



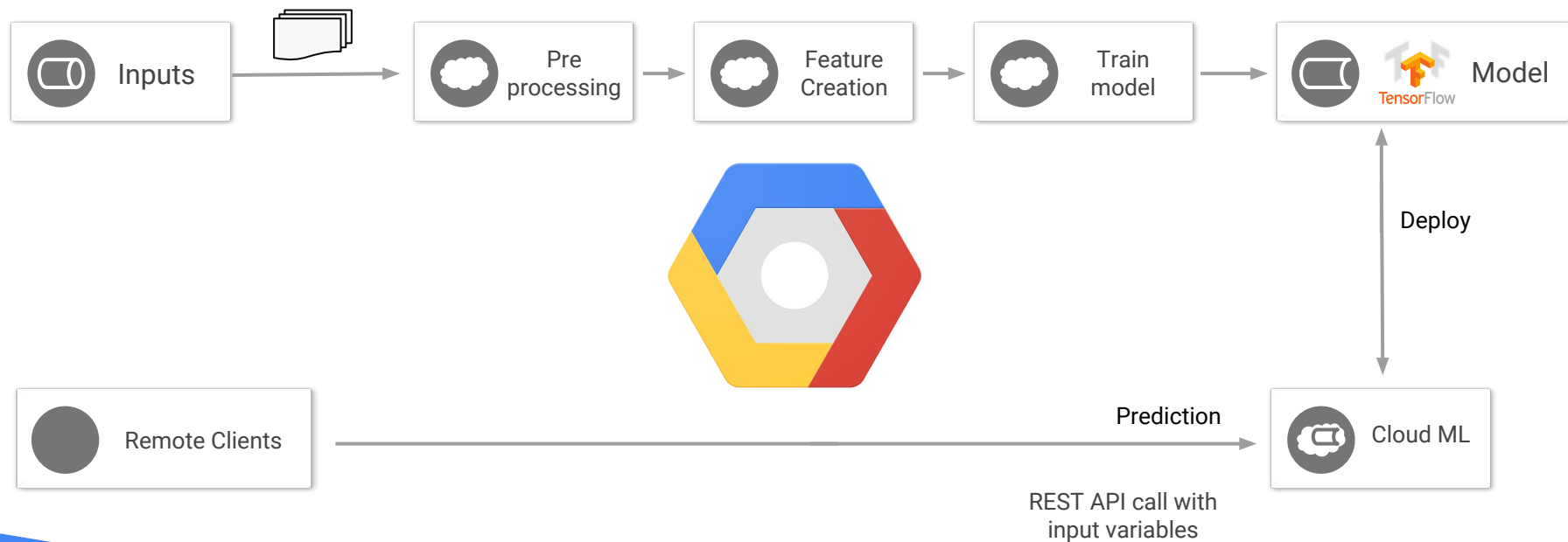
Machine learning with TensorFlow and Google Cloud

