

Machine Learning

Google Cloud Platform Fundamentals: Big Data and Machine Learning

Version #1.1



Google Cloud

Agenda



Agenda

Machine learning with TensorFlow + Lab

Pre-built machine learning models + Lab

TensorFlow is an open source library that underlies many Google products



Demo: Playing with neural networks to learn what they are

Tinker With a **Neural Network** Right Here in Your Browser.
Don't Worry, You Can't Break It. We Promise.

Iterations: 000,000 Learning rate: 0.03 Activation: Tanh Regularization: None Regularization rate: 0 Problem type: Classification

DATA INPUT 2 HIDDEN LAYERS OUTPUT

Which dataset do you want to use?
 
 

Ratio of training to test data: 50%

+

-

4 neurons

+

-

2 neurons

+

-

X₁

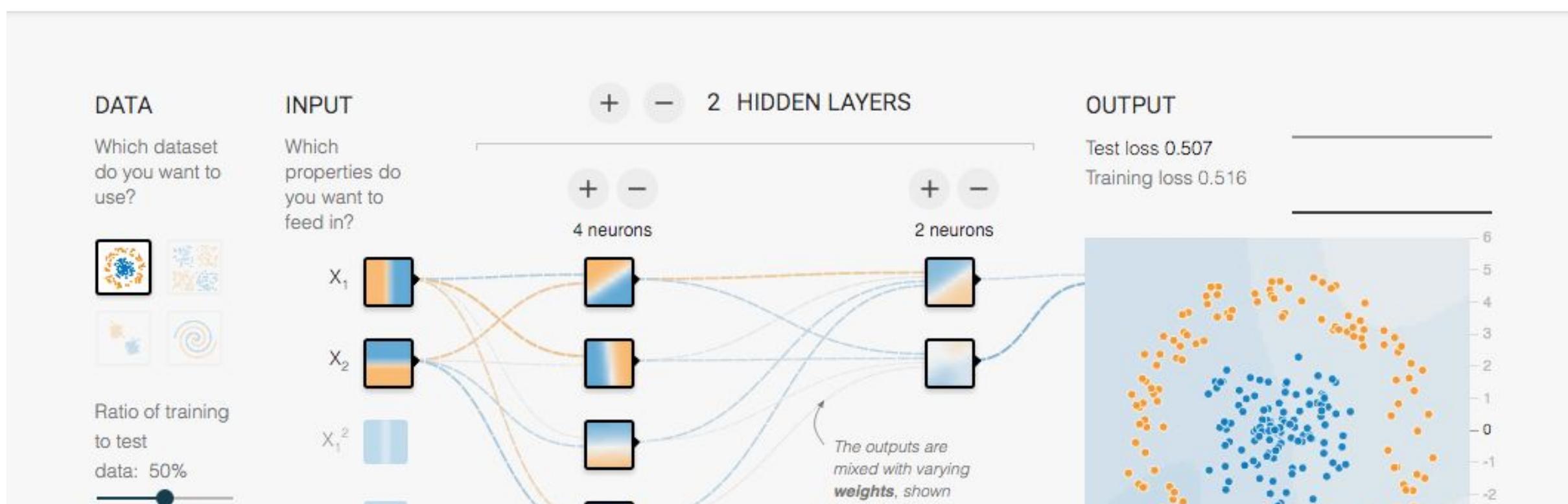
X₂

X₁²

X₂²

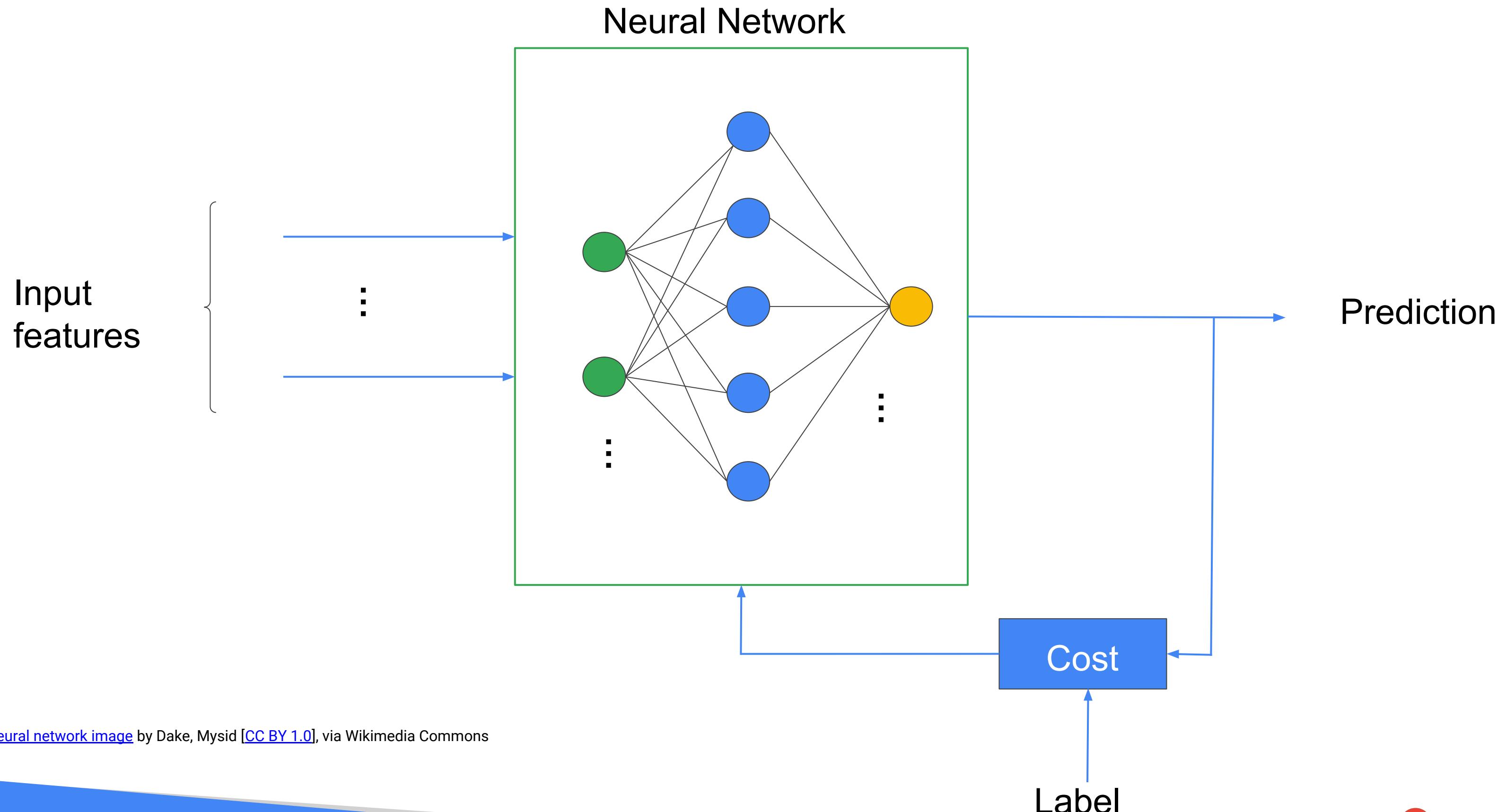
The outputs are mixed with varying weights, shown by the thickness

Test loss 0.507
Training loss 0.516



<http://playground.tensorflow.org/>

Supervised machine learning requires features and labels



Machine Learning with TensorFlow involves four steps:



Gather training data (input features and labels)



Create model



Train the model based on input data



Use the model on new data

Gather training data and select input features

1
Gather
Data

Input features

	daynumber	dayofweek	mintemp	maxtemp	rain	numtrips
104	77	4	28.9	37.9	0.01	51635
9	356	2	32.0	43.0	0.00	46781
114	67	1	35.1	48.0	0.00	57377
11	354	7	30.0	37.9	0.00	74101
316	49	3	19.0	39.9	0.05	28463

target

All input features need to be numeric

1
Gather
Data

Use as-is

	mintemp	maxtemp	rain	day_1	day_2	day_3	day_4	day_5	day_6	day_7
104	28.9	37.9	0.01	0	0	0	1	0	0	0
9	32.0	43.0	0.00	0	1	0	0	0	0	0
114	35.1	48.0	0.00	1	0	0	0	0	0	0
11	30.0	37.9	0.00	0	0	0	0	0	0	1
316	19.0	39.9	0.05	0	0	1	0	0	0	0

