



Google Cloud

Deriving Insights from
Unstructured Data using
Machine Learning

Agenda

ML drives business value

How does ML on unstructured data work?

Choosing the right ML approach

- Pre-built AI building blocks
- Using Pre-built AI to create a chatbot
- Customizing Pre-built models with AutoML
- Building a custom model

Examples of real-world ML use cases

Custom image
model to price
cars

Build off NLP
API to route
customer emails

Use Vision API
as-is to find text
in memes

Use Dialogflow
to create a new
shopping
experience



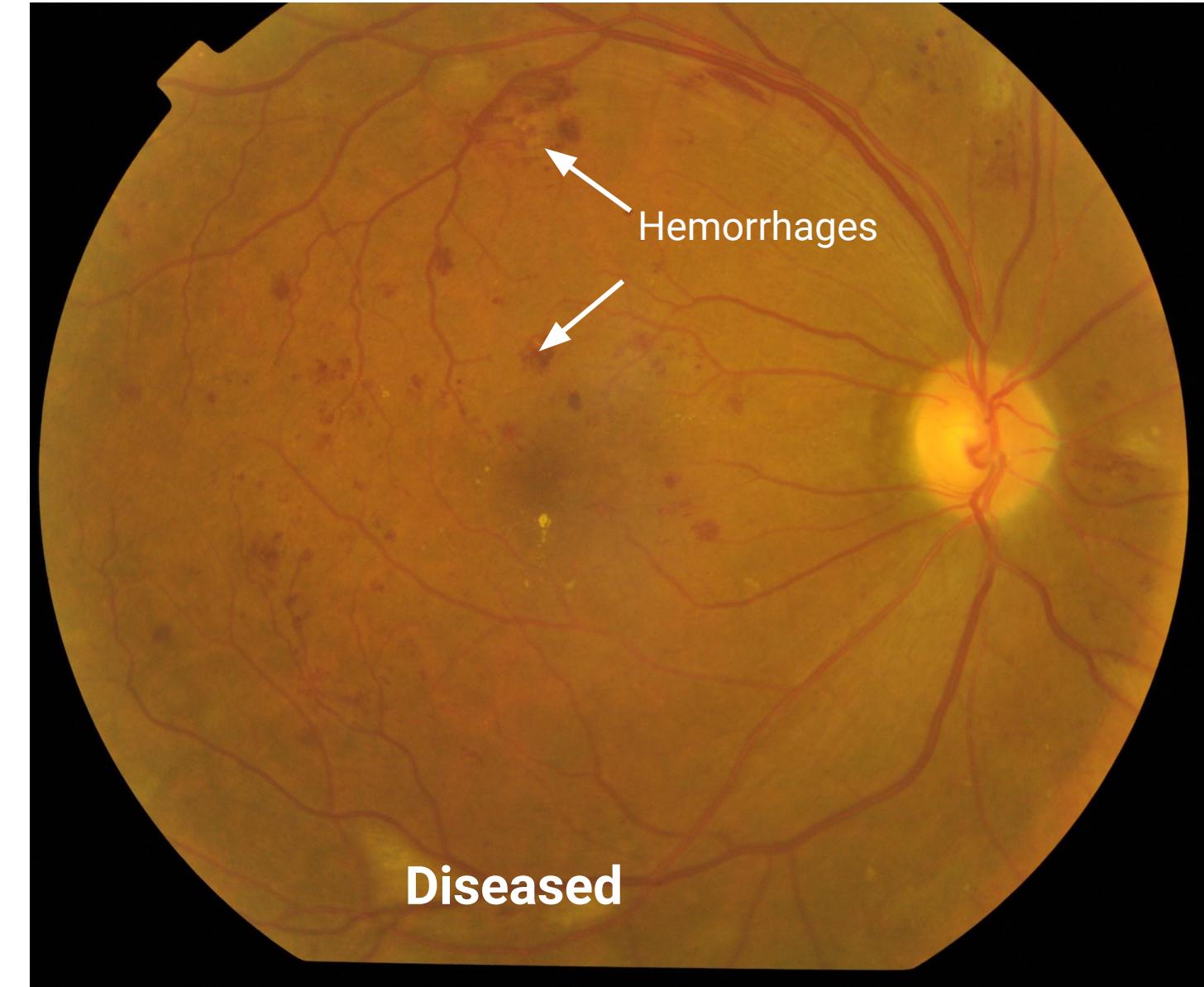
Clouds or snow-capped mountains?



Empty or Full?



Diagnosing Diabetic Retinopathy





Recap: Image classification
automates tasks that are easy
(and not easy) for humans

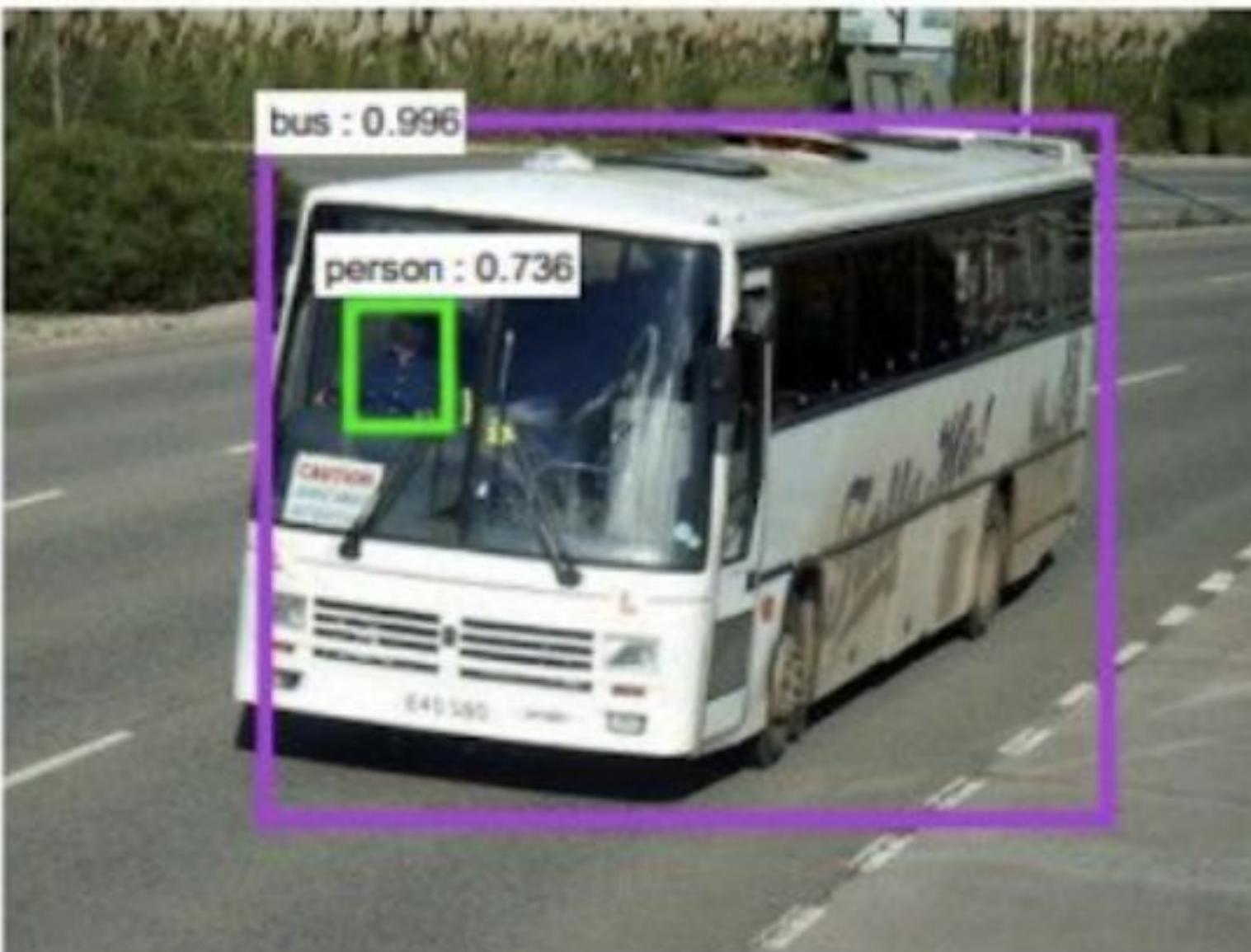


Machine learning can label images or video



mite	container ship	motor scooter	leopard
mite	container ship	motor scooter	leopard
black widow	lifeboat	go-kart	jaguar
cockroach	amphibian	moped	cheetah
tick	fireboat	bumper car	snow leopard
starfish	drilling platform	golfcart	Egyptian cat