goto; Copenhagen

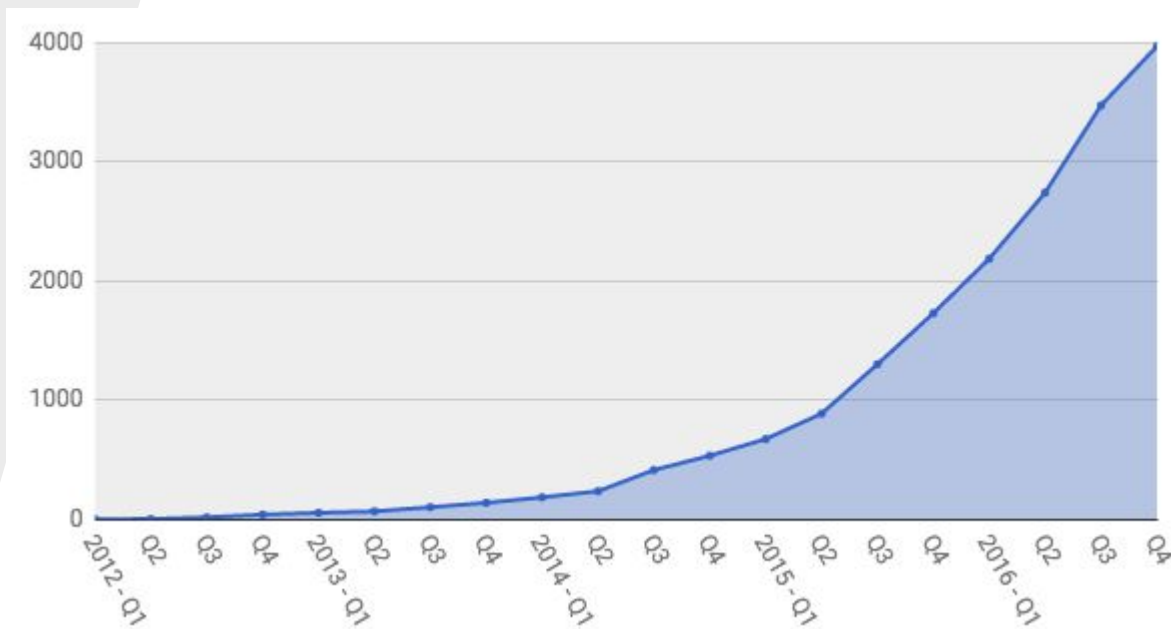
Vijay Reddy

Machine Learning Specialist, Google

End to End ML Pipeline



Rapid accelerated use of deep learning at Google



Google Cloud brings battle hardened tech from Google products



Search

Search ranking
Speech recognition



Android

Keyboard & speech input



Play

App recommendations
Game developer experience



Gmail

Smart Reply
Spam classification



Drive

Intelligence in Apps



Chrome

Search by Image



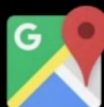
Photos

Photos search



YouTube

Video recommendations
Better thumbnails



Maps

Street View image
Parsing Local Search



Translate

text, graphic, and
speech translations



Cardboard

Smart stitching



Ads

Richer Text Ads
Automated Bidding

Two Flavors of Machine Learning

Custom ML models



TensorFlow



Machine Learning
Engine

Pre-trained ML models



Vision API



Speech API



Jobs API



Natural
Language API



Translation
API



Video
Intelligence API

Try them in your browser, for free!

cloud.google.com/translate/

Enter a word or phrase: Translate from: Translate to:

cloud.google.com/natural-language/


Try the API

Enter text in English, Spanish or Japanese

cloud.google.com/vision/

Try the API


Drag image file here or
Browse from your computer

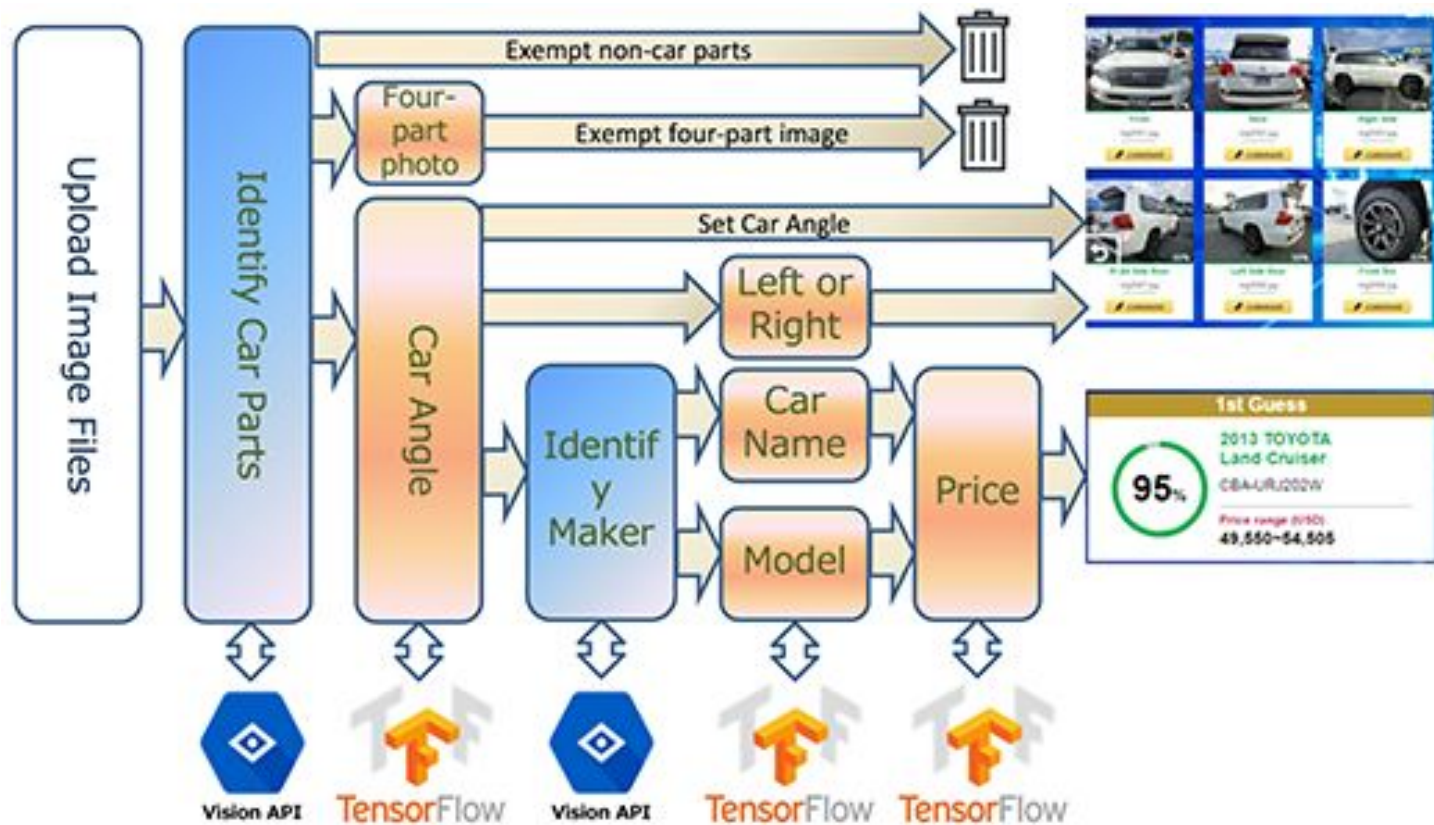


cloud.google.com/speech/

Convert your voice to text right now

Click on the microphone icon to start recording





Two Flavors of Machine Learning

Custom ML models