One-hot
encoding

Gather training data and select input features

1
Gather
Data

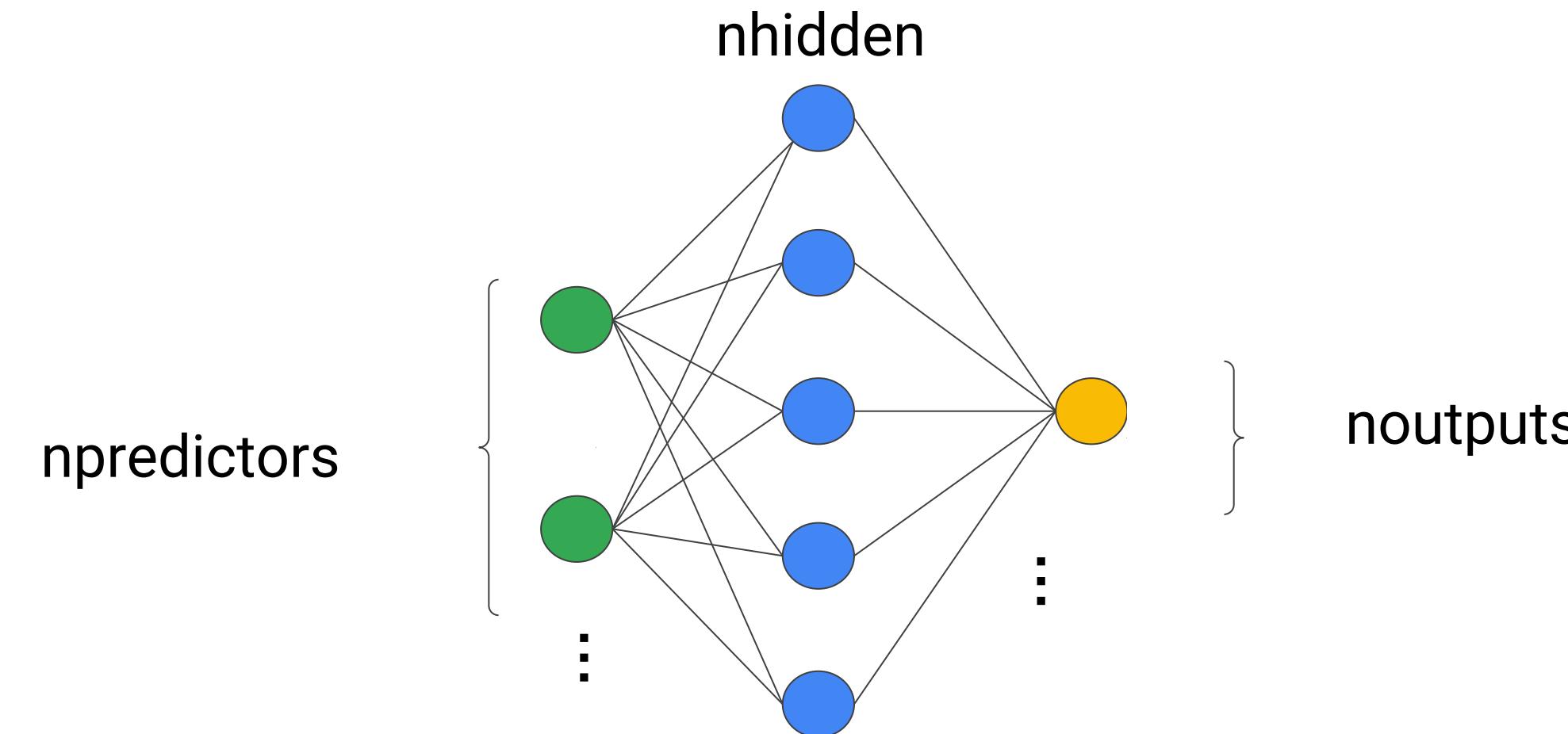
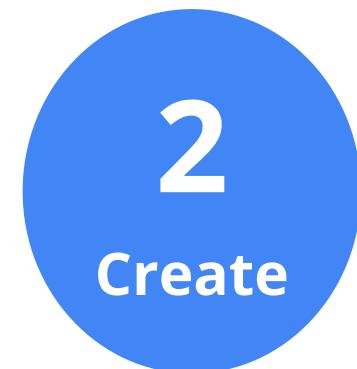
	daynumber	dayofweek	mintemp	maxtemp	rain	numtrips
104	77	4	28.9	37.9	0.01	51635
9	356	2	32.0	43.0	0.00	46781
114	67	1	35.1	48.0	0.00	57377
11	354	7	30.0	37.9	0.00	74101
316	49	3	19.0	39.9	0.05	28463

Input features

discard

target

Create a neural network model, defining the number of feature columns and hidden units

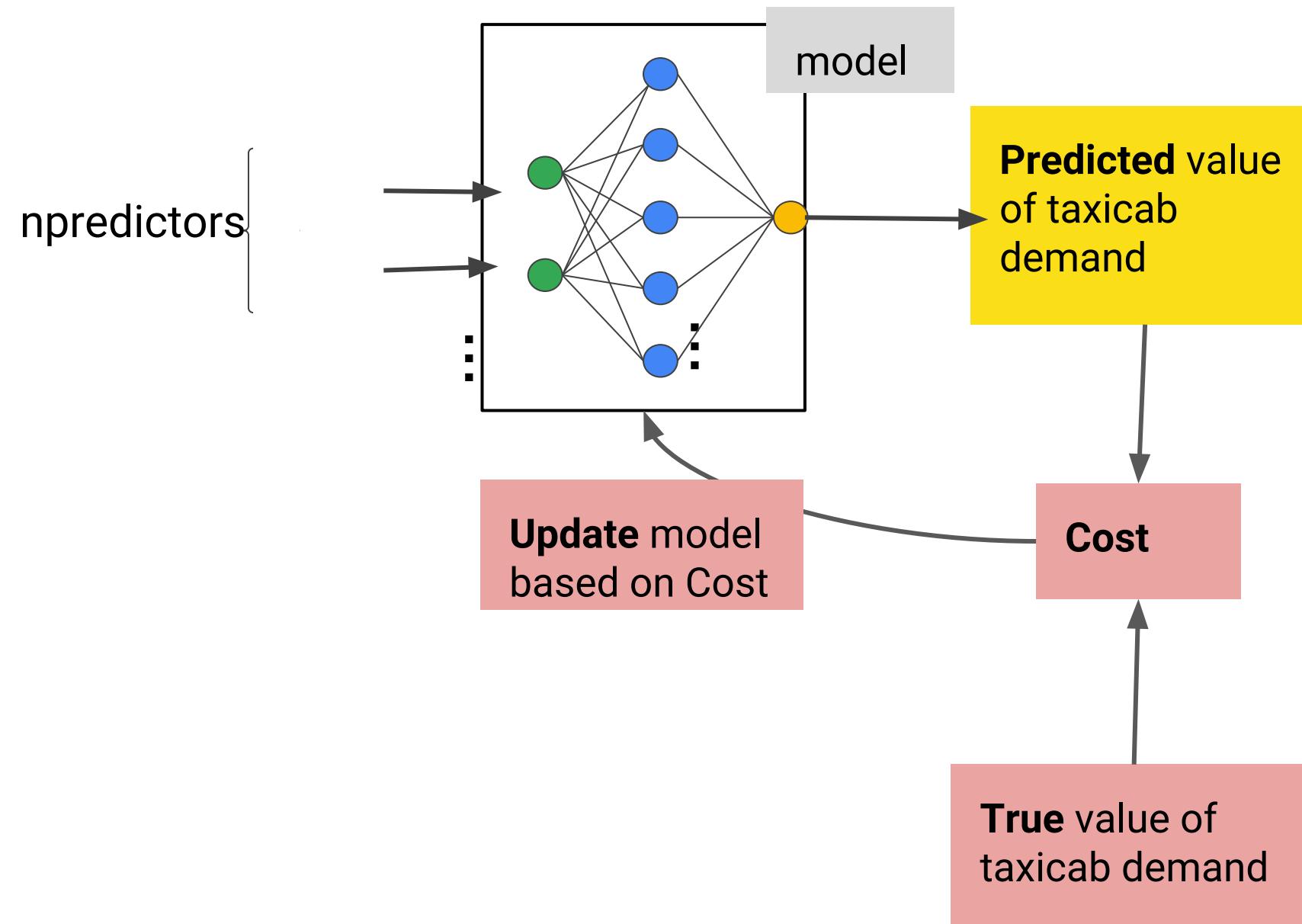


```
estimator = DNNRegressor(hidden_units=[5], feature_columns=[...])
```

