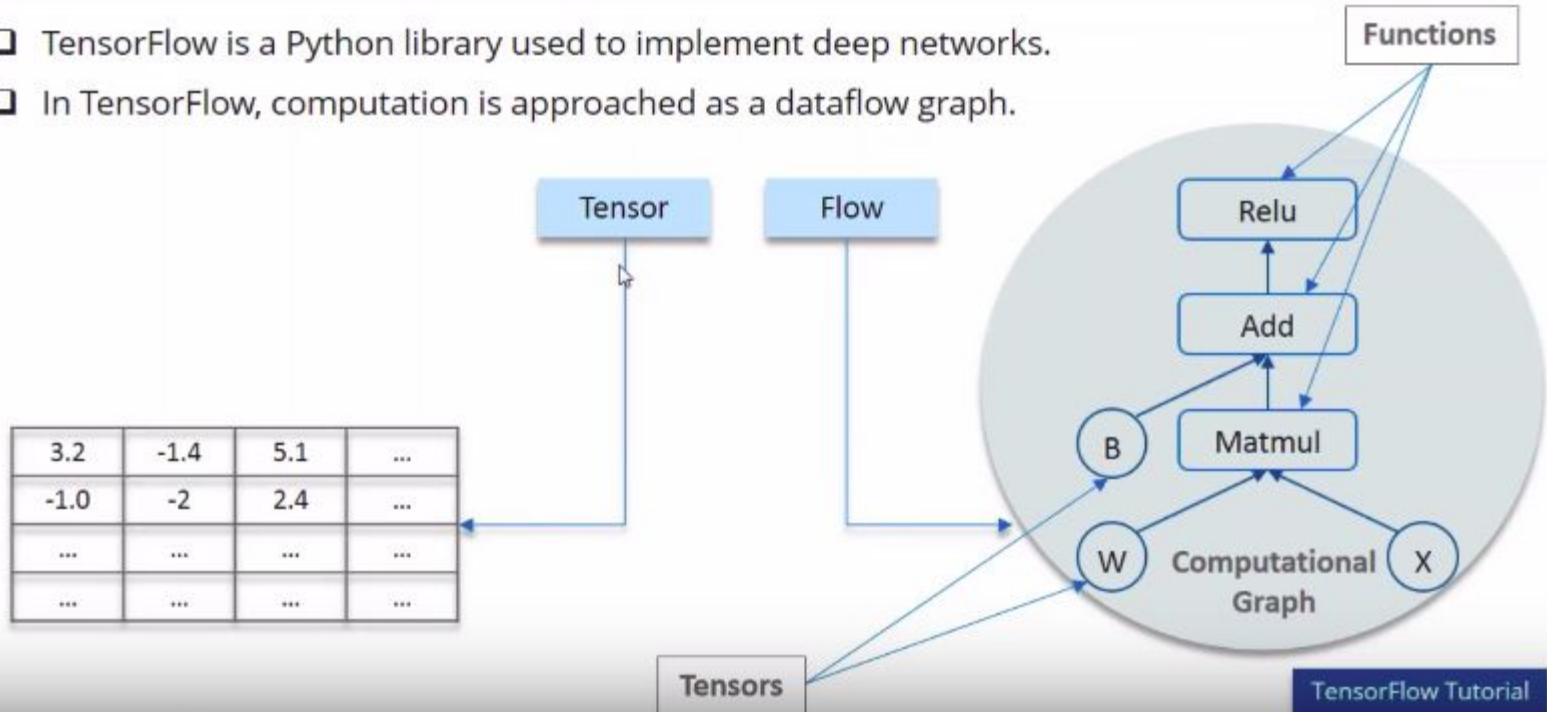


Tensorflow 2.0

—

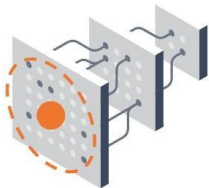


- ❑ TensorFlow is a Python library used to implement deep networks.
- ❑ In TensorFlow, computation is approached as a dataflow graph.