TensorFlow



Machine Learning
Engine

Pre-trained ML models



Vision API



Speech API



Jobs API



Natural
Language API



Translation
API

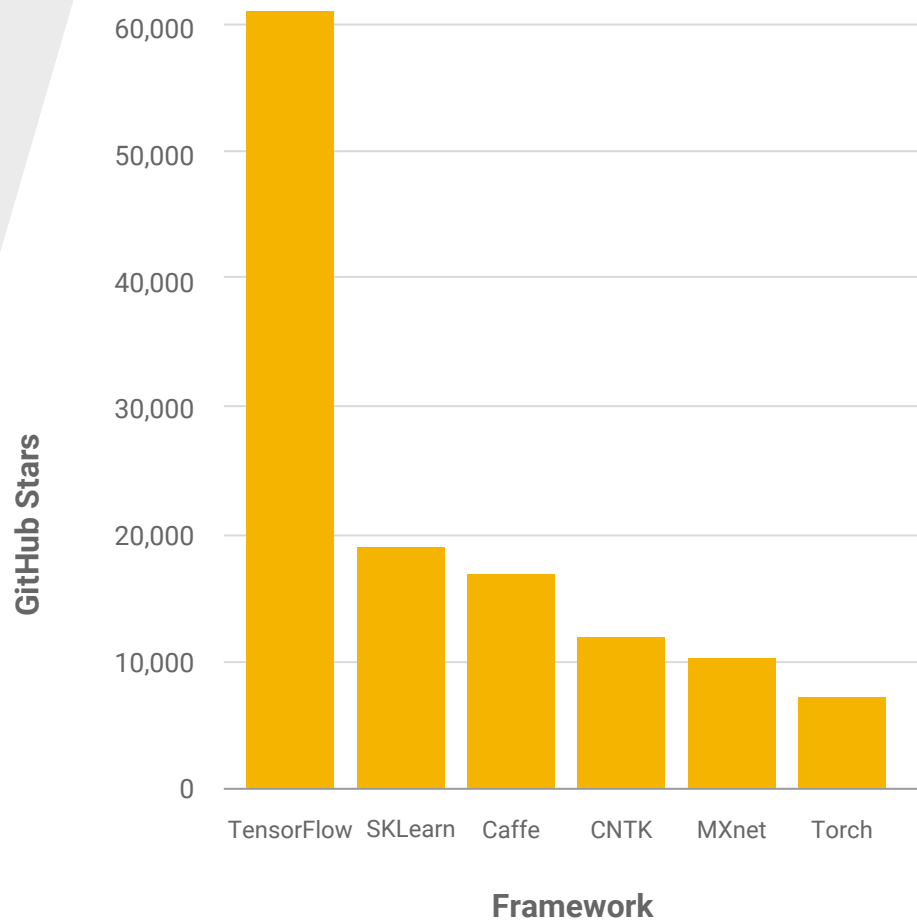


Video
Intelligence API

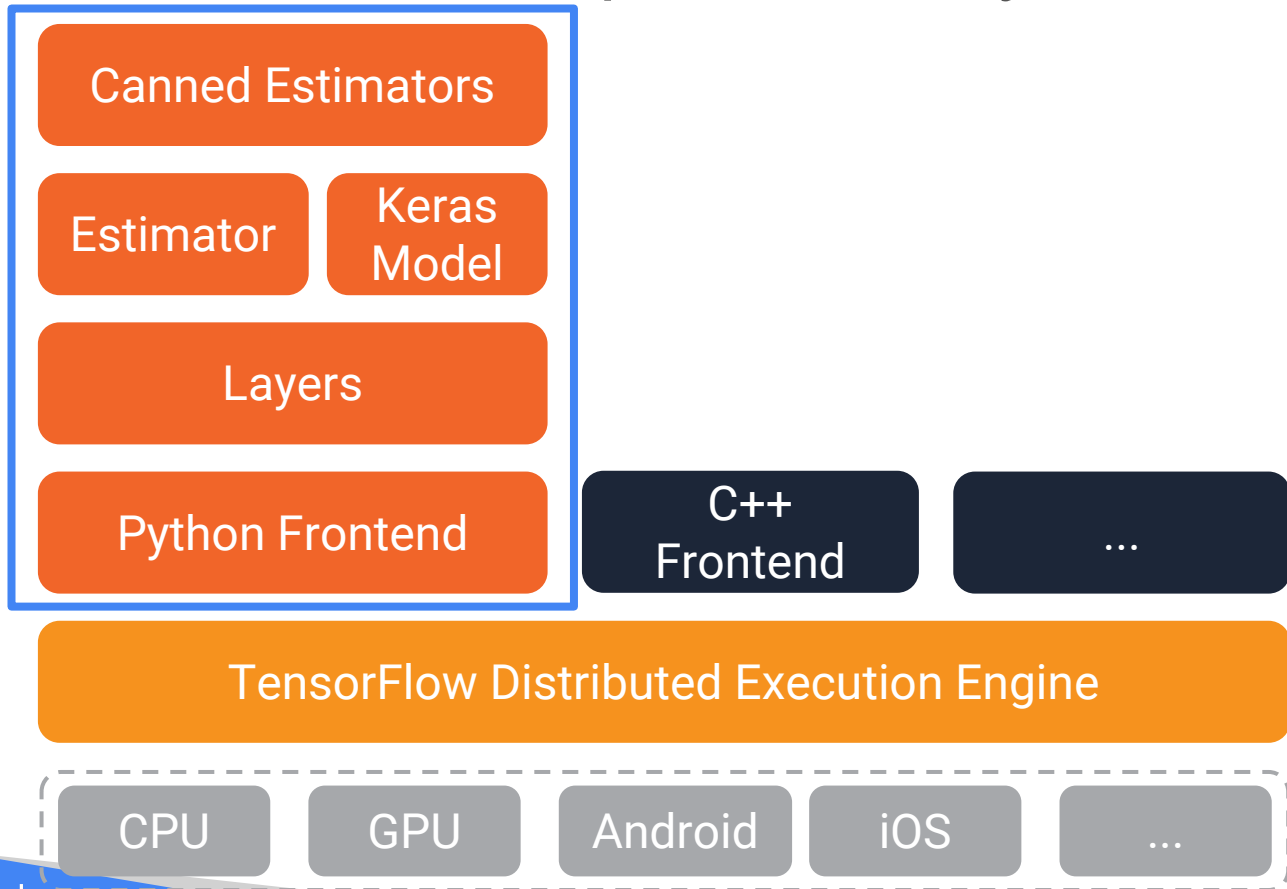
Why Tensorflow?

- Largest Developer Community
- Developer Flexibility
- Production Ready
- State of the art ML algorithms built in
- Fast C++ Backend