[Neural network image](#) by Dake, Mysid [CC BY 1.0], via Wikimedia Commons

Train the model on the collected data

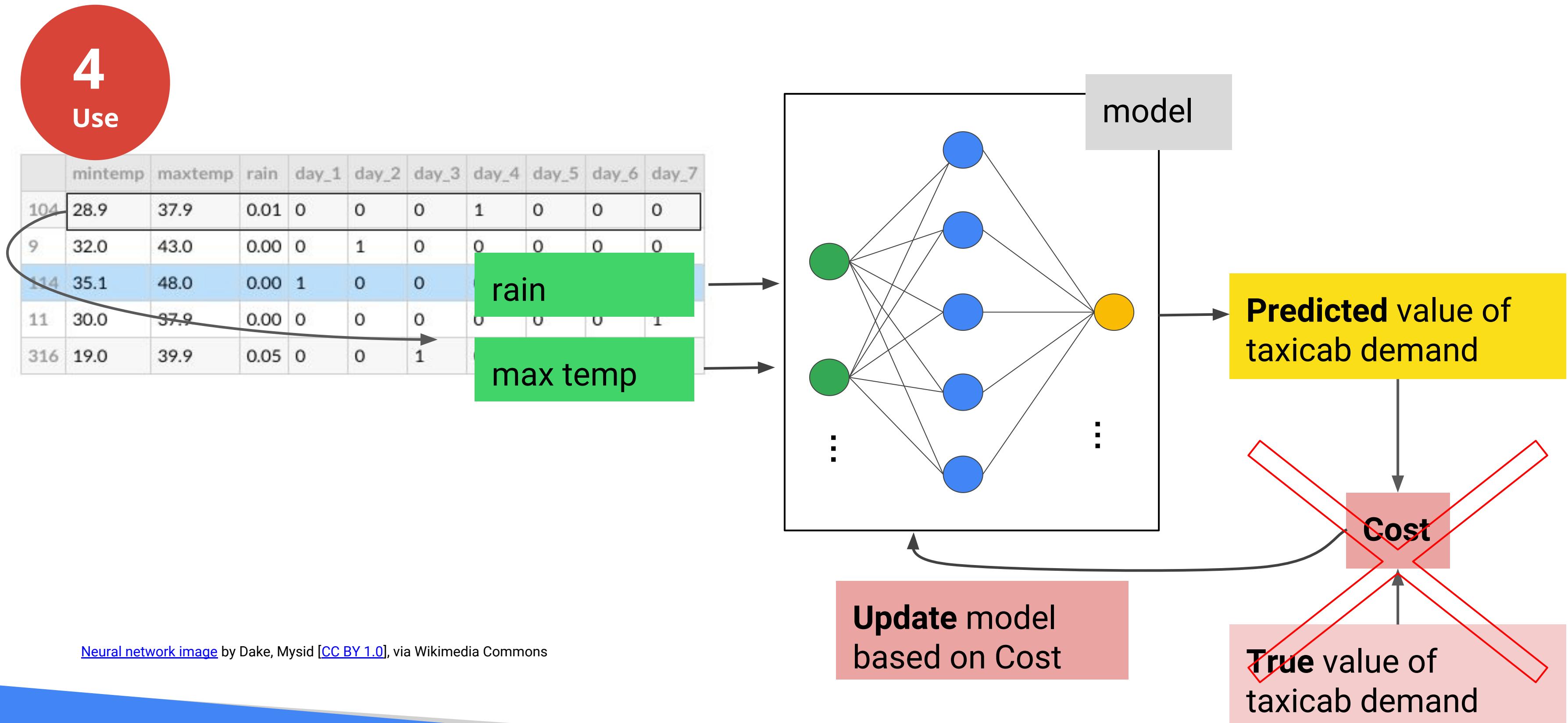
3
Train



```
estimator.fit(predictors, targets, steps=1000)
```

[Neural network image](#) by Dake, Mysid [CC BY 1.0], via Wikimedia Commons

To predict, the model needs only the input features



Use the model to predict

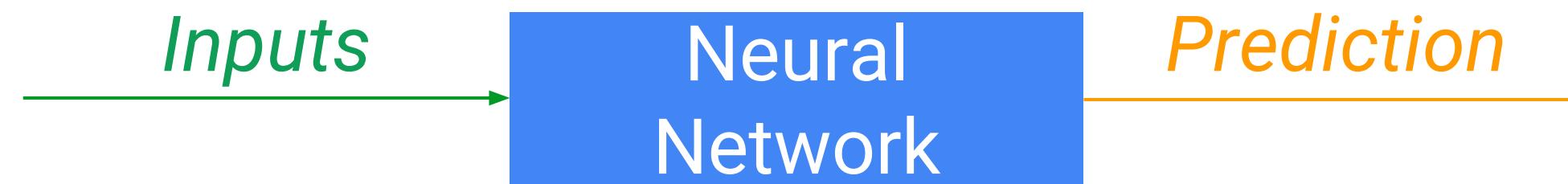
4

Use

```
input = pd.DataFrame.from_dict(data =  
    {'dayofweek' : [4, 5, 6],  
     'mintemp' : [60, 15, 60],  
     'maxtemp' : [80, 80, 65],  
     'rain' : [0, 0.8, 0]})  
  
# read trained model from /tmp/trained_model  
estimator = DNNRegressor(model_dir='/tmp/trained_model',  
                           hidden_units=[5])  
  
pred = estimator.predict(input.values)  
print pred
```

Lab 6: Carry out ML with TensorFlow

Lab 6: Carry out ML with TensorFlow



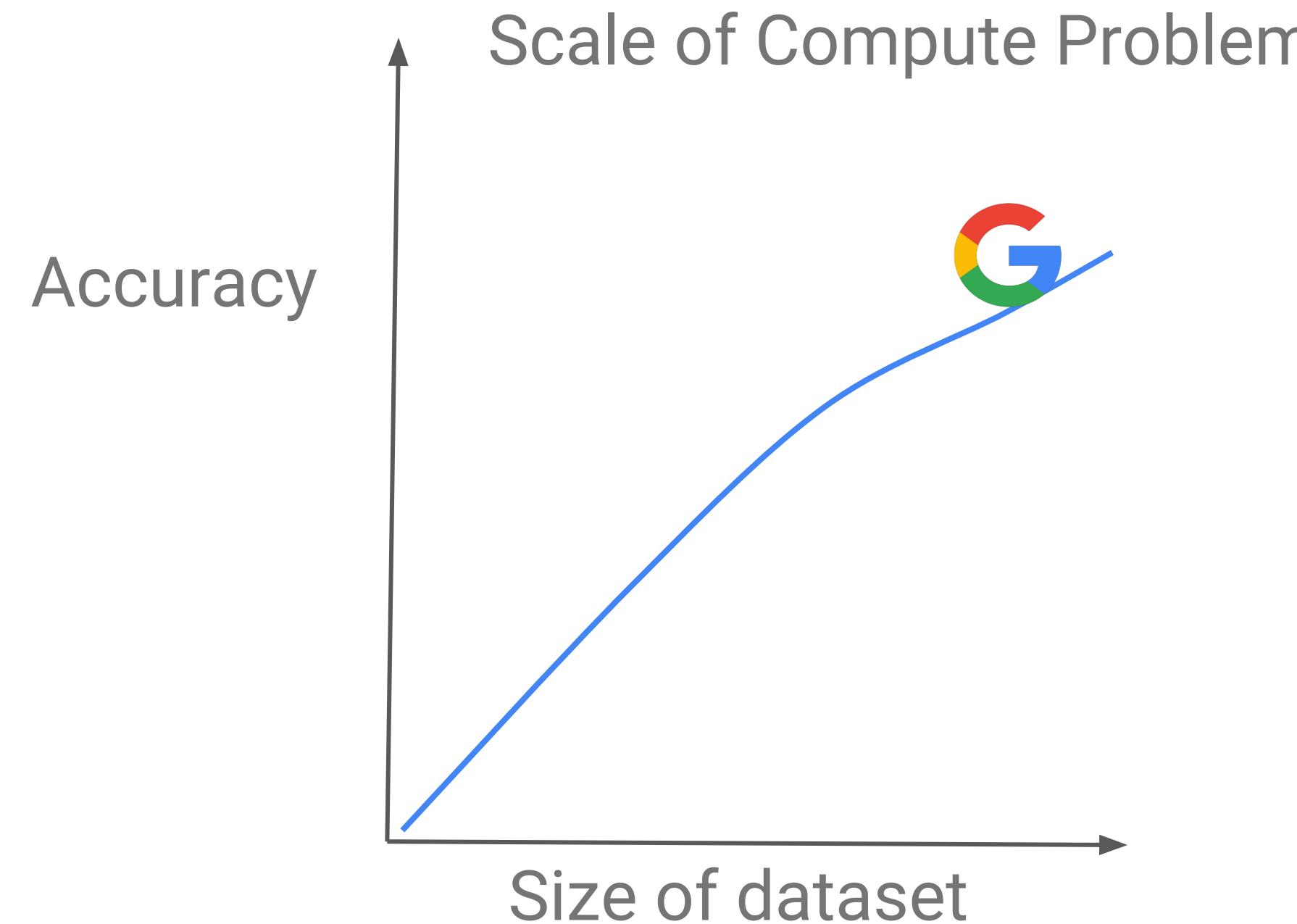
In this lab, you build a neural network to predict taxicab demand on a day-by-day basis using TensorFlow.