TensorFlow 2.0



Easy

Simplified APIs.
Focused on Keras and
eager execution



Powerful

Flexibility and performance.
Power to do cutting edge research
and scale to > 1 exaflops



Scalable

Tested at Google-scale.
Deploy everywhere



Deploy anywhere

Servers



TensorFlow
Extended

Edge devices



TensorFlow
Lite

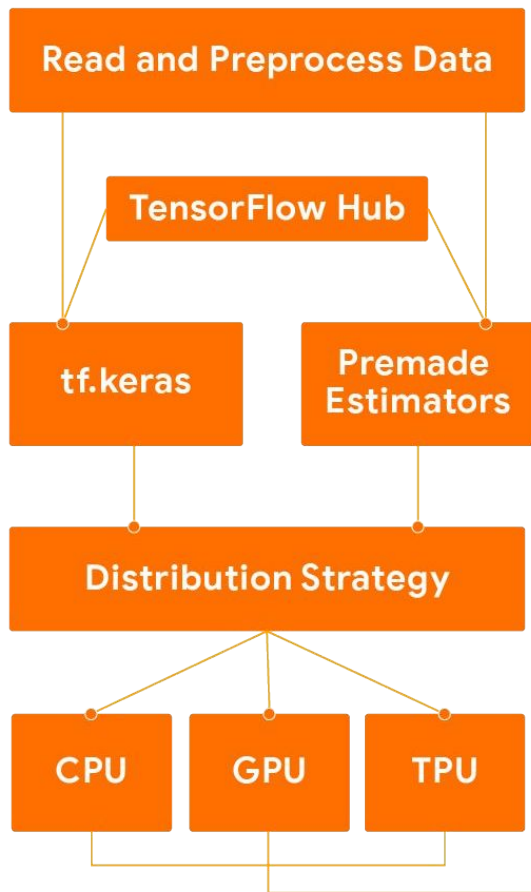
JavaScript



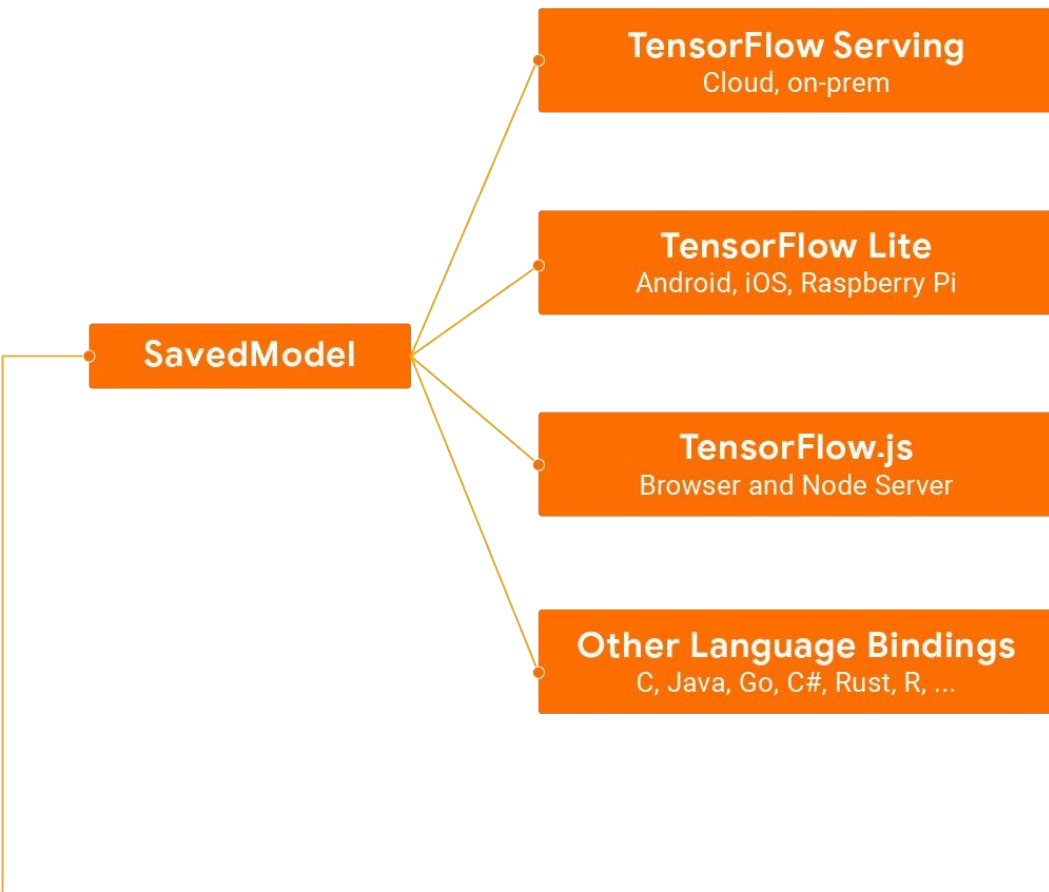
TensorFlow
.JS



TRAINING



DEPLOYMENT





Specifics

What's Gone

`Session.run`

`tf.control_dependencies`

`tf.global_variables_initializer`

`tf.cond`, `tf.while_loop`

`tf.contrib`



Specifics

What's Gone

`Session.run`

`tf.control_dependencies`

`tf.global_variables_initializer`

`tf.cond`, `tf.while_loop`

`tf.contrib`

What's New

Eager execution by default

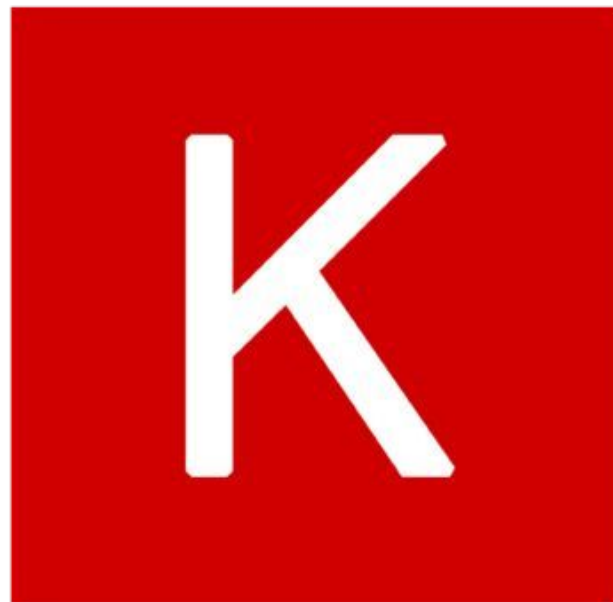
`tf.function`

Keras as main high-level
api



tf.keras

—



For Beginners

```
model = tf.keras.models.Sequential([  
    tf.keras.layers.Flatten(),  
    tf.keras.layers.Dense(512, activation='relu'),  
    tf.keras.layers.Dropout(0.2),  
    tf.keras.layers.Dense(10, activation='softmax')  
])
```

For Beginners

```
model = tf.keras.models.Sequential([
    tf.keras.layers.Flatten(),
    tf.keras.layers.Dense(512, activation='relu'),
    tf.keras.layers.Dropout(0.2),
    tf.keras.layers.Dense(10, activation='softmax')
])
model.compile(optimizer='adam',
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])
```

For Beginners

```
model = tf.keras.models.Sequential([
    tf.keras.layers.Flatten(),
    tf.keras.layers.Dense(512, activation='relu'),
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    tf.keras.layers.Dense(10, activation='softmax')
])
model.compile(optimizer='adam',
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])

model.fit(x_train, y_train, epochs=5)
```