Machine learning can detect objects in images or video



Having fun with ML: Pose Detection



camera FaceTime HD Camera

algorithm single-pose

- Input

outputStride 16

inputImageResolut... 225

- Single Pose Detection

minPoseConfidence 0.1

minPartConfidence 0.5

► Multi Pose Detection

- Output

showVideo

showSkeleton

showPoints

Close Controls

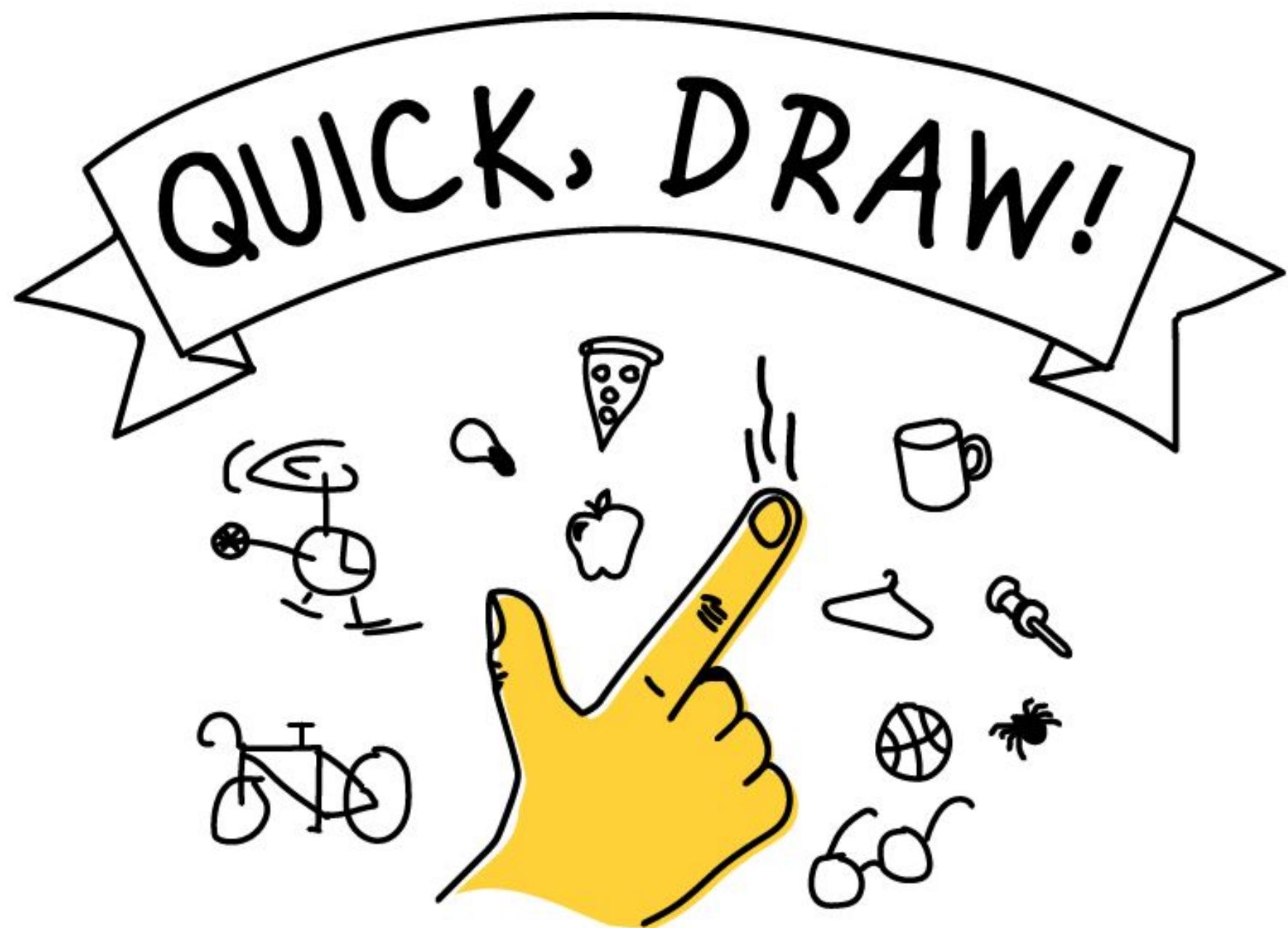
A screenshot of a mobile application's settings interface for pose detection. It includes dropdown menus for camera selection and algorithm choice, and a series of sliders and checkboxes for input parameters like output stride, image resolution, and confidence thresholds for single and multi-pose detection. The 'Output' section contains three checked checkboxes for displaying video, skeletons, and points. At the bottom right is a 'Close Controls' button.