Agenda

Machine learning with TensorFlow + Lab

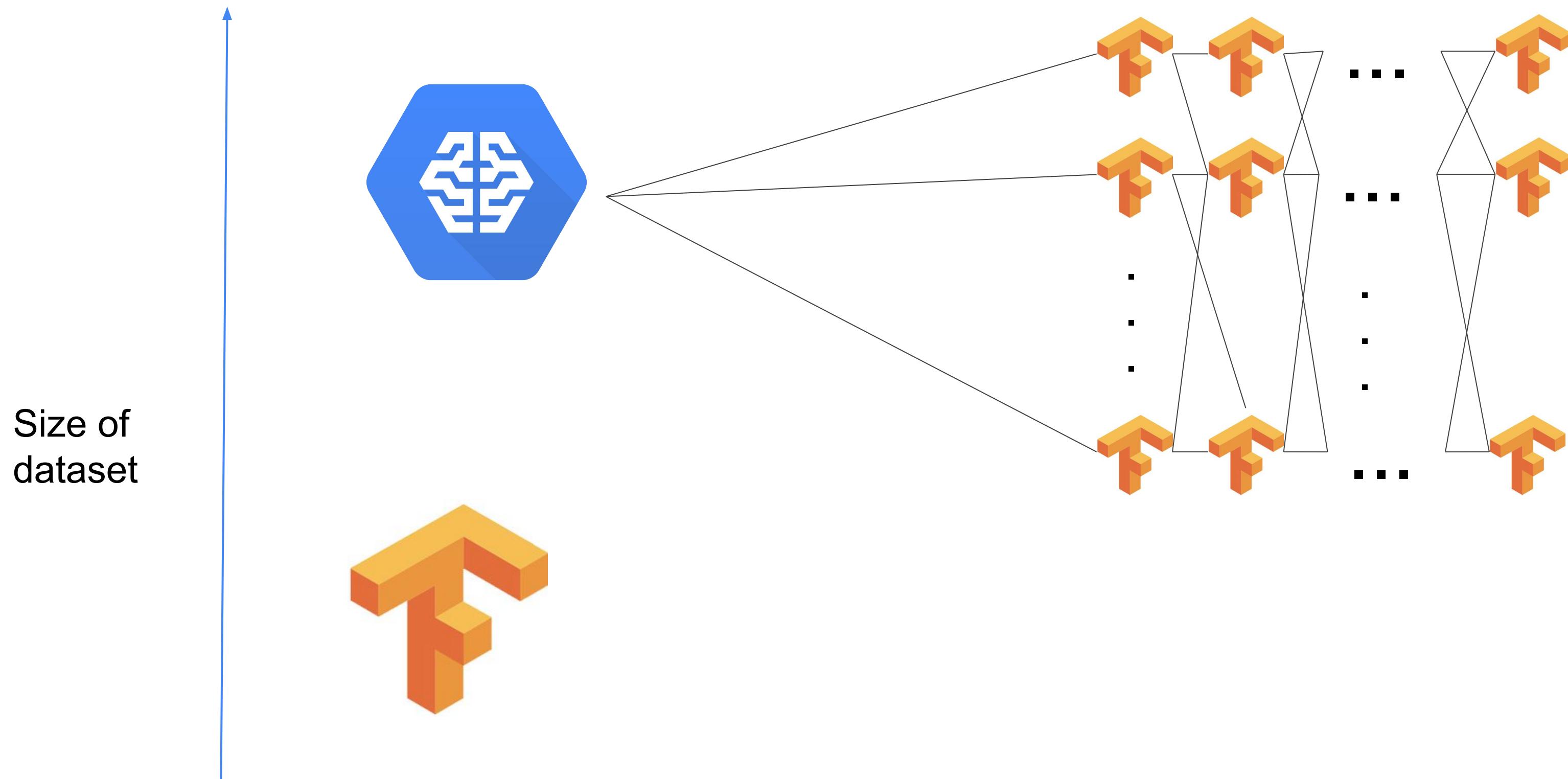
[Pre-built machine learning models + Lab](#)

The accuracy of a ML problem is driven largely by the size and quality of the dataset; this is why ML requires massive compute



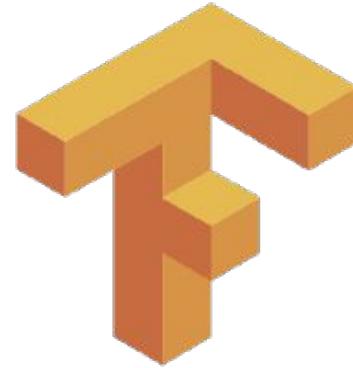
<https://cloudplatform.googleblog.com/2016/05/Google-supercharges-machine-learning-tasks-with-custom-chip.html>

CloudML Engine simplifies the use of Distributed TensorFlow



ML APIs are pre-trained ML models (trained off Google's data) for common tasks; they are accessible through REST APIs