For Beginners

```
model = tf.keras.models.Sequential([
    tf.keras.layers.Flatten(),
    tf.keras.layers.Dense(512, activation='relu'),
    tf.keras.layers.Dropout(0.2),
    tf.keras.layers.Dense(10, activation='softmax')
])
model.compile(optimizer='adam',
              loss='sparse_categorical_crossentropy',
              metrics=['accuracy'])

model.fit(x_train, y_train, epochs=5)
model.evaluate(x_test, y_test)
```


tensorflow_datasets



—



TensorFlow Datasets

- audio
 - "nsynth"
- image
 - "cifar10"
 - "diabetic_retinopathy_detection"
 - "imagenet2012"
 - "mnist"
- structured
 - "titanic"
- text
 - "imdb_reviews"
 - "lm1b"
 - "squad"
- translate
 - "wmt_translate_ende"
 - "wmt_translate_enfr"
- video
 - "bair_robot_pushing_small"
 - "moving_mnist"
 - "starcraft_video"

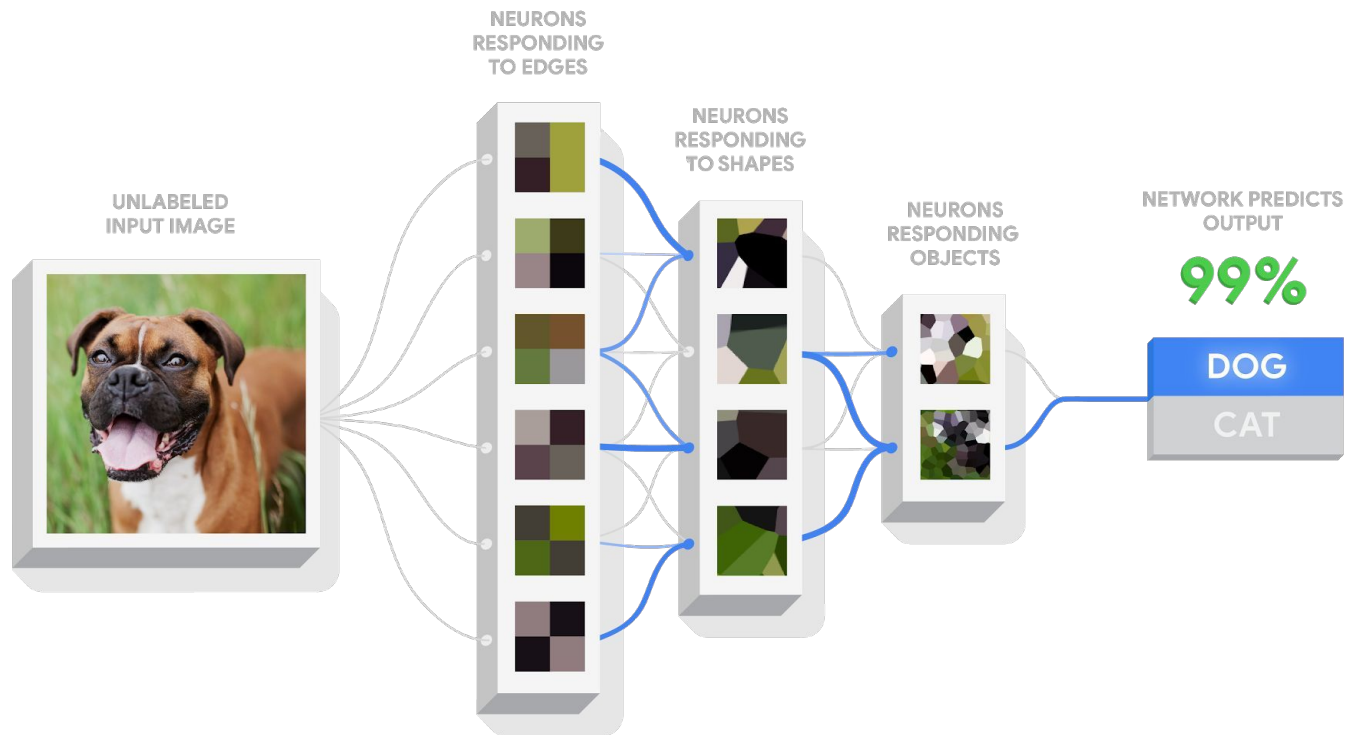
More at

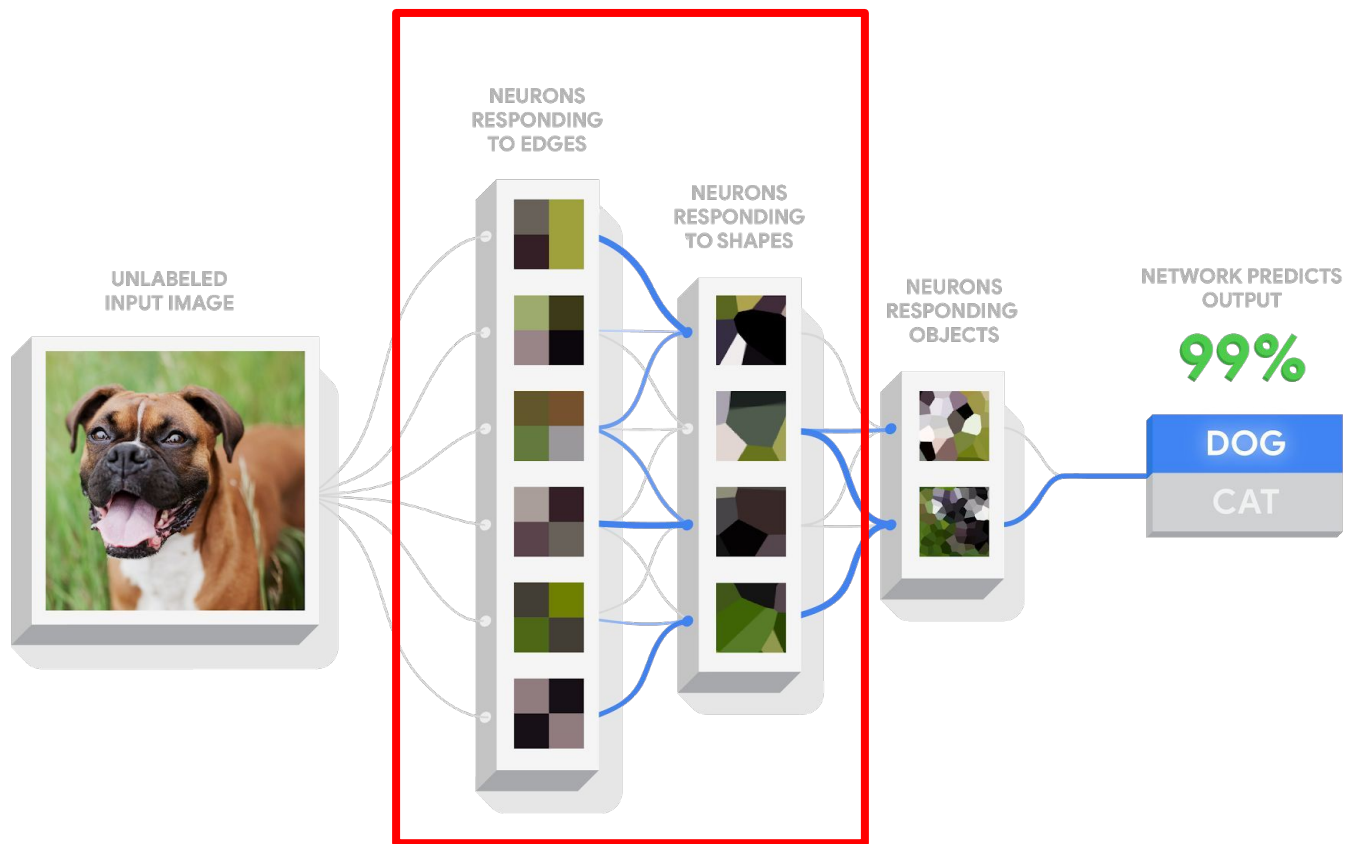
tensorflow.org/datasets

Transfer Learning



—





Transfer Learning

```
import tensorflow as tf

base_model =

    tf.keras.applications.SequentialMobileNetV2(
        input_shape=(160, 160, 3),
        include_top=False,
        weights='imagenet')

base_model.trainable = False

model = tf.keras.models.Sequential([
    base_model,
    tf.keras.layers.GlobalAveragePooling2D(),
    tf.keras.layers.Dense(1)
])

# Compile and fit
```