Having fun with ML: Pose Detection

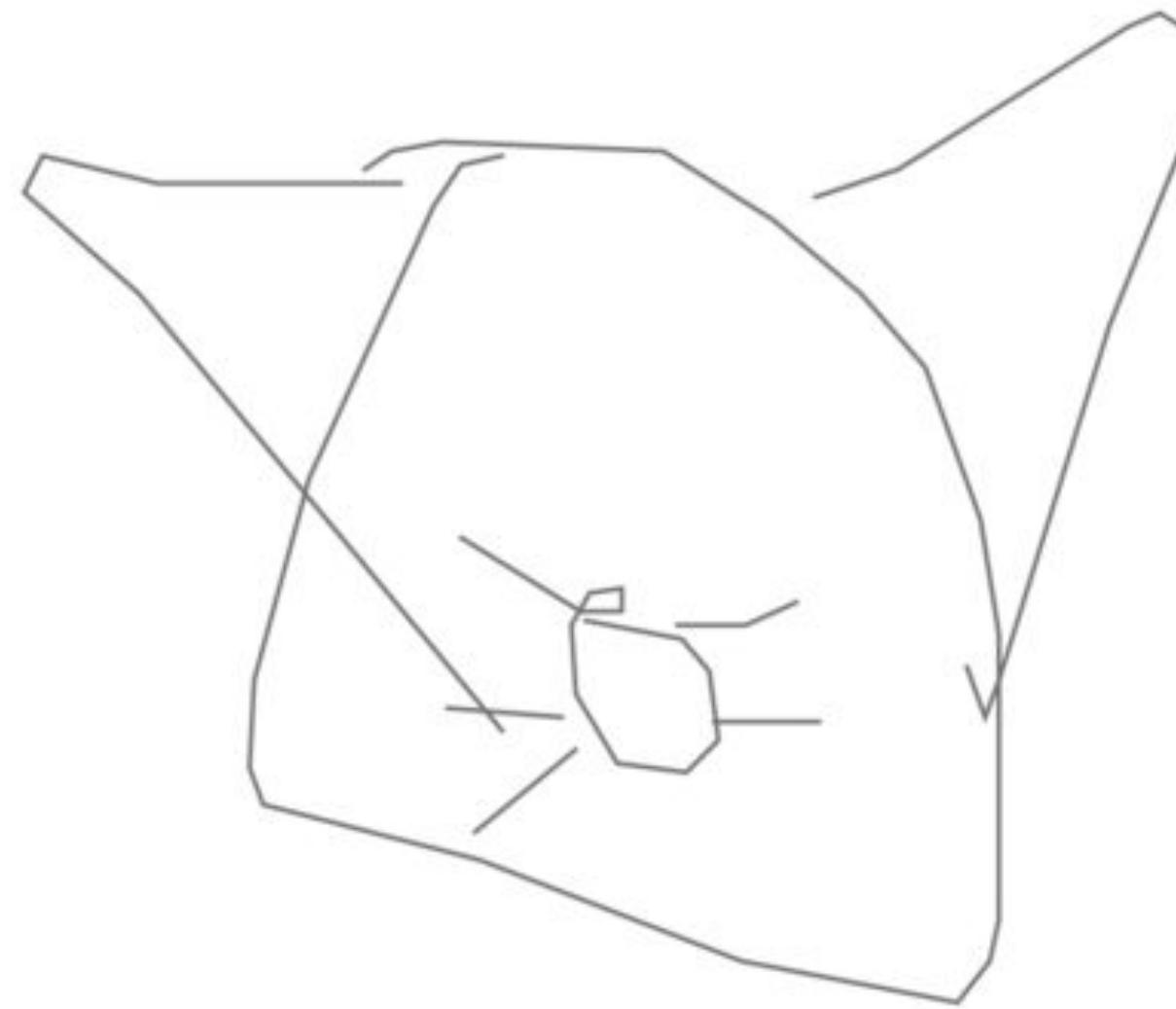


g.co/movemirror

Having fun with ML: Quick Draw



Having fun with ML: How Quickdraw learned what a cat is



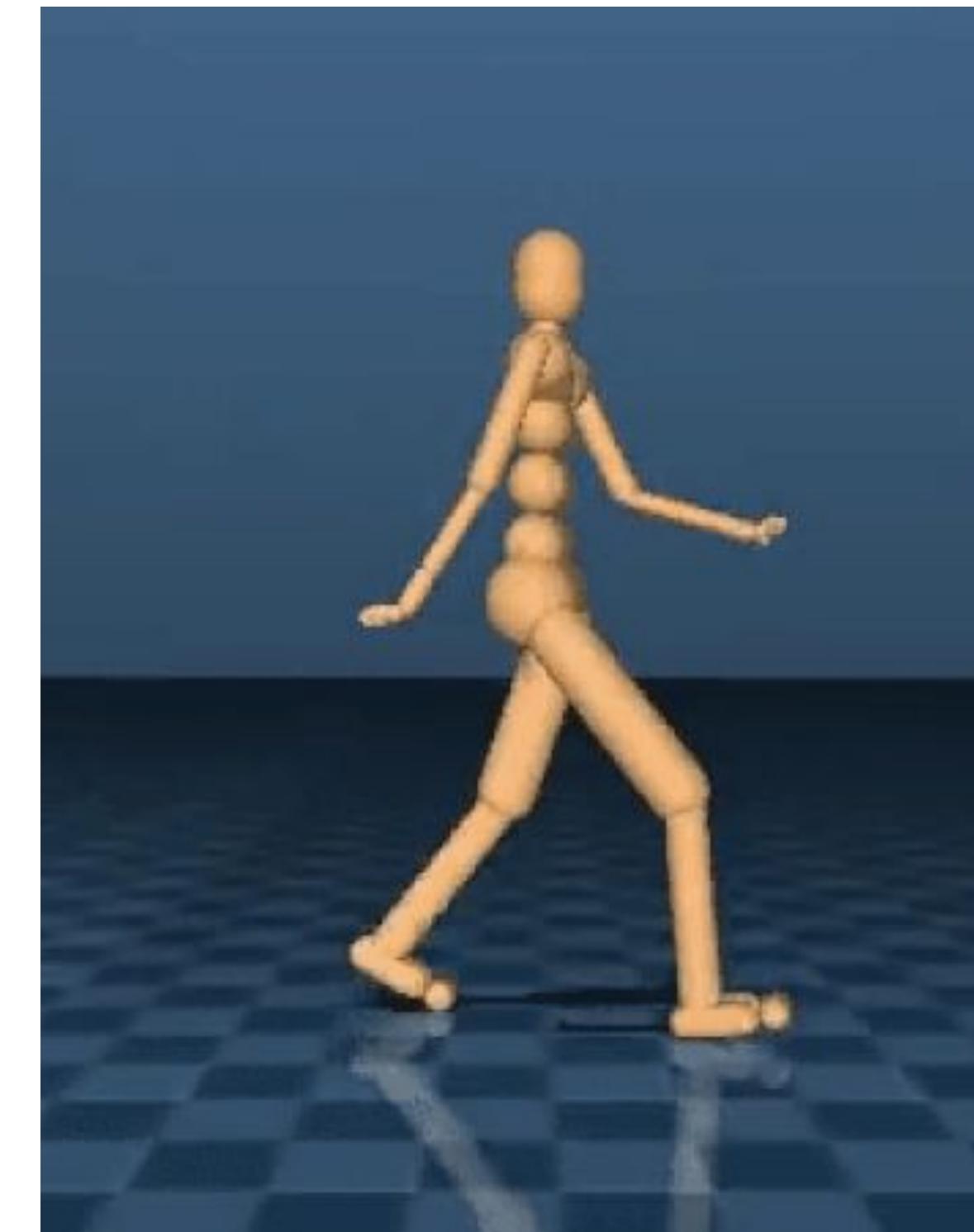
Having fun with ML: Auto Draw

+

Having fun with ML: TF JAM Shooting Hoops with Machine Learning



Having fun with ML: Deepmind - A simulated 'humanoid' walker



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We know this is a cat, but how would
you teach a machine?



We know this is a cat, but how would you teach a machine?

Maybe we highlight the eyes?



What about this?

Okay...how
about eyes
OR ears



We've added more *rules* that we pre-define as “cat-like”



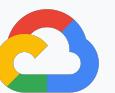
What about this?

Scores pretty
low on our
rule for cat
ears



Or even this?

No eyes are
even present.
This is hard!





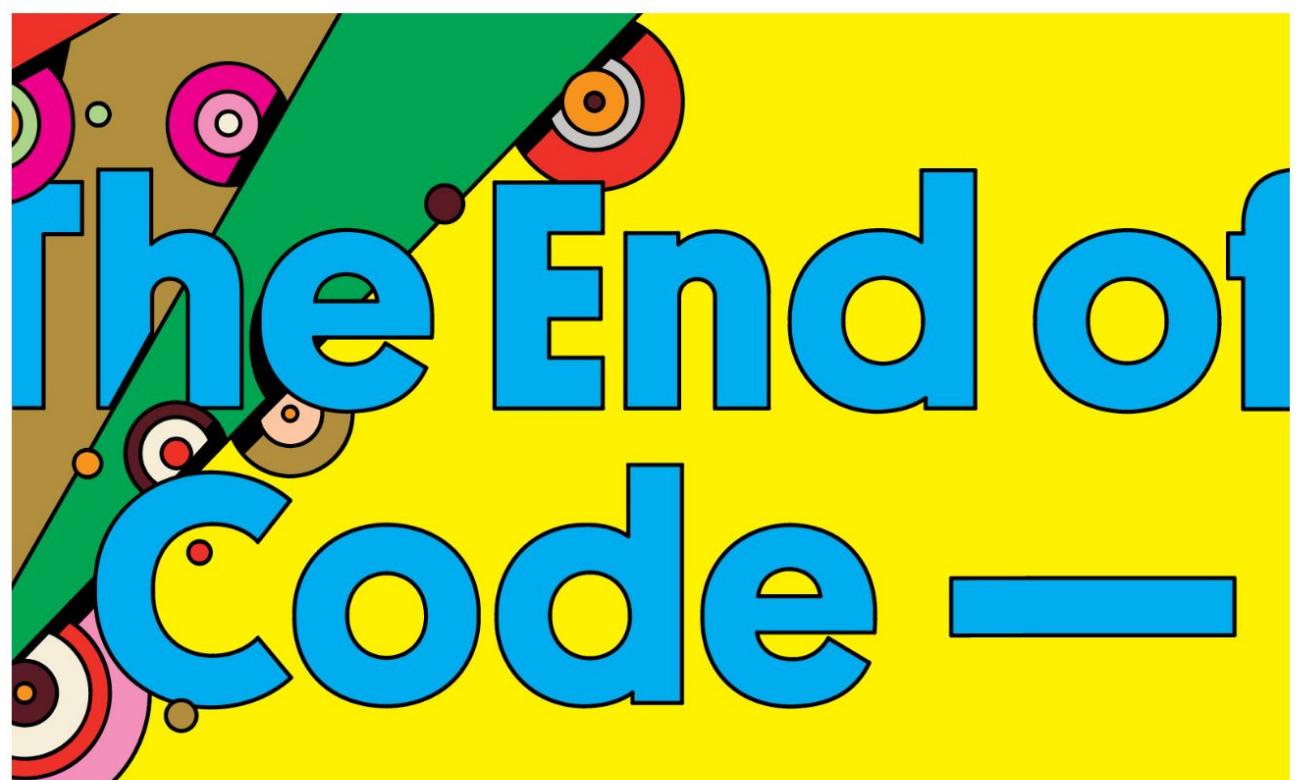
WIRED

SUBSCRIBE



JASON TANZ BUSINESS 05.17.16 6:50 AM

SOON WE WON'T PROGRAM COMPUTERS. WE'LL TRAIN THEM LIKE DOGS

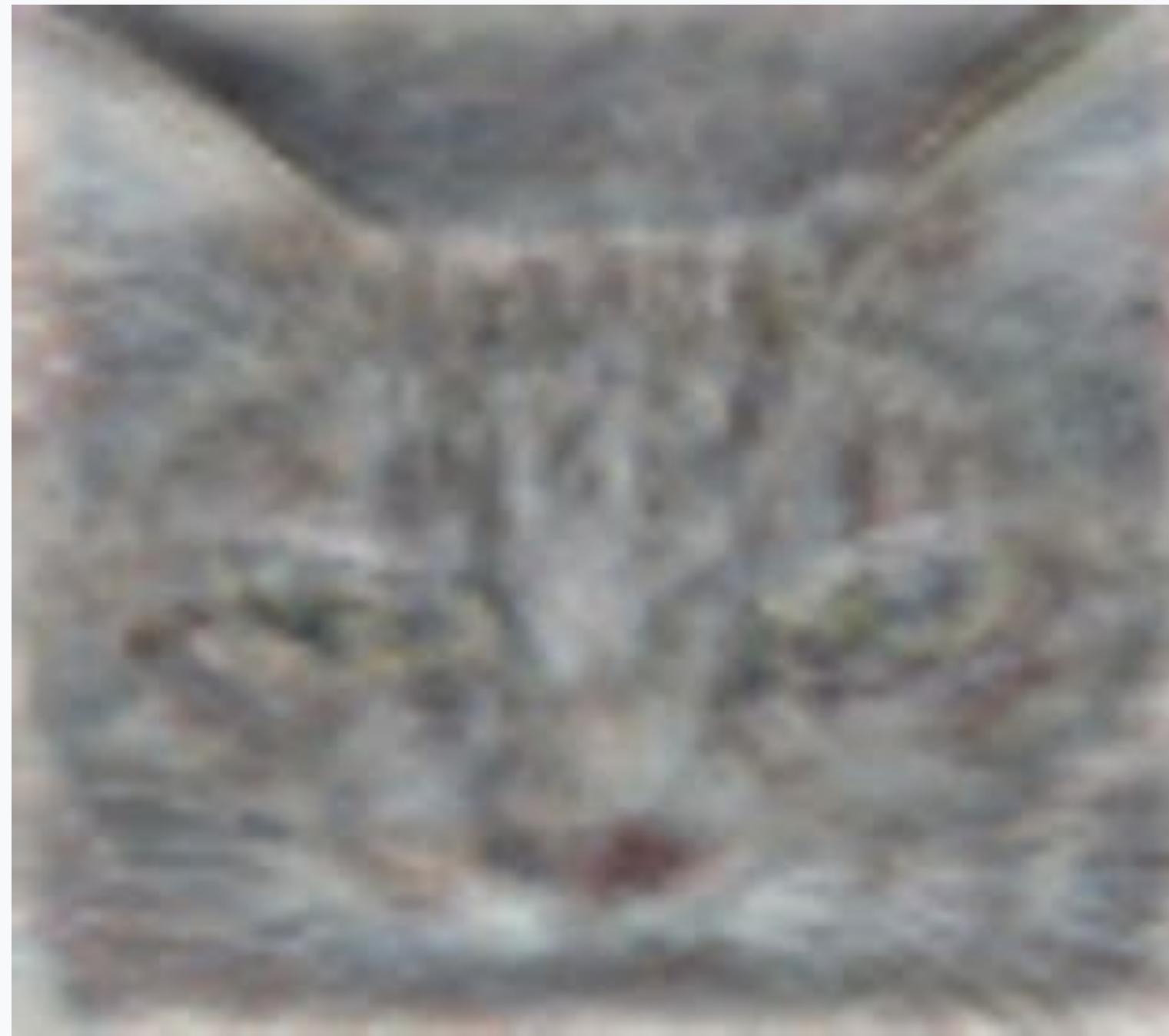


WIRED's headline

"If you want to teach a neural network to recognize a cat, for instance, you don't tell it to look for whiskers, ears, fur, and eyes. You simply **show it thousands and thousands of photos of cats**, and eventually it works things out."