Use your own data to train models



TensorFlow



Cloud Machine Learning Engine

Machine Learning as an API



Cloud Vision API



Cloud Speech-to-Text



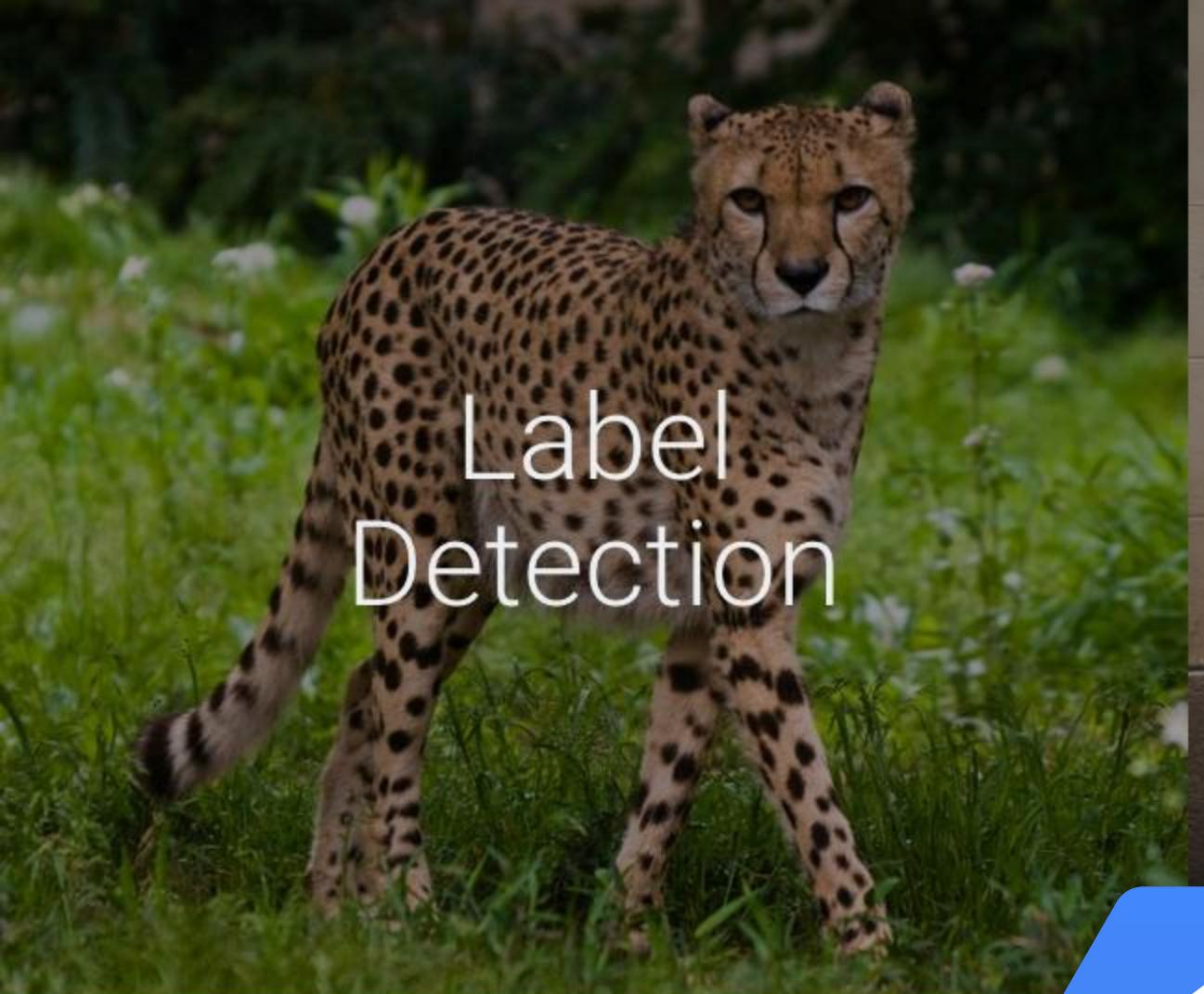
Cloud Natural Language API



Cloud Translation API



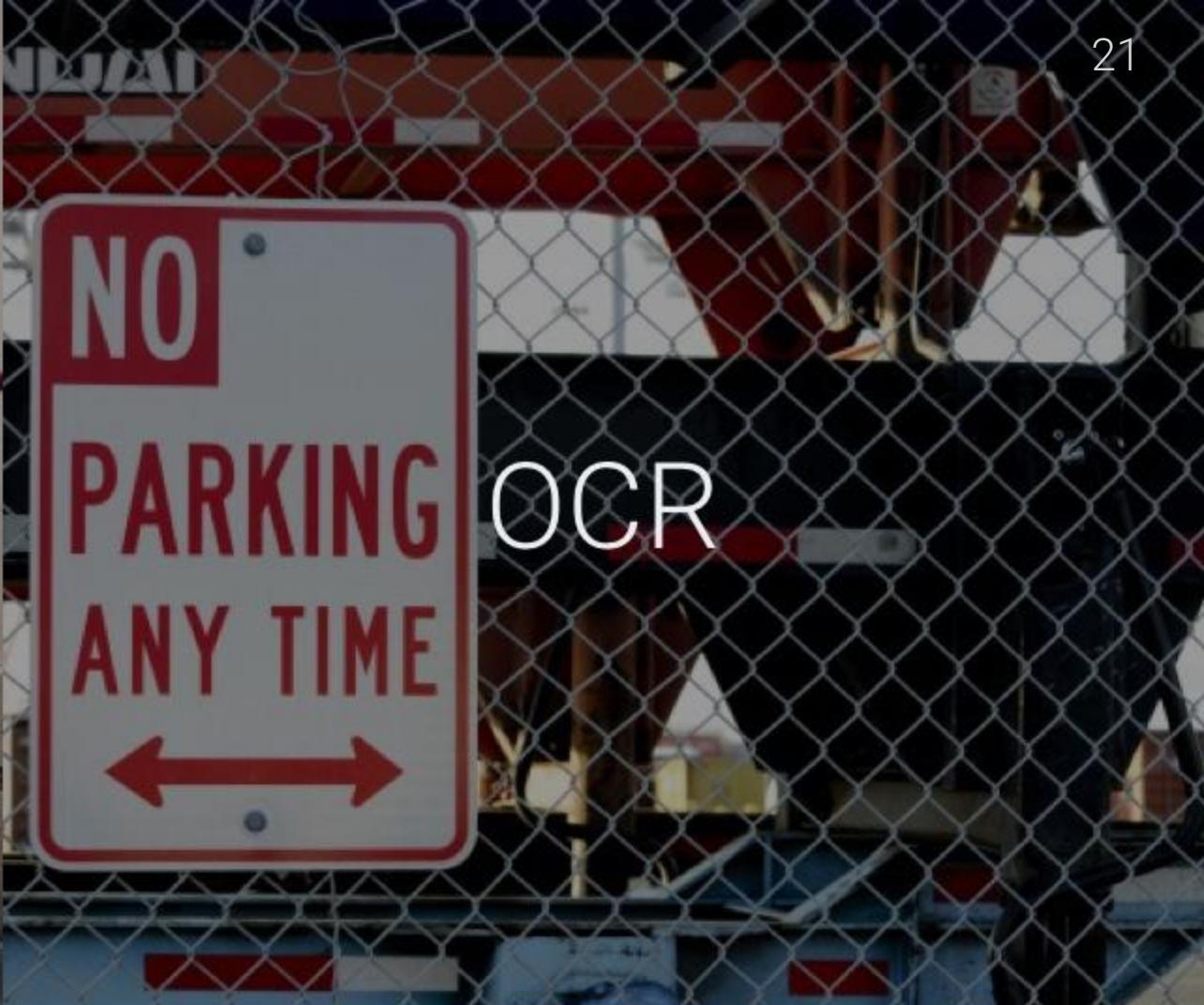
Cloud Video Intelligence



Explicit Content
Detection

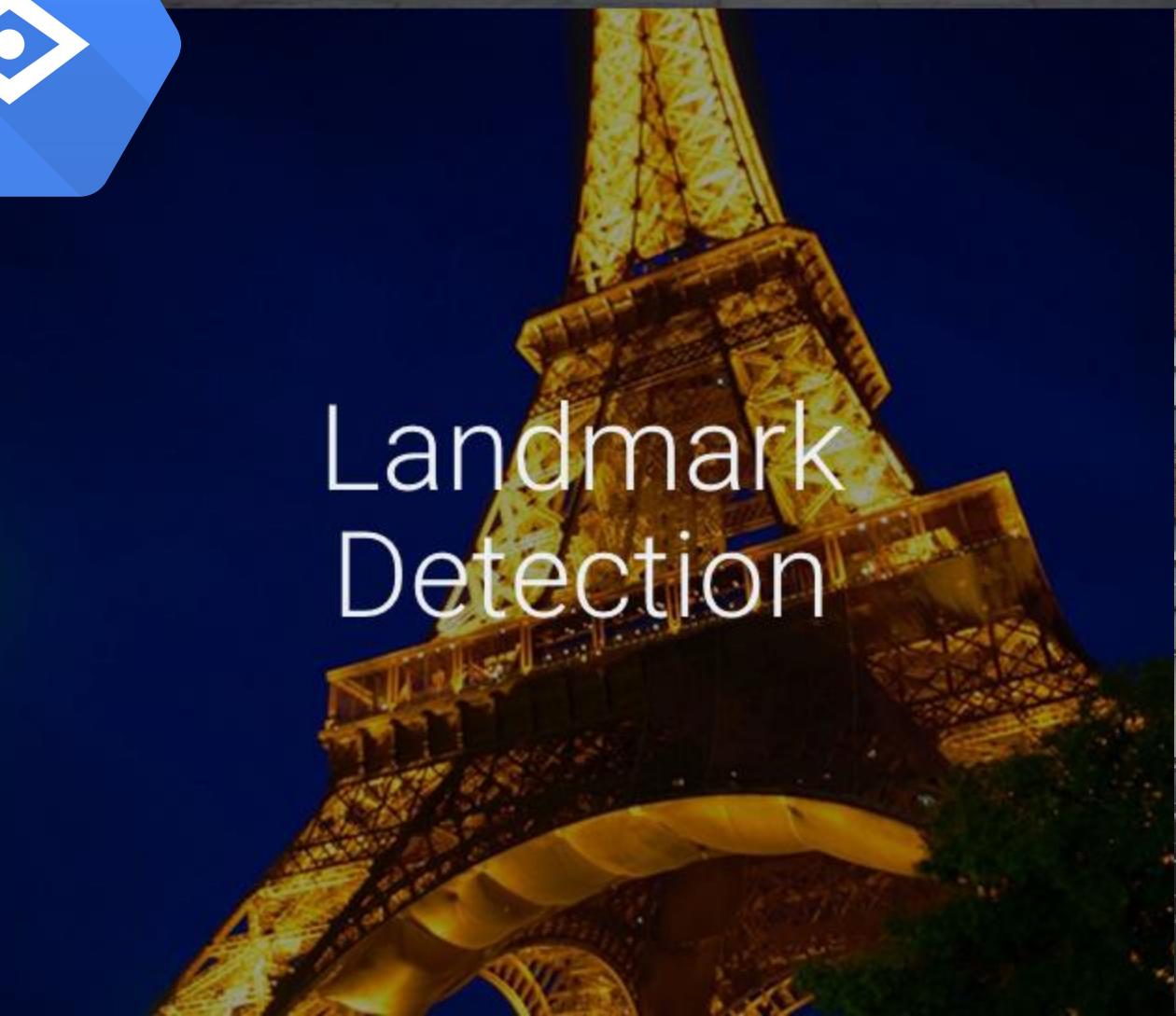


Face
Detection



NO
PARKING
ANY TIME

OCR



Landmark
Detection



Logo Detection
Google

Face detection

```
"faceAnnotations" : [
  {
    "headwearLikelihood" : "VERY_UNLIKELY",
    "surpriseLikelihood" : "VERY_UNLIKELY",
    "rollAngle" : -4.6490049,
    "angerLikelihood" : "VERY_UNLIKELY",
    "landmarks" : [
      {
        "type" : "LEFT_EYE",
        "position" : {
          "x" : 691.97974,
          "y" : 373.11096,
          "z" : 0.000037421443
        }
      }
    ]
  }
]
```



```
"detectionConfidence" : 0.93568963,