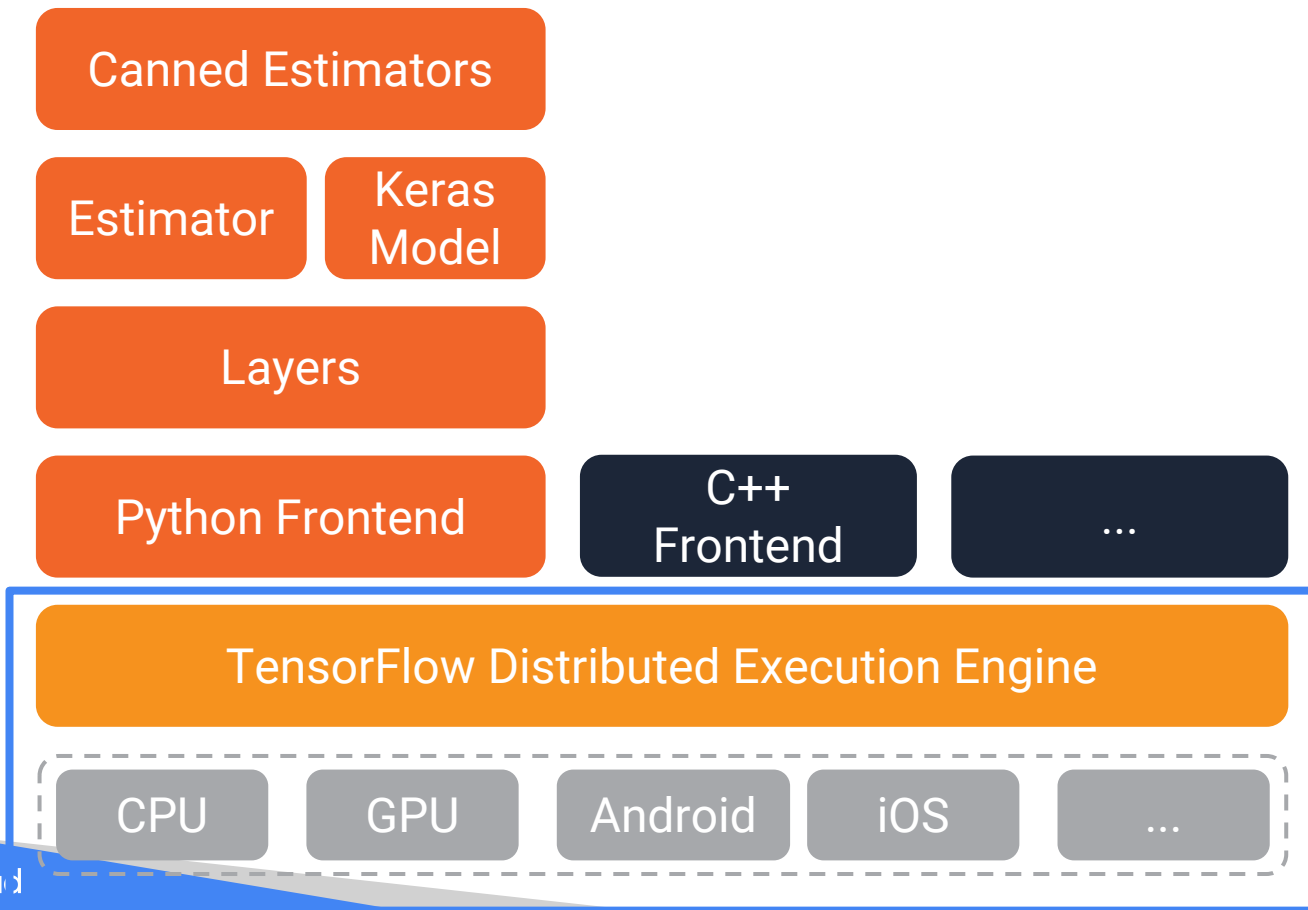
Largest Developer Community



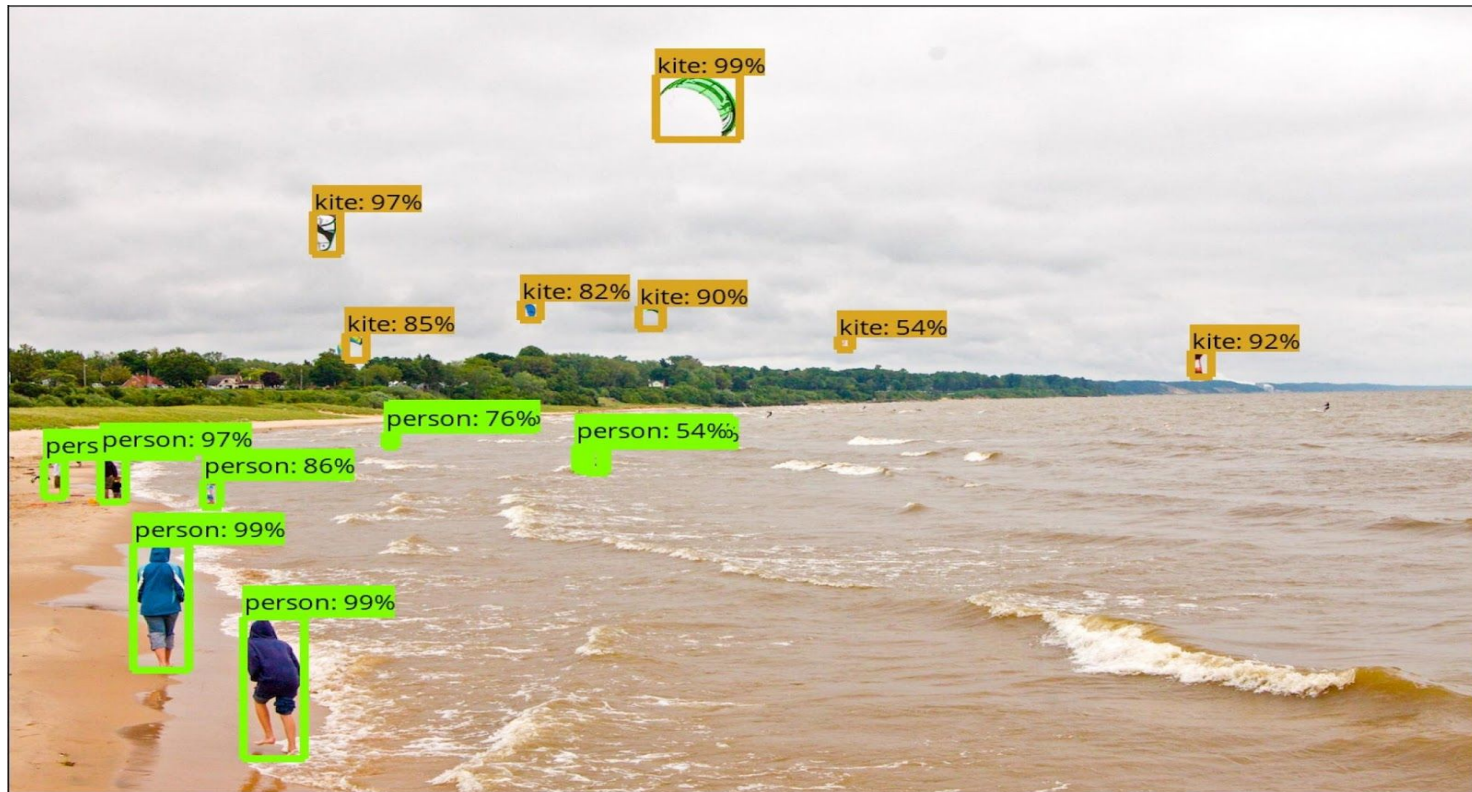
Developer Flexibility