Google in 2012: Show the computer 10 million images, have it find cats

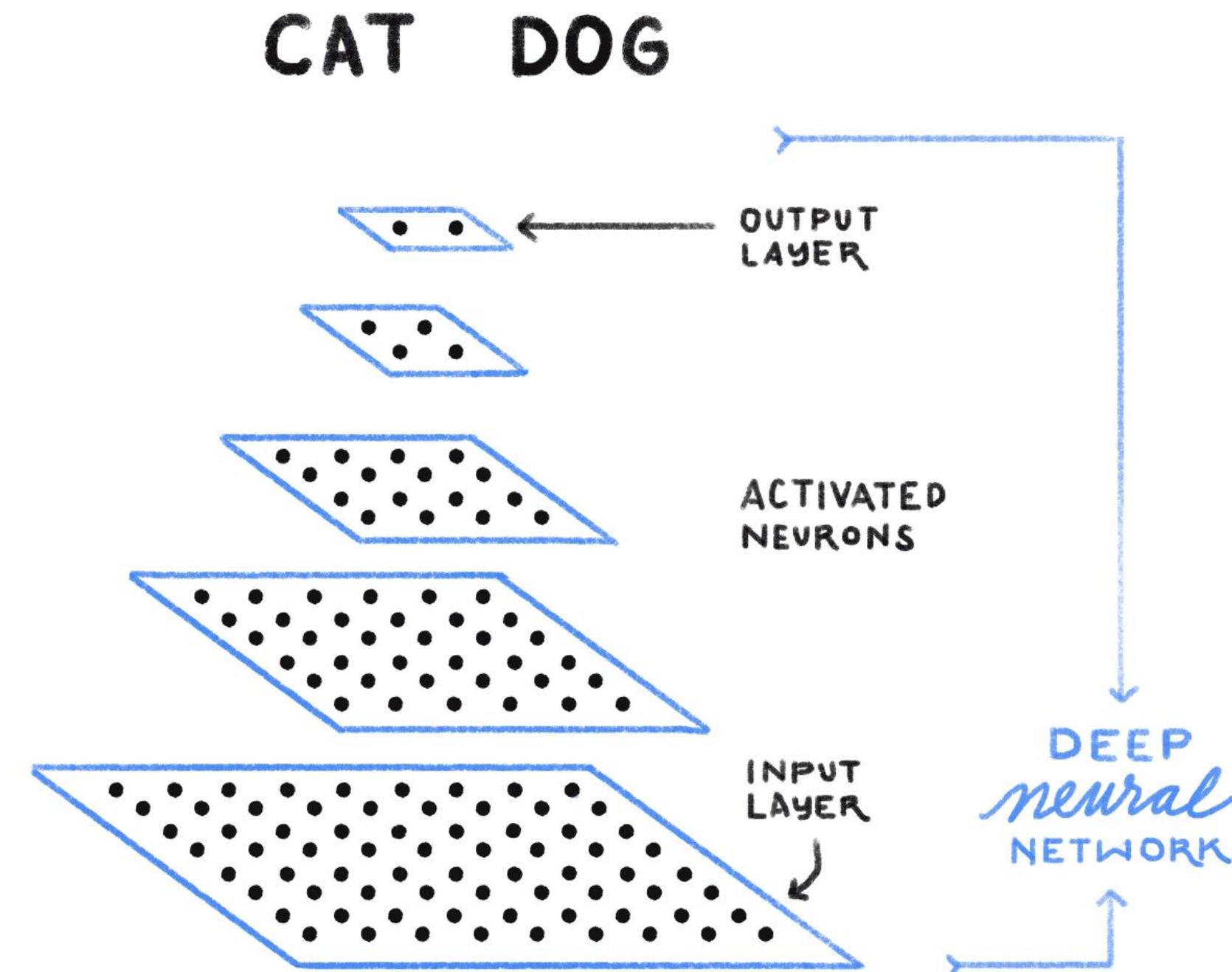


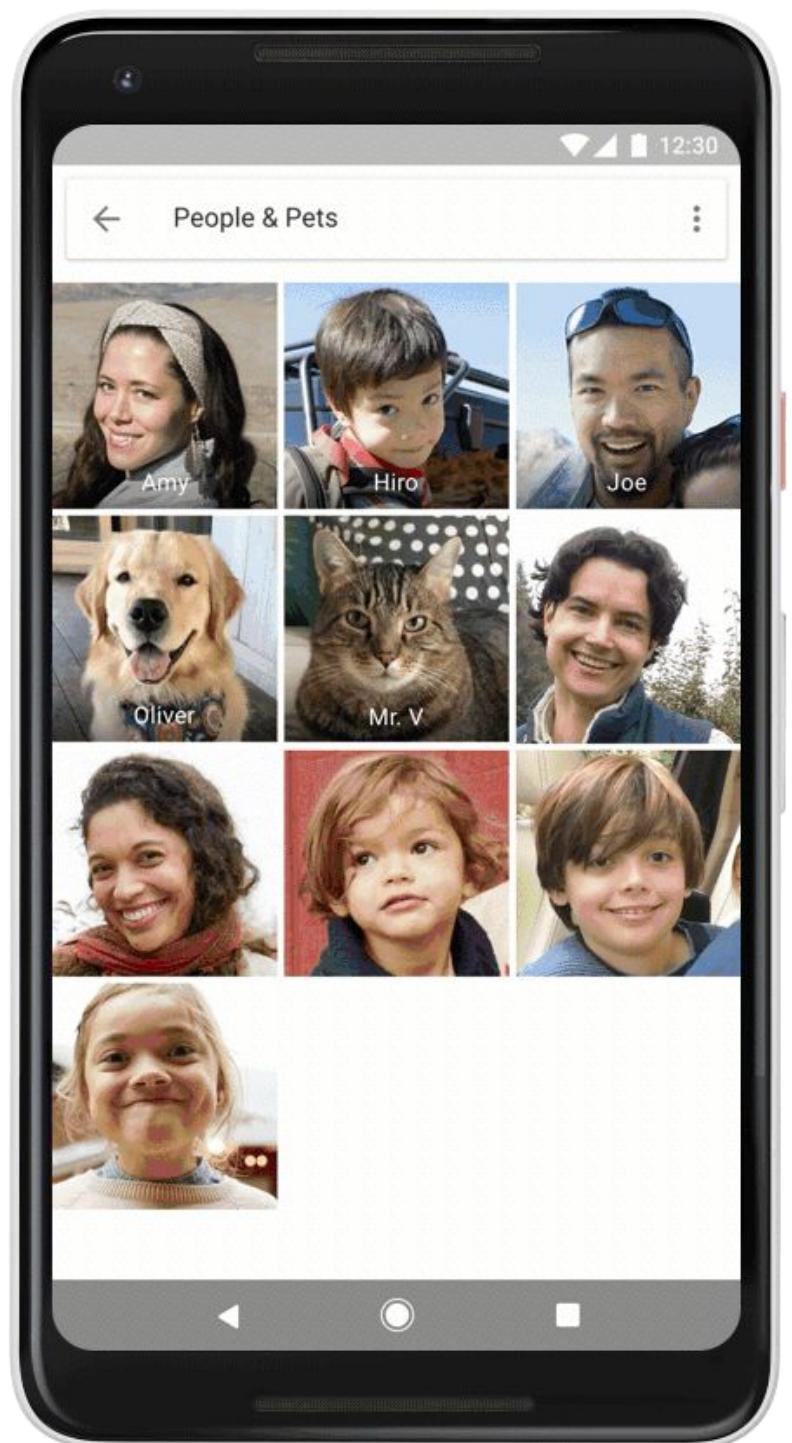
Remember this?



Modern AI Applications use Deep Learning

IS THIS A
CAT or DOG?