"joyLikelihood" : "VERY_LIKELY",
"panAngle" : 4.150538,
"sorrowLikelihood" : "VERY_UNLIKELY",
"tiltAngle" : -19.377356,
"underExposedLikelihood" : "VERY_UNLIKELY",
"blurredLikelihood" : "VERY_UNLIKELY"
```

Web annotations

```
{
  "entityId": "/m/016ms7",
  "score": 1.44038,
  "description": "Ford Anglia"
}
```

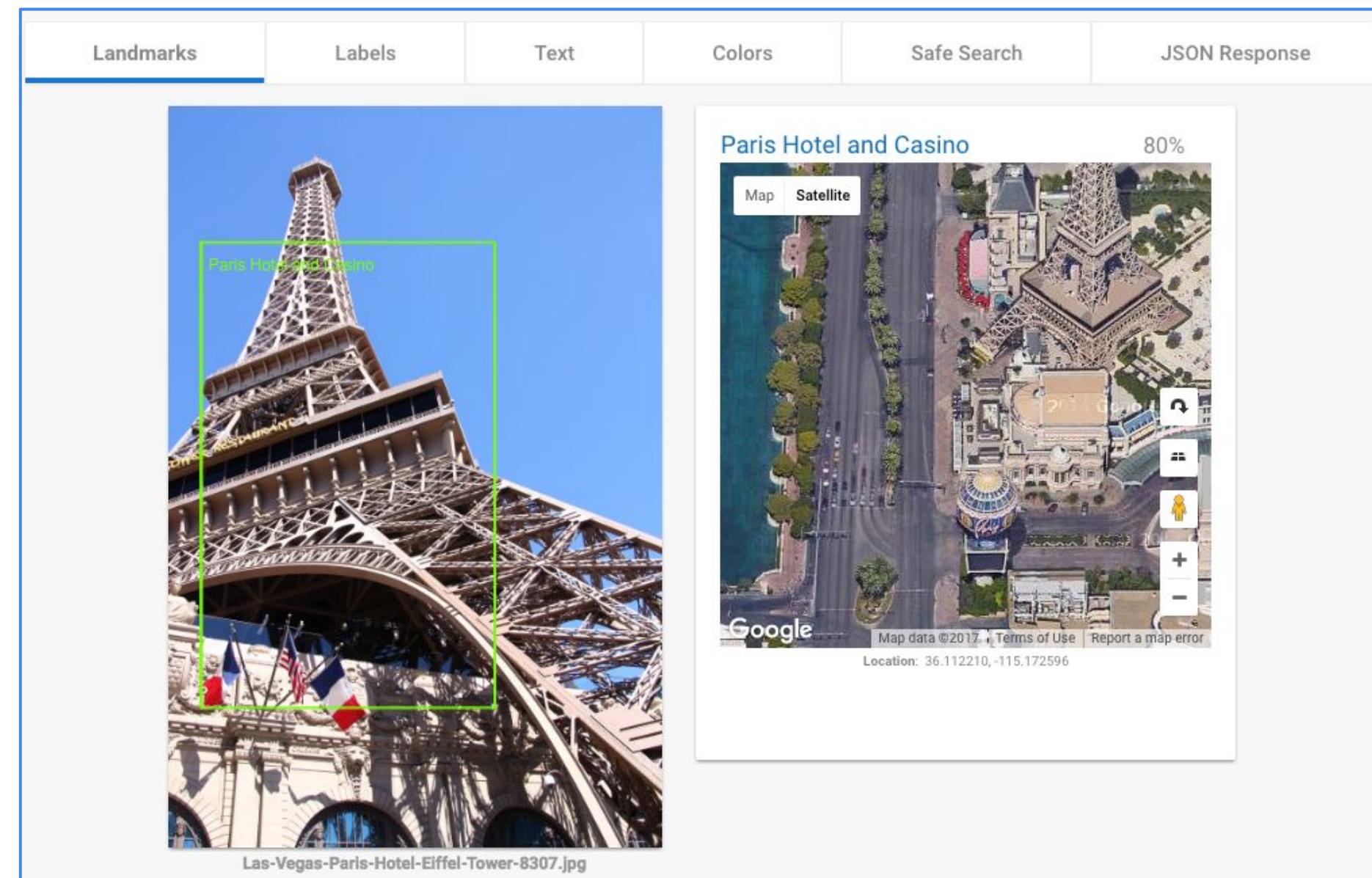
```
{
  "entityId": "/m/0gff2yr",
  "score": 5.92256,
  "description": "ArtScience Museum"
}
```

```
{
  "entityId": "/m/0h898pd",
  "score": 7.4162,
  "description": "Harry Potter (Literary Series)"
}
```



CC-BY 2.0 Rev Stan: <https://www.flickr.com/photos/revstan/6865880240>

Try it in the browser with your own images



cloud.google.com/vision

The Translation API supports 100+ languages



<https://cloud.google.com/translate/>

Wootric uses the Cloud Natural Language API (entity and sentiment) to make sense of qualitative customer feedback