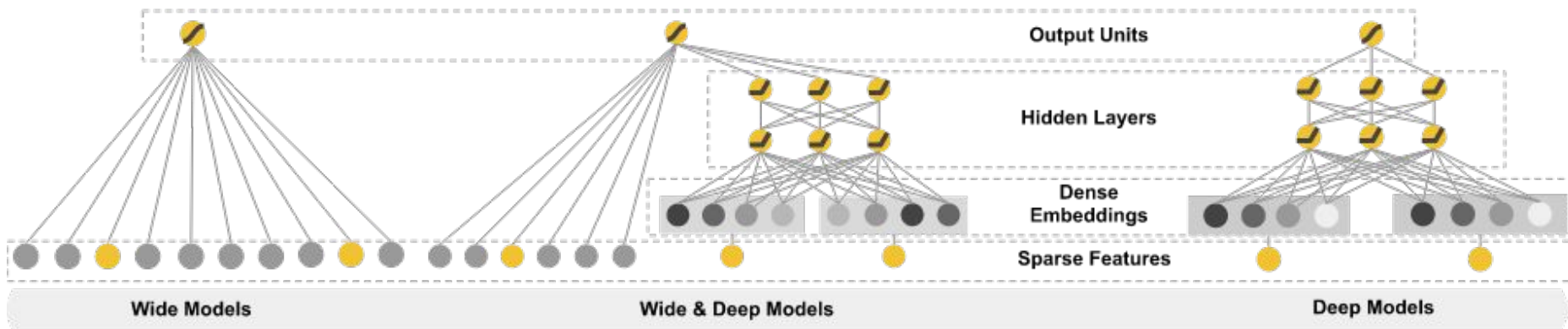
Production Ready



State of the Art Algorithms

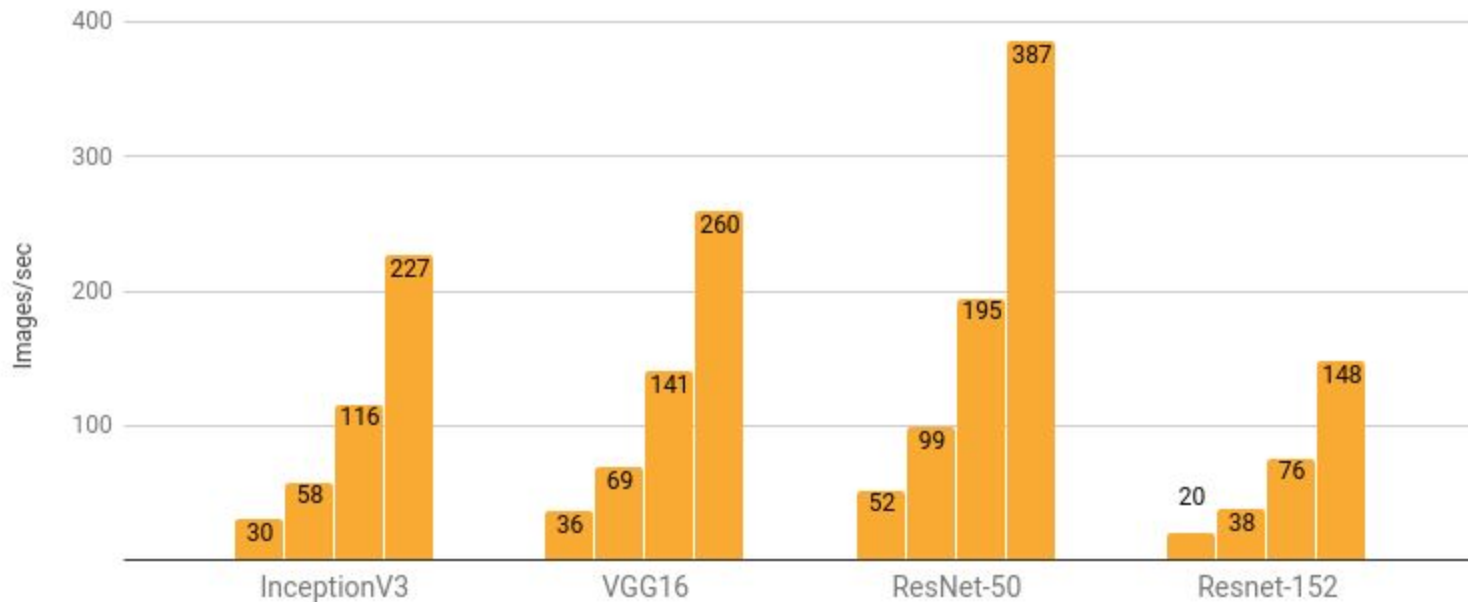