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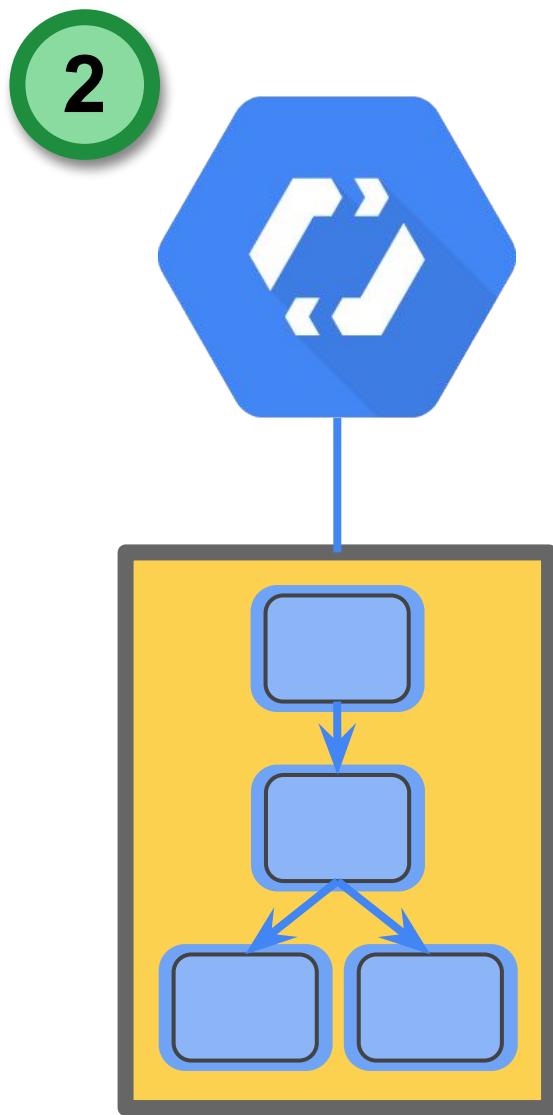
Choosing the right ML approach

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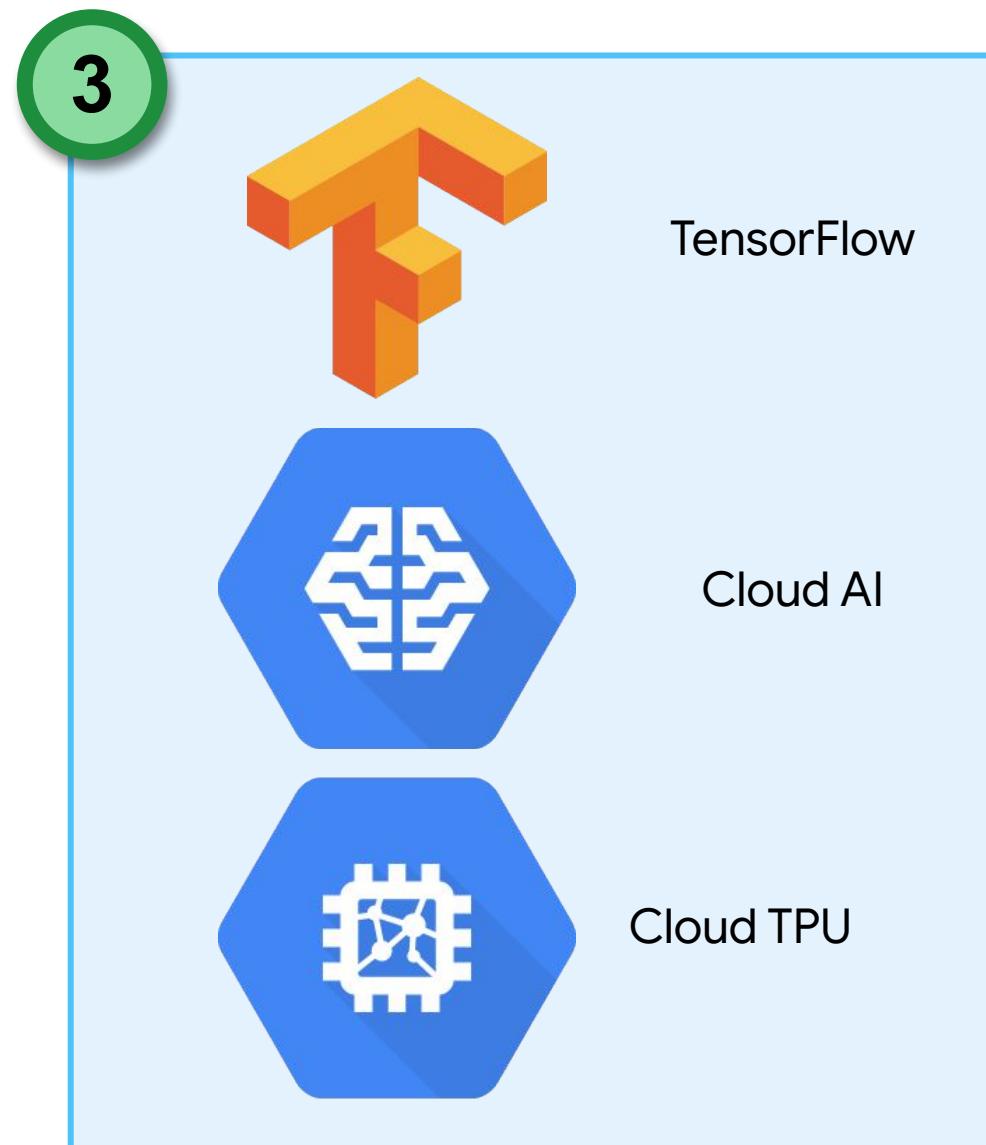
Artificial Intelligence application strategy



Use pre-built AI



Add Custom Models



Create new Models

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Do you need a Custom Model?

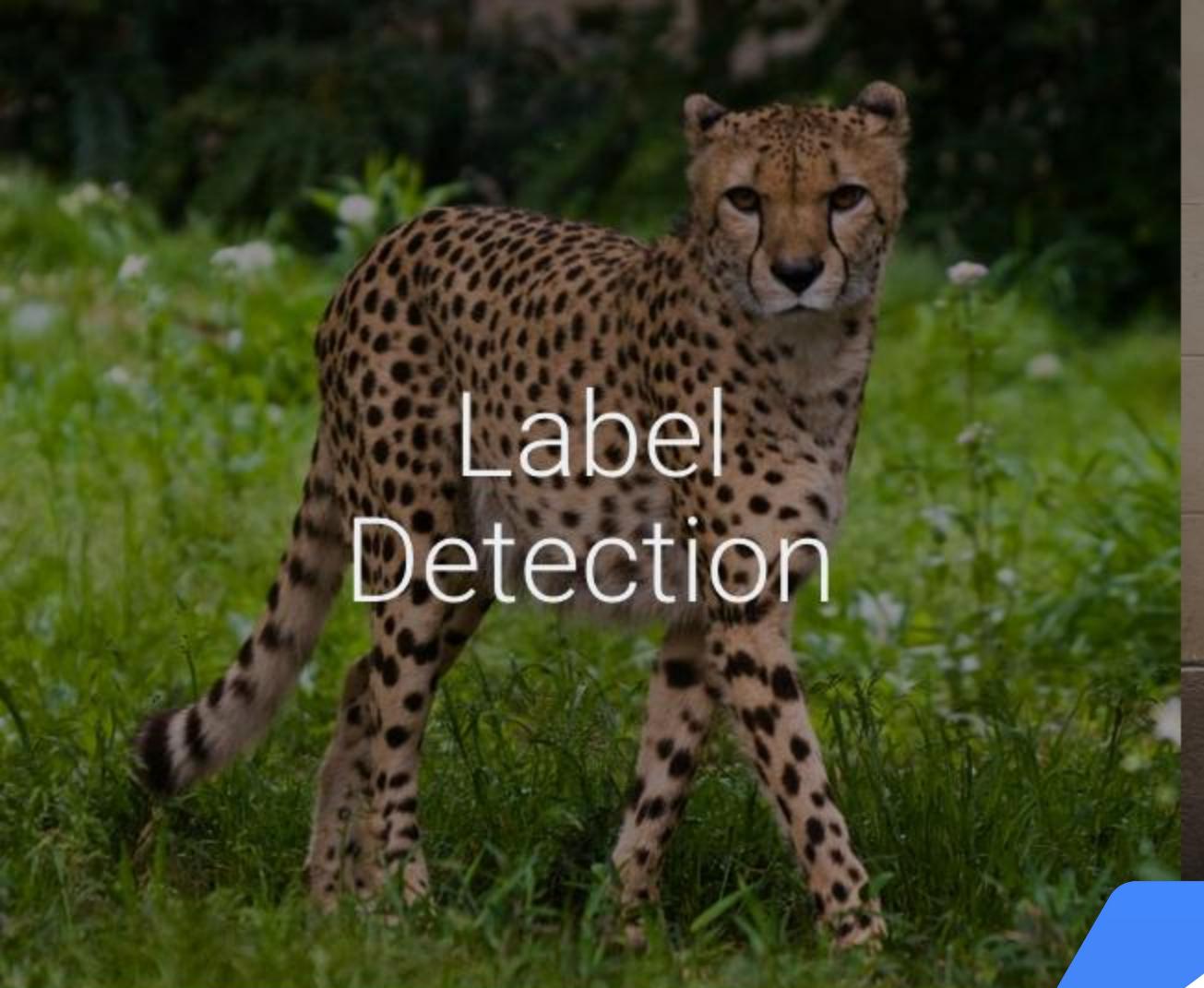


Good Machine Learning models require
lots of high-quality training data, why
not start with a pre-trained model?