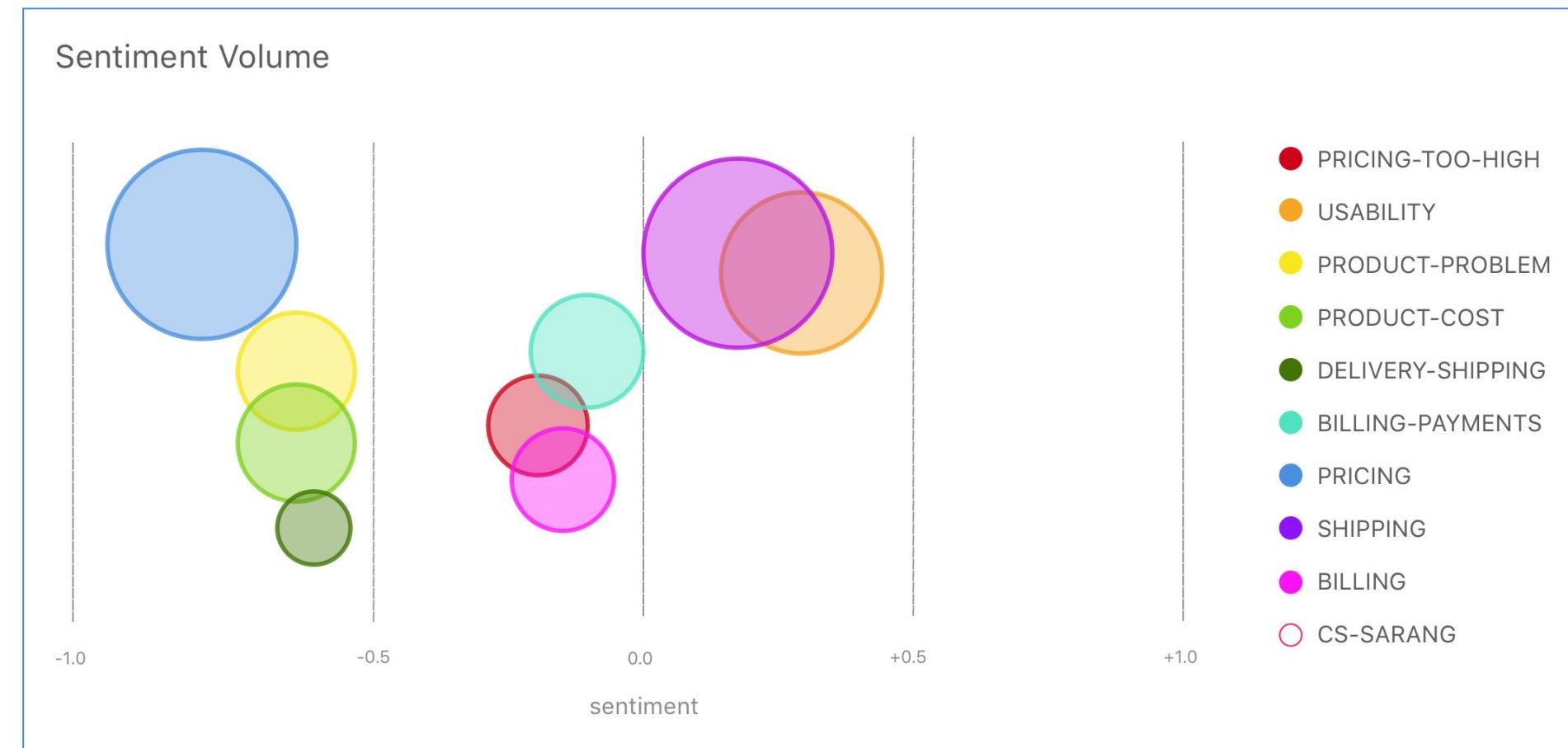
Great. What is most satisfying about it?

It was super easy to get started. I wished there were more examples though.

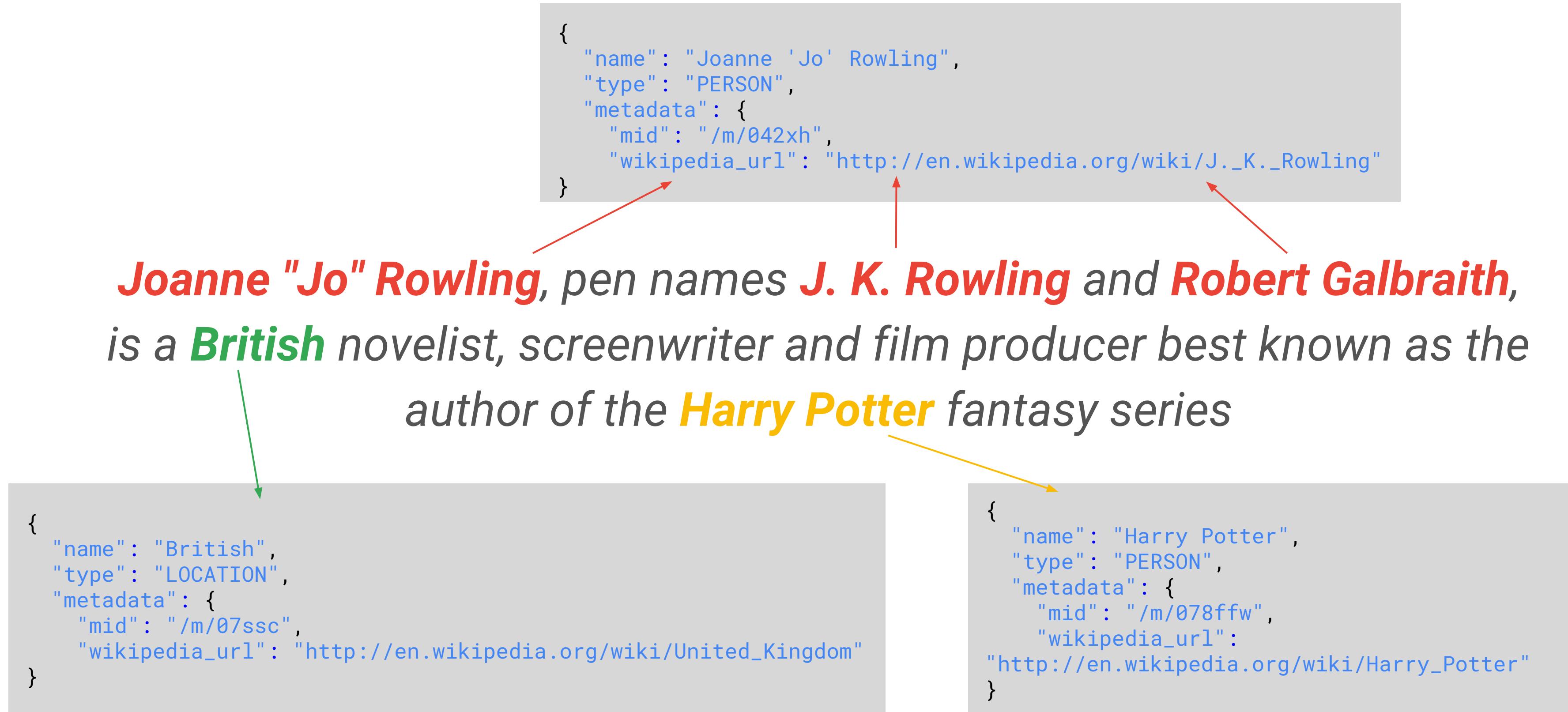
Not at all likely 0 1 2 3 4 5 6 7 8 9 10 Extremely likely

SEND

powered by [wootric](#)