TensorFlow Hub

Q

USER GUIDE

Text

Embedding

Image

Classification

Feature Vector

Generator

Video

Classification

Publishers

Google

DeepMind

Text embedding

universal-sentence-encoder by Google
text-embedding DAN en
Encoder of greater-than-word length text trained on a variety of data.

nnlm-en-dim128 by Google
text-embedding Google News NLM en
Token based text embedding trained on English Google News 2008 corpus.

elmo by Google
text-embedding 1 Billion Word Benchmark ELMo en
Embeddings from a language model trained on the 1 Billion Word Benchmark.

[View more text embeddings](#)

Image feature vectors

imagenet/inception_v3/feature_vector by Google
image-feature-vector ImageNet (LSVNC-2012-CLS) Inception V3
Feature vectors of images with Inception V3 trained on ImageNet (LSVNC-2012-CLS).

<https://blog.csdn.net/TensorFlowers>

https://tfhub.dev/google/imagenet/inception_v3/feature_vector



Getting Started





TensorFlow 2.0

```
pip install tensorflow
```

[Installing TensorFlow 2.0, Keras, & Python 3.8 in Windows 10](#)



An end-to-end open source machine learning platform

TensorFlow

[For JavaScript](#)

[For Mobile & IoT](#)

[For Production](#)

The core open-source library to help you develop and train ML models. Get started quickly by running Colab notebooks directly in your browser.

[Get started with TensorFlow](#)





+



+





New Courses



deeplearning.ai

coursera

Introduction to TensorFlow
for AI, ML and DL

coursera.org/learn/introduction-tensorflow



UDACITY

Intro to
TensorFlow for
Deep Learning

udacity.com/tensorflow



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tensorflow

<http://www.tensorflow.org> github-admin@tensorflow.org

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Jupyter Notebook 4.3k 4.2k

[community](#)

Stores documents used by the TensorFlow developer community

871 388

Find a repository...

Type: All ▾

Language: All ▾

[tensorflow](#)

An Open Source Machine Learning Framework for Everyone

Top languages

Python Jupyter Notebook



3 To do

Feature: Unify argument names (~70).
tensorflow#25357 opened by dynamicwebpaige
2.0 type:feature

...

Keras model evaluate() progress bar randomly stops before 100%
tensorflow#24593 opened by ageron
2.0 comp:keras

...

Side effects induced by attribute and slice operators must be limited in Python control flow.
tensorflow#26189 opened by dynamicwebpaige
2.0

...

28 In progress

2.0 Reference Models: Keras Application Set (1 GPU)
tensorflow#25341 opened by dynamicwebpaige
2.0 type:feature

...

2.0 Reference Models: Transformer (1 GPU, 8 GPU with dist strat and Keras)
tensorflow#25342 opened by dynamicwebpaige
2.0 type:feature

...

2.0 Reference Models: NMT Model (1 GPU, 8 GPU with dist strat and Keras)
tensorflow#25343 opened by dynamicwebpaige
2.0 type:feature

...

18 Done

Feature: modify the TF 2.0 upgrade script to convert .ipynb files.
tensorflow#25448 opened by dynamicwebpaige
2.0 type:feature

...

Feature: TensorFlow.js compatibility with TF 2.0.
tensorflow#25360 opened by dynamicwebpaige
2.0 type:feature

...

Feature: TensorFlow Lite compatibility with TF 2.0.
tensorflow#25361 opened by dynamicwebpaige
2.0 comp:lite type:feature

...

Feature: TensorBoard compatibility

github.com/orgs/tensorflow/projects/4



TensorFlow Datasets

Data Infeed Made Simple



tf.thanks_for_watching!



Kareem Negm

Solution Challenge

DSC AI-Azhar

Questions !



Kareem Negm
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