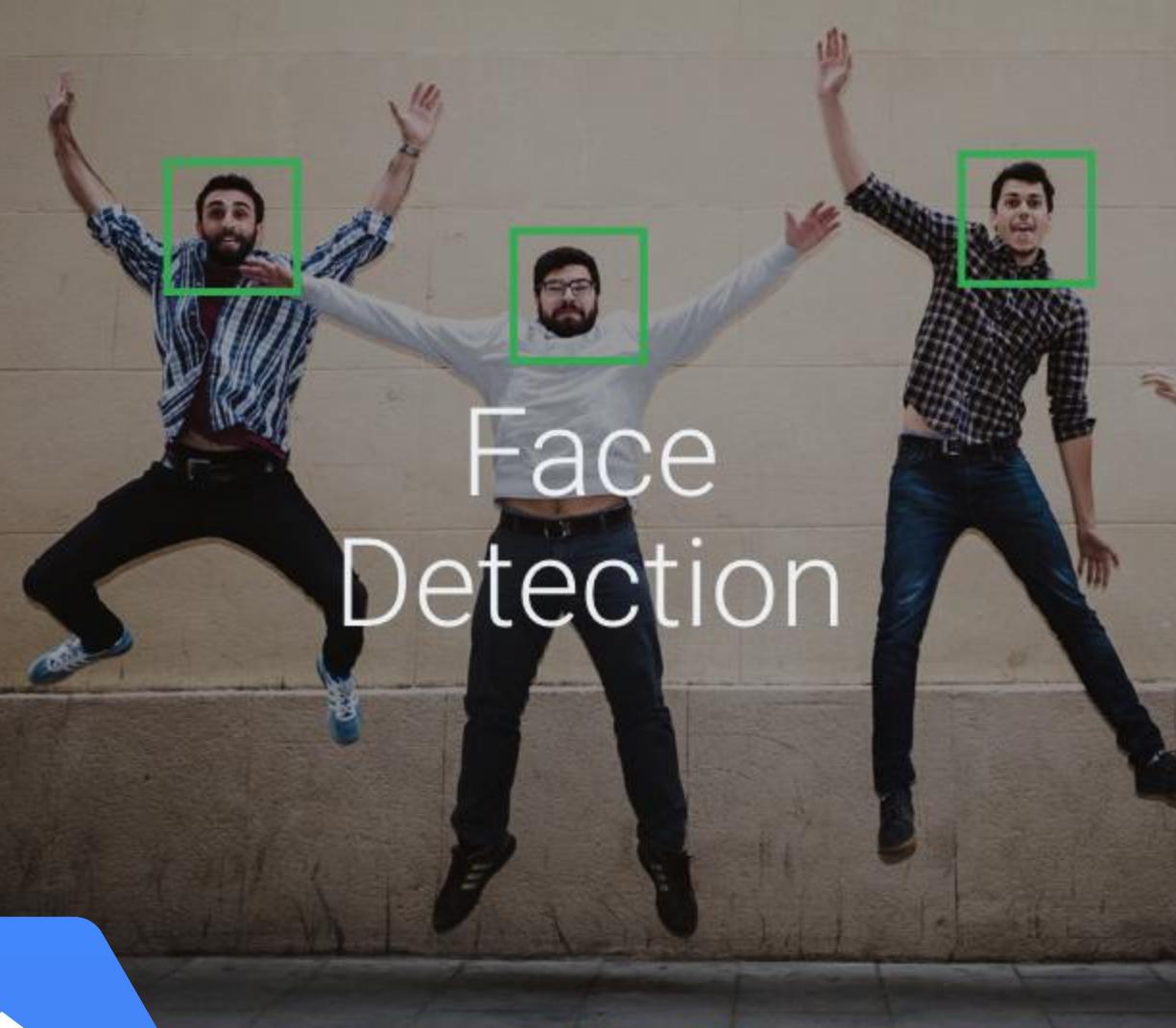
Demo

Cloud Vision API

Out-of-the-box, pre-built ML models



Label
Detection

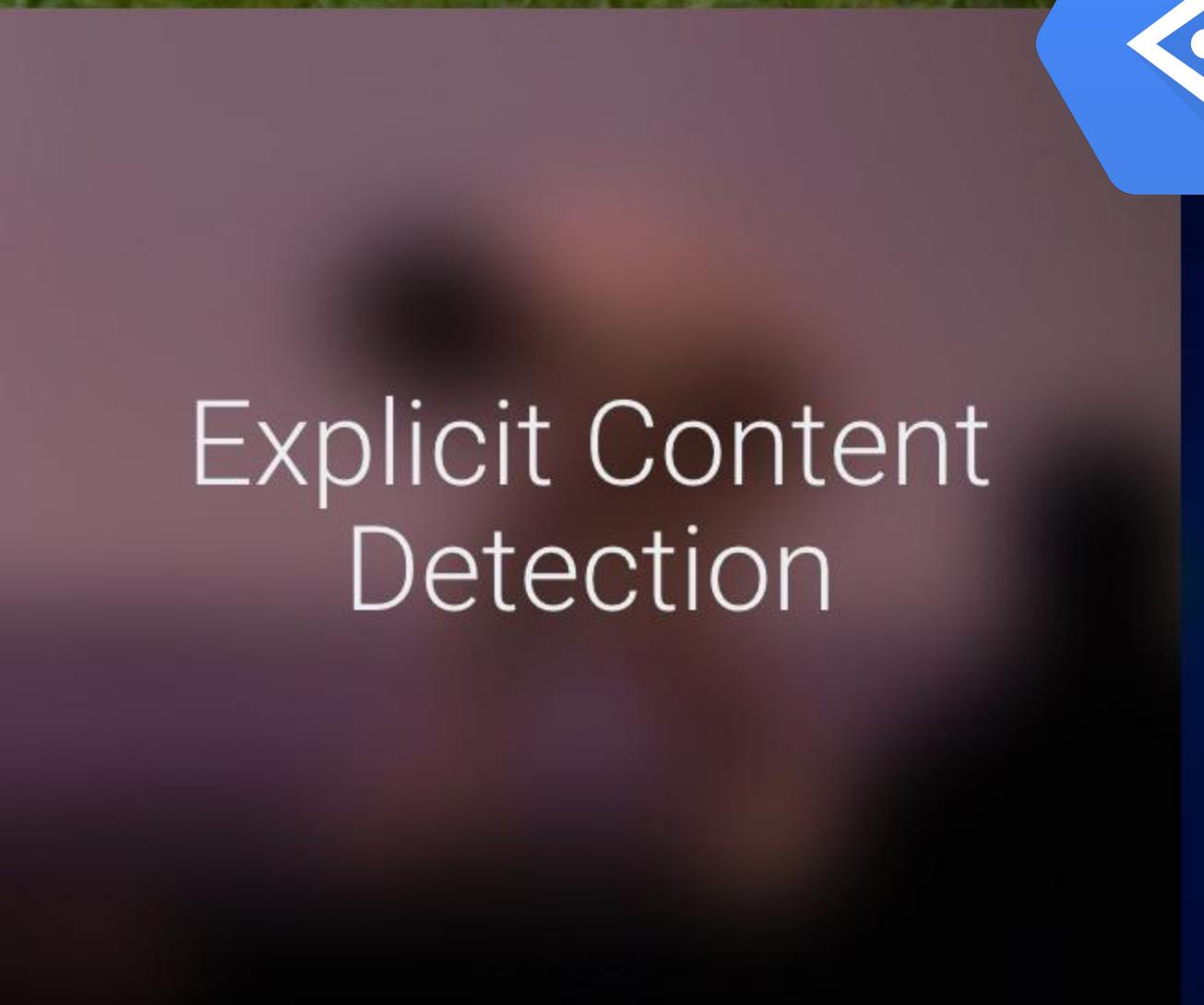


Face
Detection

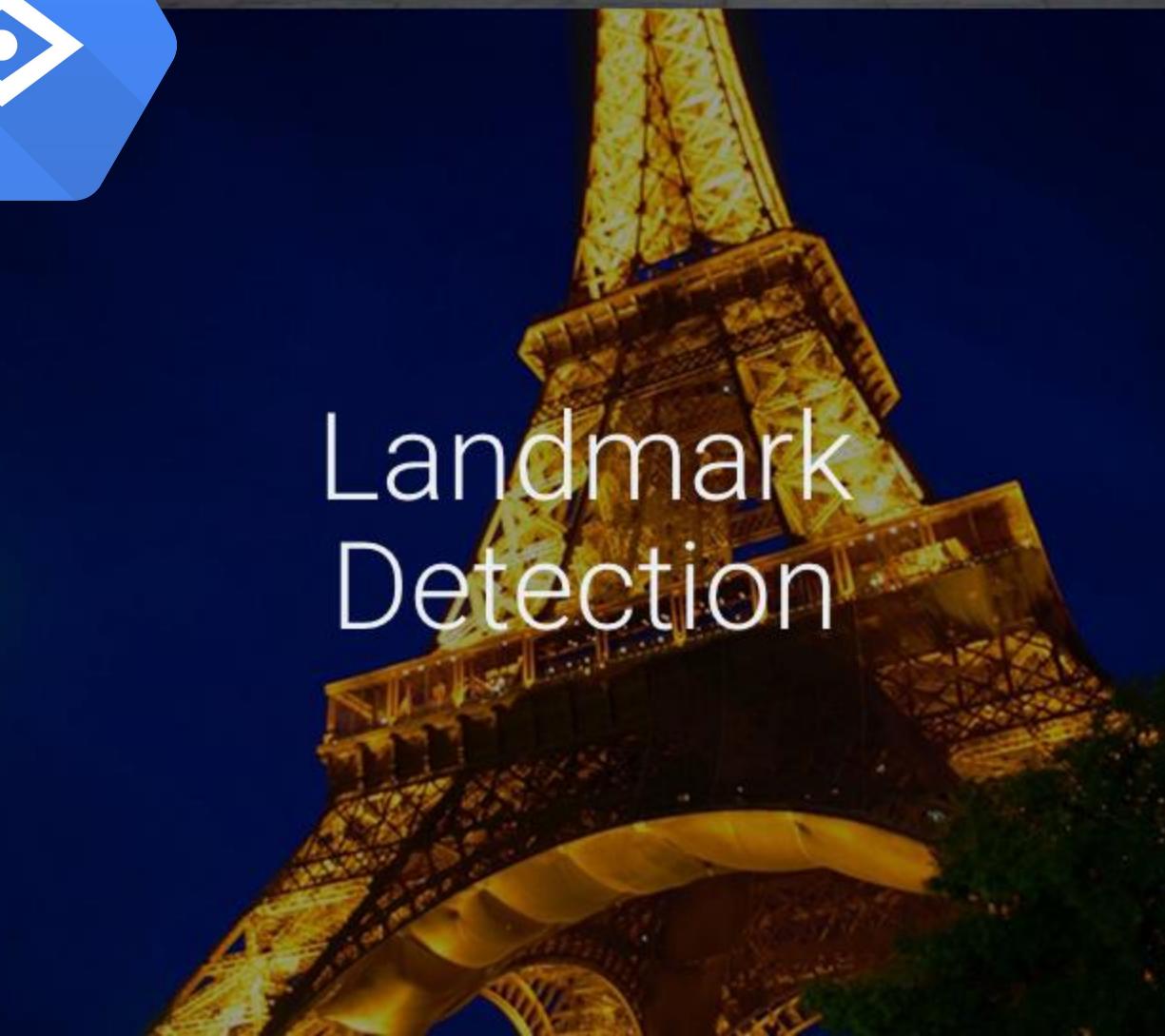


NO
PARKING
ANY TIME

OCR



Explicit Content
Detection



Landmark
Detection



Logo Detection
Google

Face detection

```
5 "faceAnnotations" : [
```

```
6 {
```

```
7   "headwearLikelihood" : "VERY_UNLIKELY",  
8   "surpriseLikelihood" : "VERY_UNLIKELY",  
9   "rollAngle" : -4.6490049,  
10  "angerLikelihood" : "VERY_UNLIKELY",  
11  "landmarks" : [
```

```
12  {
```

```
13    "type" : "LEFT_EYE",  
14    "position" : {  
15      "x" : 691.97974,  
16      "y" : 373.11096,  
17      "z" : 0.000037421443  
18    }
```

```
19  },
```

```
20  ...  
21  ],
```

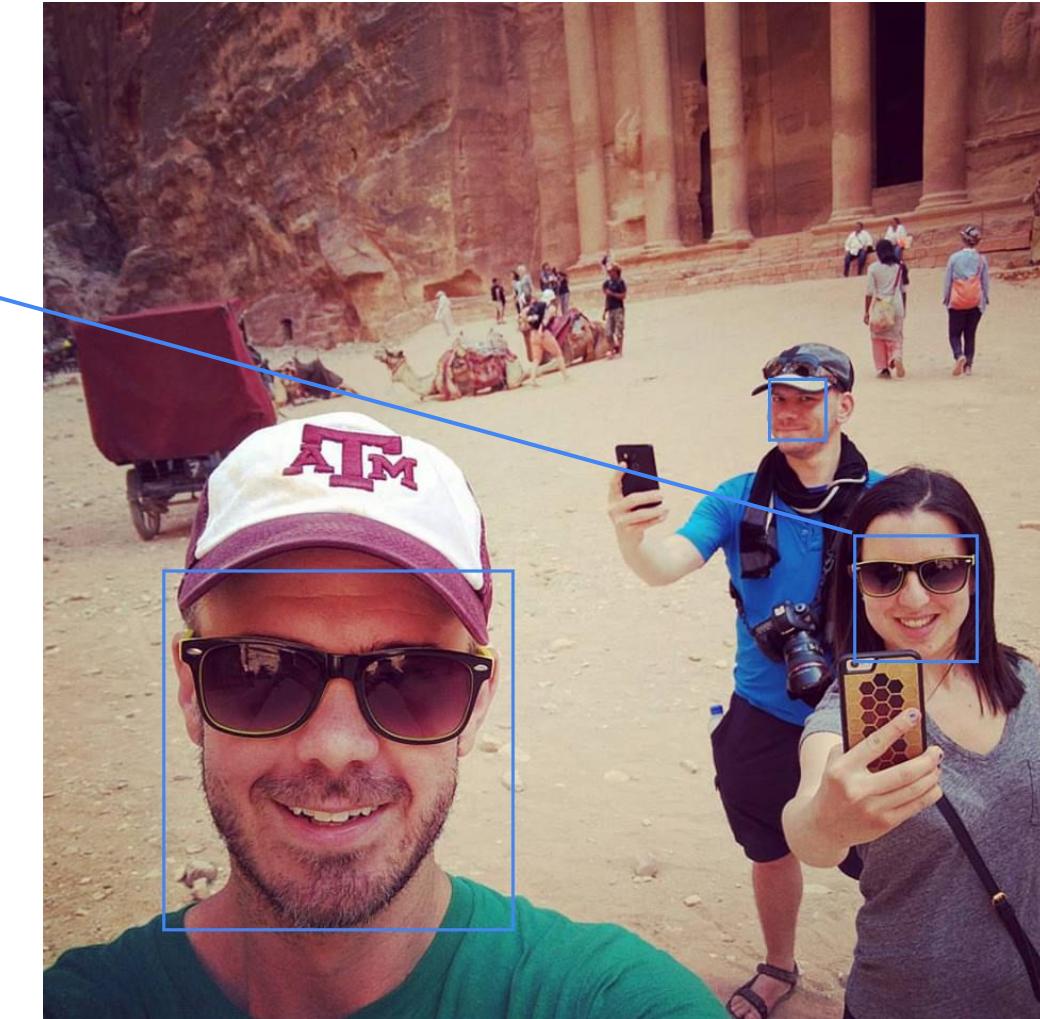