Extracted entities are tied into a knowledge graph

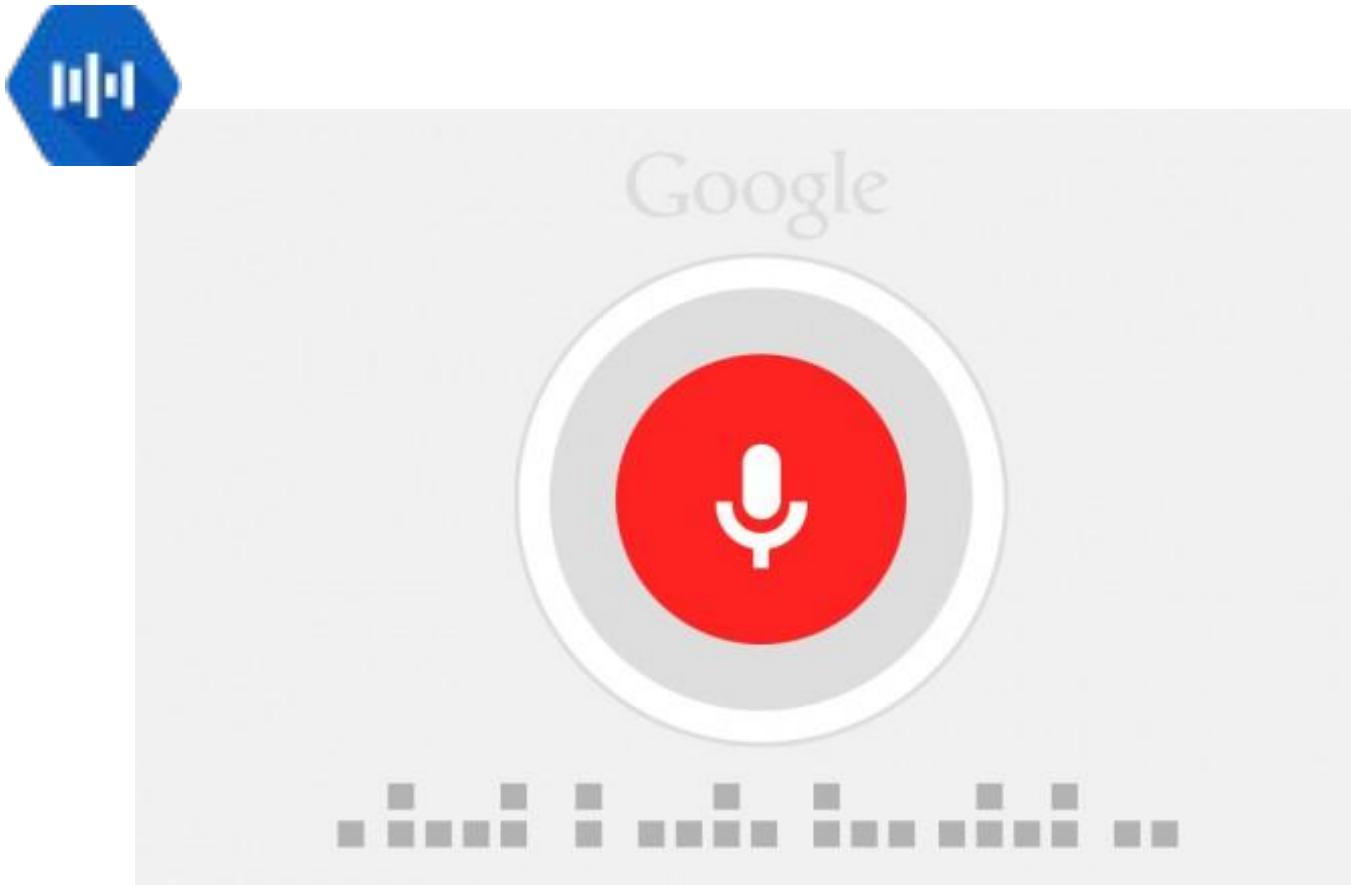


When you analyze sentiment, you get a score
(positive/negative) as well as a magnitude (how intense?)

The food was excellent, I would definitely go back!

```
{  
  "documentSentiment": {  
    "score": 0.8,  
    "magnitude": 0.8  
  }  
}
```

The Cloud Speech-to-Text can be used to transcribe audio to text

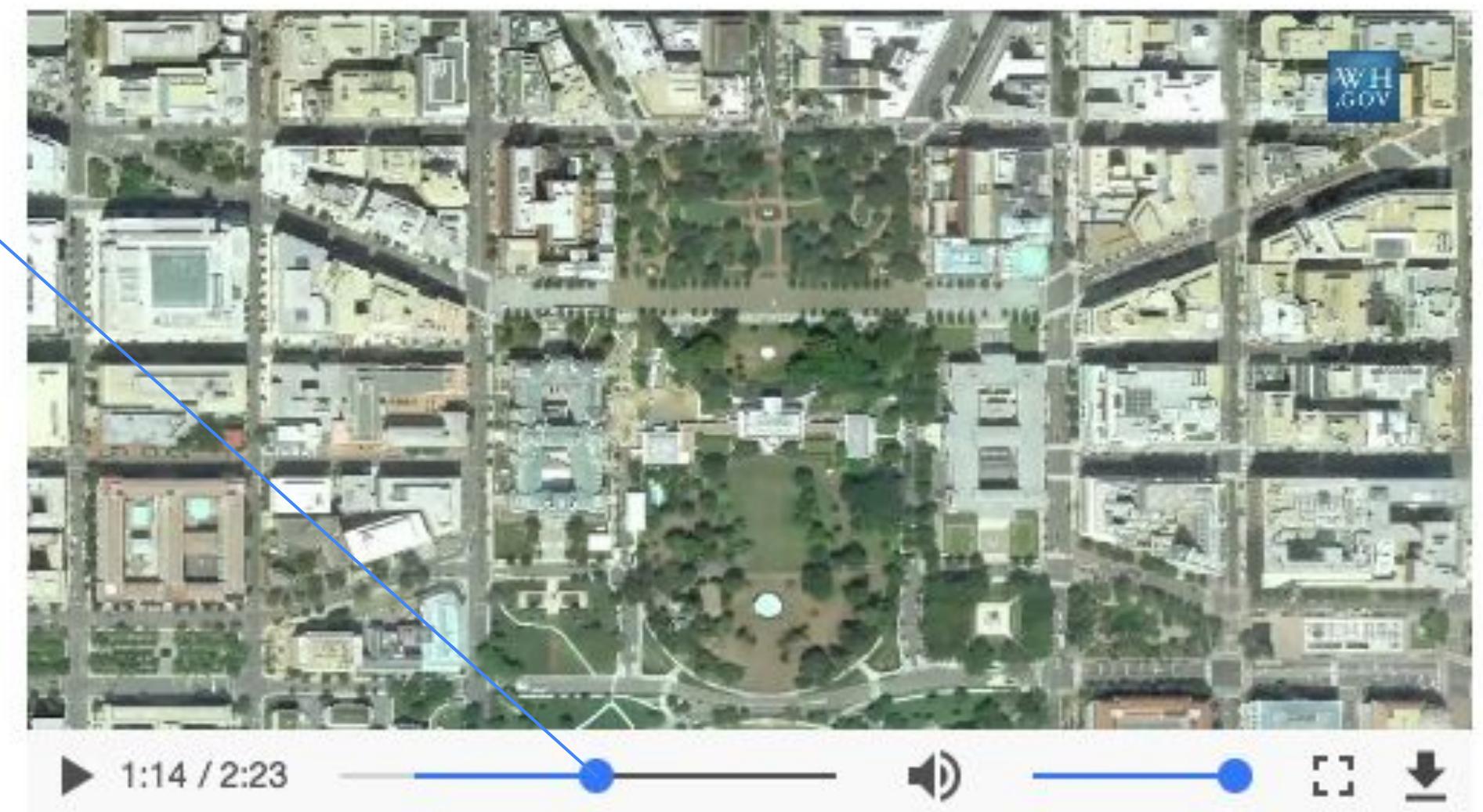


<http://cloud.google.com/speech-to-text>

Like the Vision API, the Video Intelligence API can identify labels in a video, along with a timestamp

{

```
"description": "Bird's-eye view",  
"language_code": "en-us",  
"locations": {  
    "segment": {  
        "start_time_offset": 71905212,  
        "end_time_offset": 73740392  
    },  
    "confidence": 0.96653205  
}  
}
```



<https://cloud.google.com/video-intelligence/>

Lab: Machine Learning APIs

Lab 7: Machine Learning APIs

Use several of the Machine Learning APIs (Vision, Translate, Natural Language Processing, Speech) from Python



Module Review

Module review answer

Match the use case on the left with the product on the right

Searching for objects by attribute value

High-throughput writes of wide-column data

Warehousing structured data

Create, test new machine learning methods

Develop Big Data algorithms interactively in Python

No-ops, custom machine learning applications at scale

Automatically reject inappropriate image content

Build application to monitor Spanish twitter feed

Transcribe customer support calls

1. Vision API
2. Datalab
3. BigTable
4. TensorFlow
5. BigQuery
6. Speech-to-Text
7. Cloud MLE
8. Translation API
9. Datastore

Module review answer

Match the use case on the left with the product on the right

Searching for objects by attribute value (9)

High-throughput writes of wide-column data (3)

Warehousing structured data (5)

Create, test new machine learning methods (4)

Develop Big Data algorithms interactively in Python (2)

No-ops, custom machine learning applications at scale (7)

Automatically reject inappropriate image content (1)

Build application to monitor Spanish twitter feed (8)

Transcribe customer support calls (6)

1. Vision API
2. Datalab
3. BigTable
4. TensorFlow
5. BigQuery
6. Speech-to-Text
7. Cloud MLE
8. Translation API
9. Datastore

Resources

TensorFlow

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

Cloud Machine Learning Engine

<https://cloud.google.com/ml-engine/>

Vision API

<https://cloud.google.com/vision/>

Translation API

<https://cloud.google.com/translate/>

Speech-to-Text

<https://cloud.google.com/speech-to-text>

Video Intelligence API

<https://cloud.google.com/video-intelligence>

cloud.google.com