State of the Art Algorithms



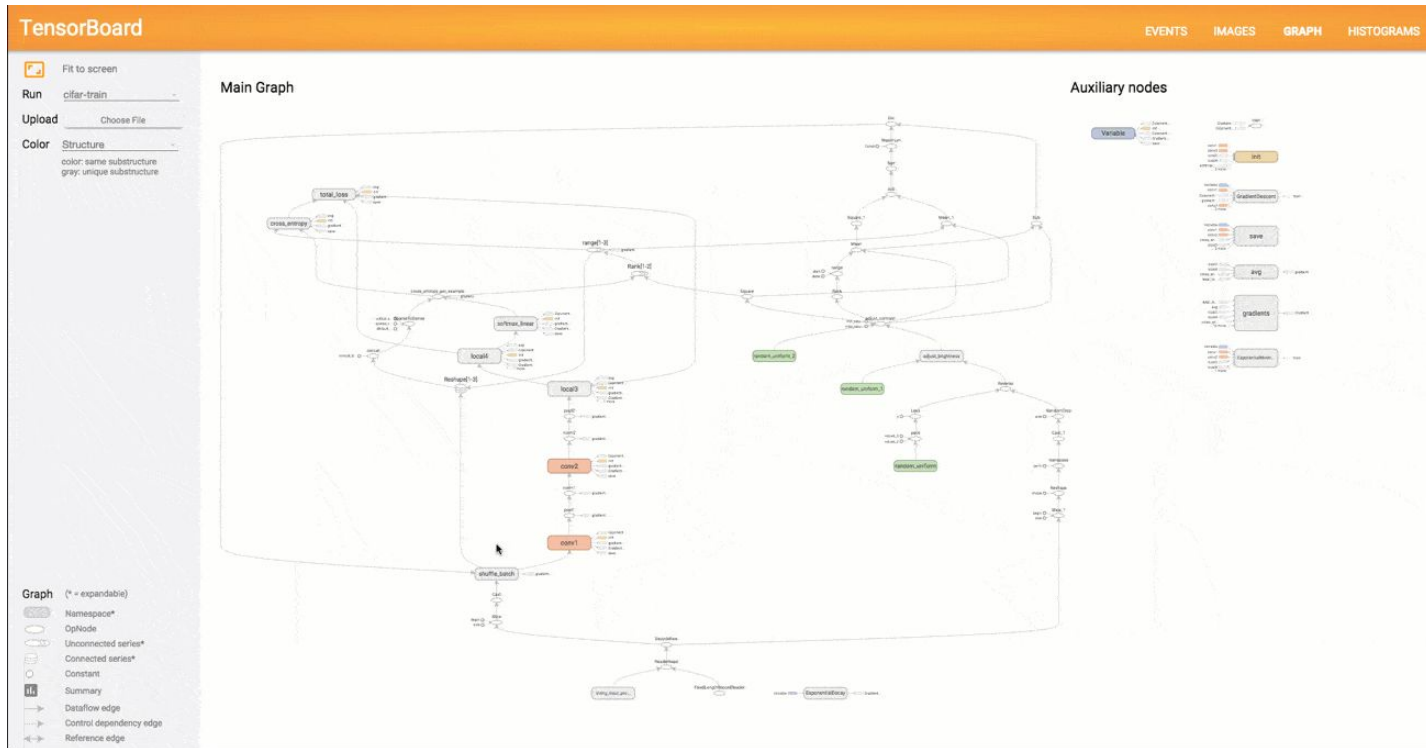
Fast

Training: NVIDIA® Tesla® K80 synthetic data (1,2,4, and 8 GPUs)