```
22  "boundingPoly" : {
```

```
23    "vertices" : [
```

```
24    {
```

```
25      "x" : 743,  
26      "y" : 449  
27    },
```

```
28    ...  
29  }
```



```
30   "detectionConfidence" : 0.93568963,  
31   "joyLikelihood" : "VERY_LIKELY",  
32   "panAngle" : 4.150538,  
33   "sorrowLikelihood" : "VERY_UNLIKELY",  
34   "tiltAngle" : -19.377356,  
35   "underExposedLikelihood" : "VERY_UNLIKELY",  
36   "blurredLikelihood" : "VERY_UNLIKELY"
```

2

3

Web annotations

5

6

7

8

9

10

11

12

13

14

15

16

17

```
{  
  "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)"  
}
```



2

3 Try it in the browser with your own images

5

6

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10

11

12

13

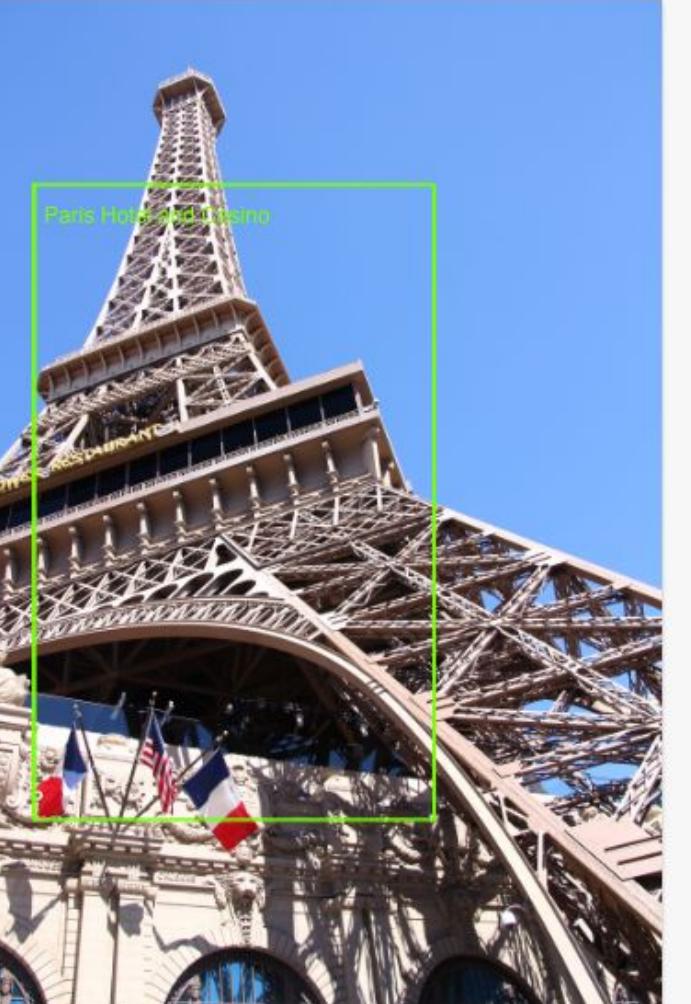
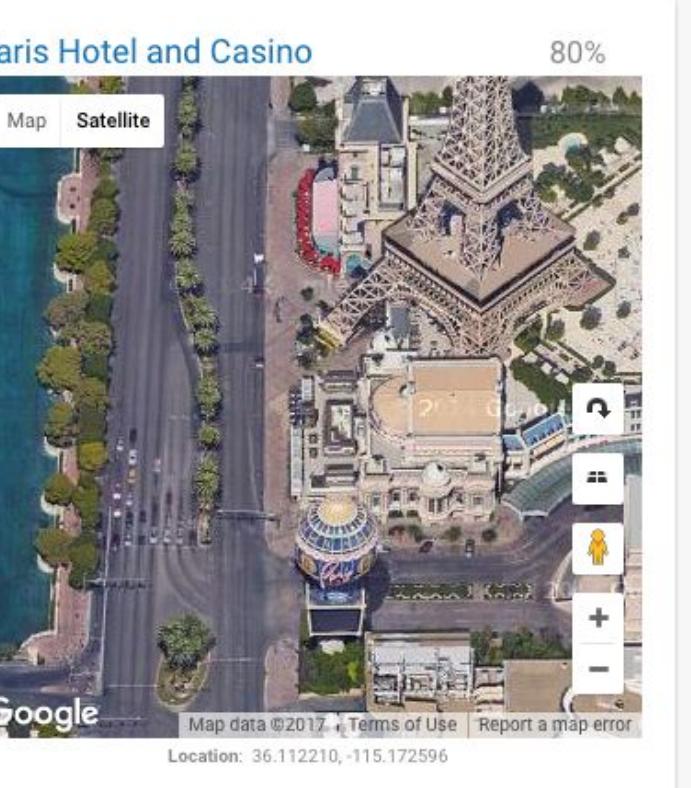
14