<https://www.tensorflow.org/performance/benchmarks>

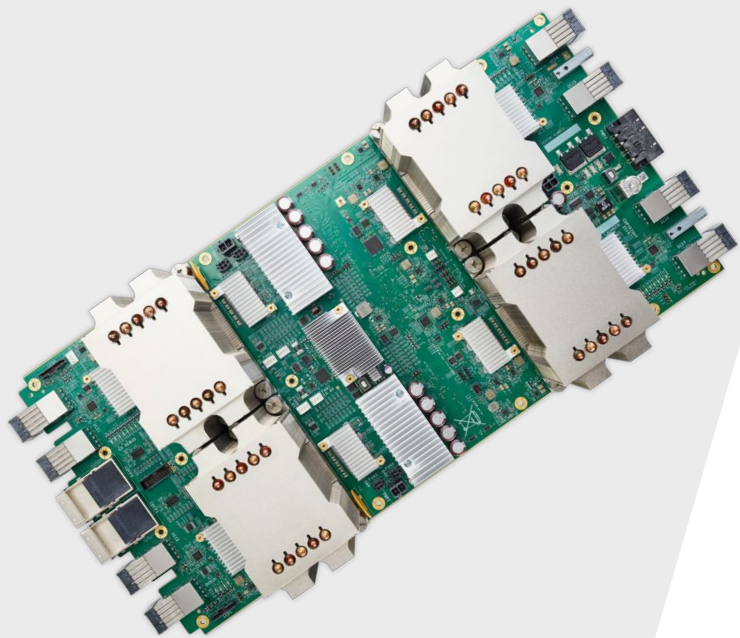
C++ Backend



Why Google Cloud ML Engine?

- Horizontal scaling made easy
- Automatic Hyperparameter Tuning
- Automatic monitoring/logging/versioning
- Built in auto-scaling prediction service
- Access to TPUs (coming soon)
- No lock-in

Tensor Processing Unit



	nVidia k80	TPU
FLOPs	9 Teraflops	180 Teraflops

Predicting Housing Prices

PREDICTING HOUSE SALE PRICES

Sq. Footage	Price
1,000	\$100,000
3,000	\$300,000

How much would a 2,000 sq ft. house sell for?

Predicting Housing Prices

PREDICTING HOUSE SALE PRICES

Sq. Footage	Price
1,000	\$100,000
3,000	\$300,000
2,000	\$200,000

A better dataset

PREDICTING HOUSE SALE PRICES

Sq. Footage	Crime Rate (1-100)	School Rating (1-5)	Price
1,000	1	5	\$300,000
2,000	50	3	\$200,000
4,000	80	1	\$100,000

How much would a 3,000 sq ft. house with a crime rate of 30 and a school rating of 2 cost?

Not so easy now...

To the Cloud

<https://goo.gl/FQK82z>

Feature Columns

Feature	Feature Type	Examples	TF Function
Price	Continuous	\$300,000	<code>real_valued_column</code>
Department	Categorical	Math, English	<code>sparse_column_with_keys</code>
Occupation	Categorical	Engineer, Project Manager	<code>sparse_column_with_hash_bucket</code>
			And more....

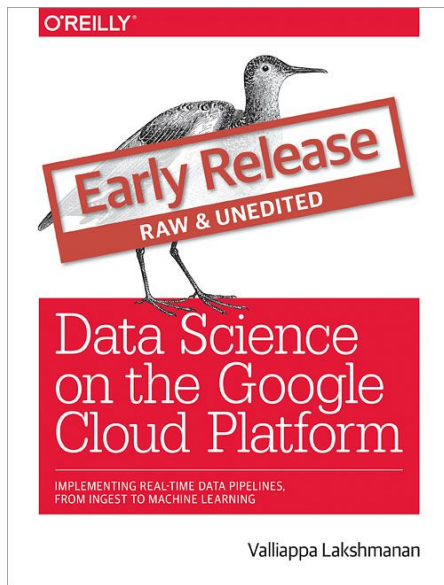
Canned Estimators

Estimator	Description
LinearClassifier	Constructs a linear classification model
DNNClassifier	Construct a neural network classification model
DNNLinearCombinedClassifier	Best of both worlds!
KMeansClustering	Unsupervised Learning
DynamicRnnEstimator	Recurrent Neural Network
SVM	Support vector machine
Custom Estimator	For anything else!

Learn More

<https://www.coursera.org/learn/serverless-machine-learning-gcp>

<http://shop.oreilly.com/product/0636920057628.do>



Thank You