15

16

17

18

Landmarks	Labels	Text	Colors	Safe Search	JSON Response
					

Landmarks

Labels

Text

Colors

Safe Search

JSON Response

Paris Hotel and Casino

80%

Map Satellite

Google

Map data ©2017, Terms of Use, Report a map error

Location: 36.112210, -115.172596

Las-Vegas-Paris-Hotel-Eiffel-Tower-8307.jpg

cloud.google.com/vision

The Translation API supports 100+ languages

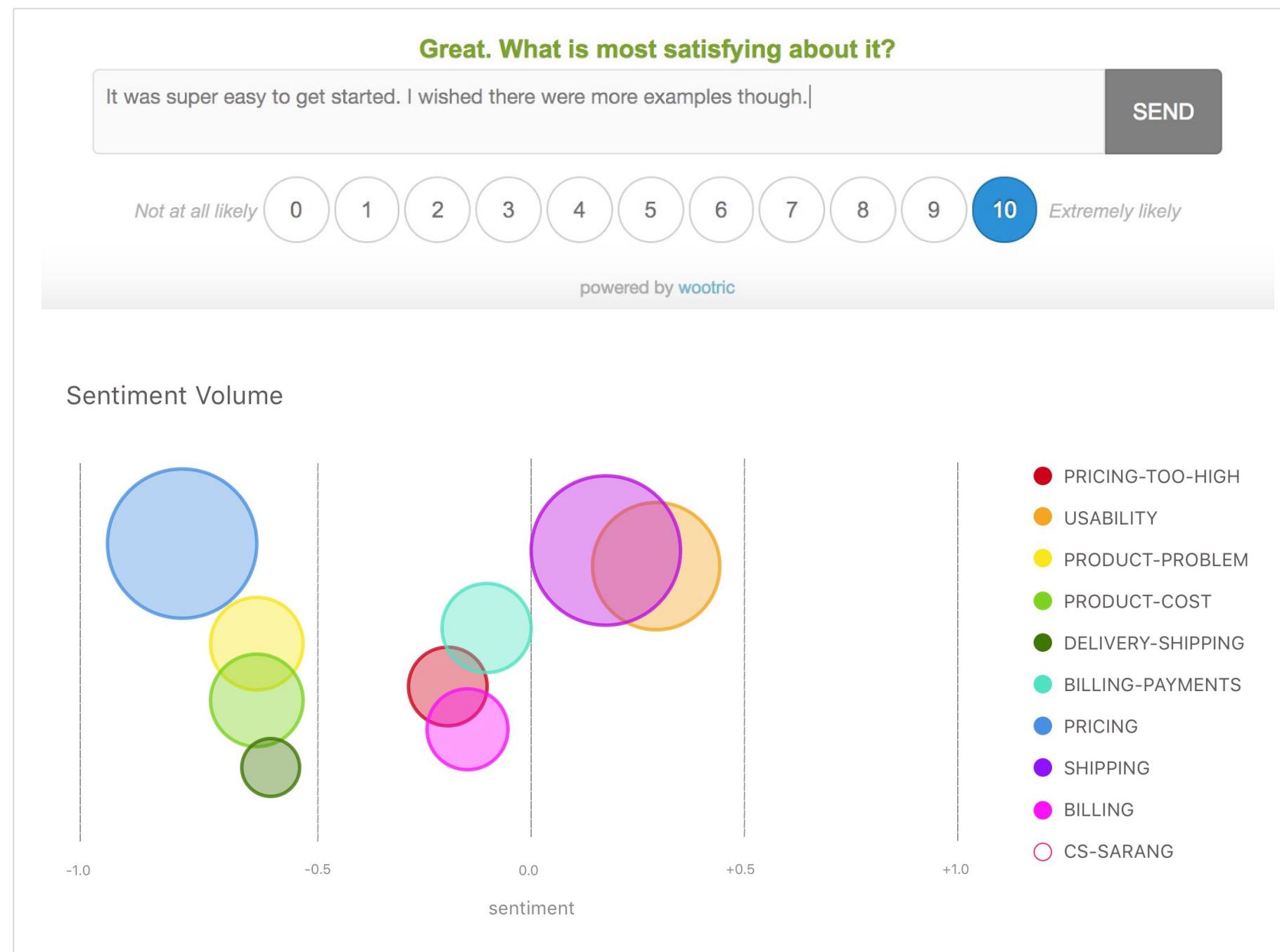


<https://cloud.google.com/translate/>

2

3 **Wootric uses the Cloud Natural Language API (entity and sentiment) to**

5 **make sense of qualitative customer feedback**



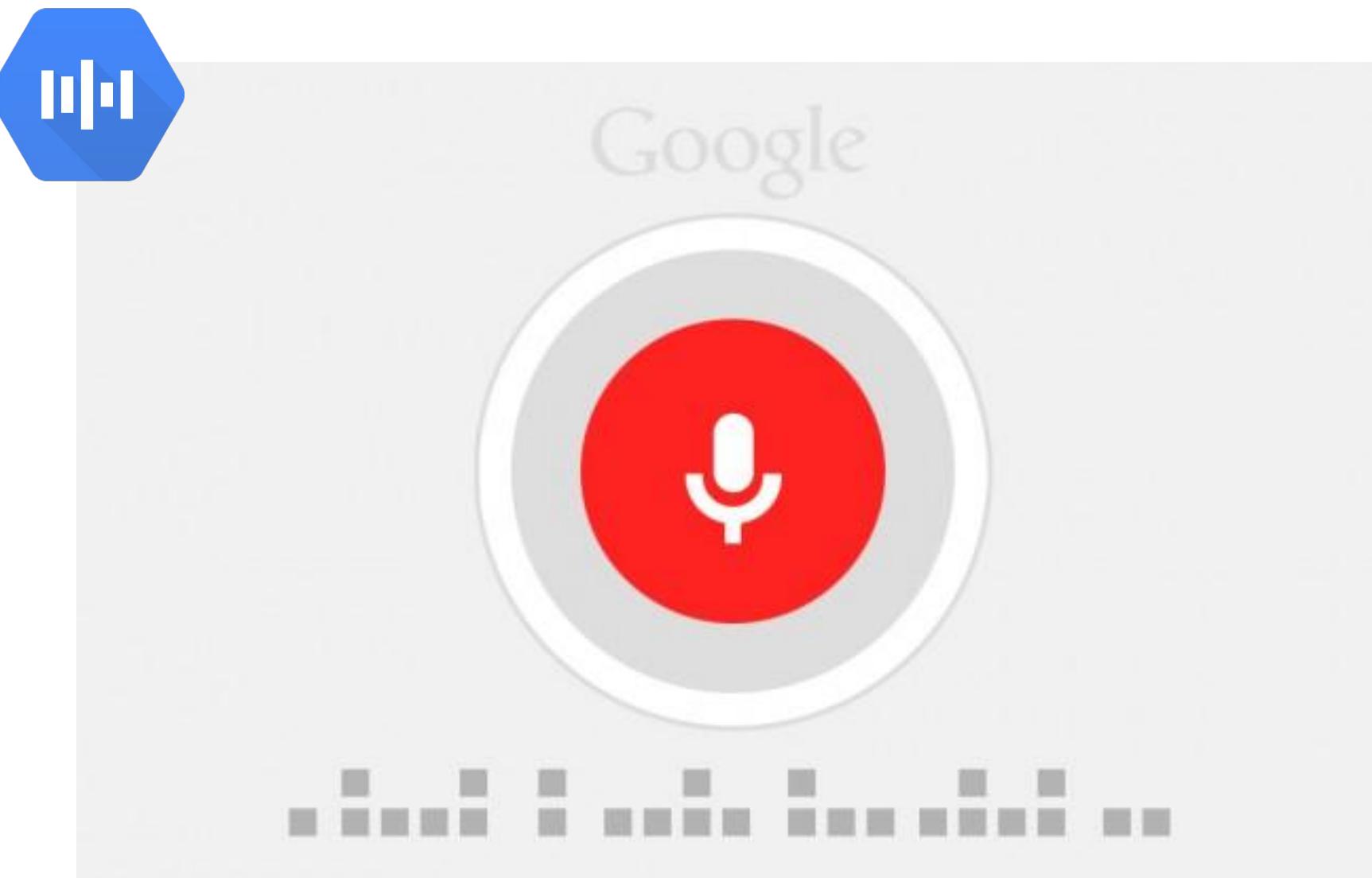
2
3 When you analyze sentiment, you get a score (positive/negative) as well
5 as a magnitude (how intense?)
6

7 *The food was excellent, I would definitely go back!*

```
9 {  
10     "documentSentiment": {  
11         "score": 0.8,  
12         "magnitude": 0.8  
13     }  
14 }
```

2

3 The Cloud Speech API can be used to transcribe audio to text



<http://cloud.google.com/speech>

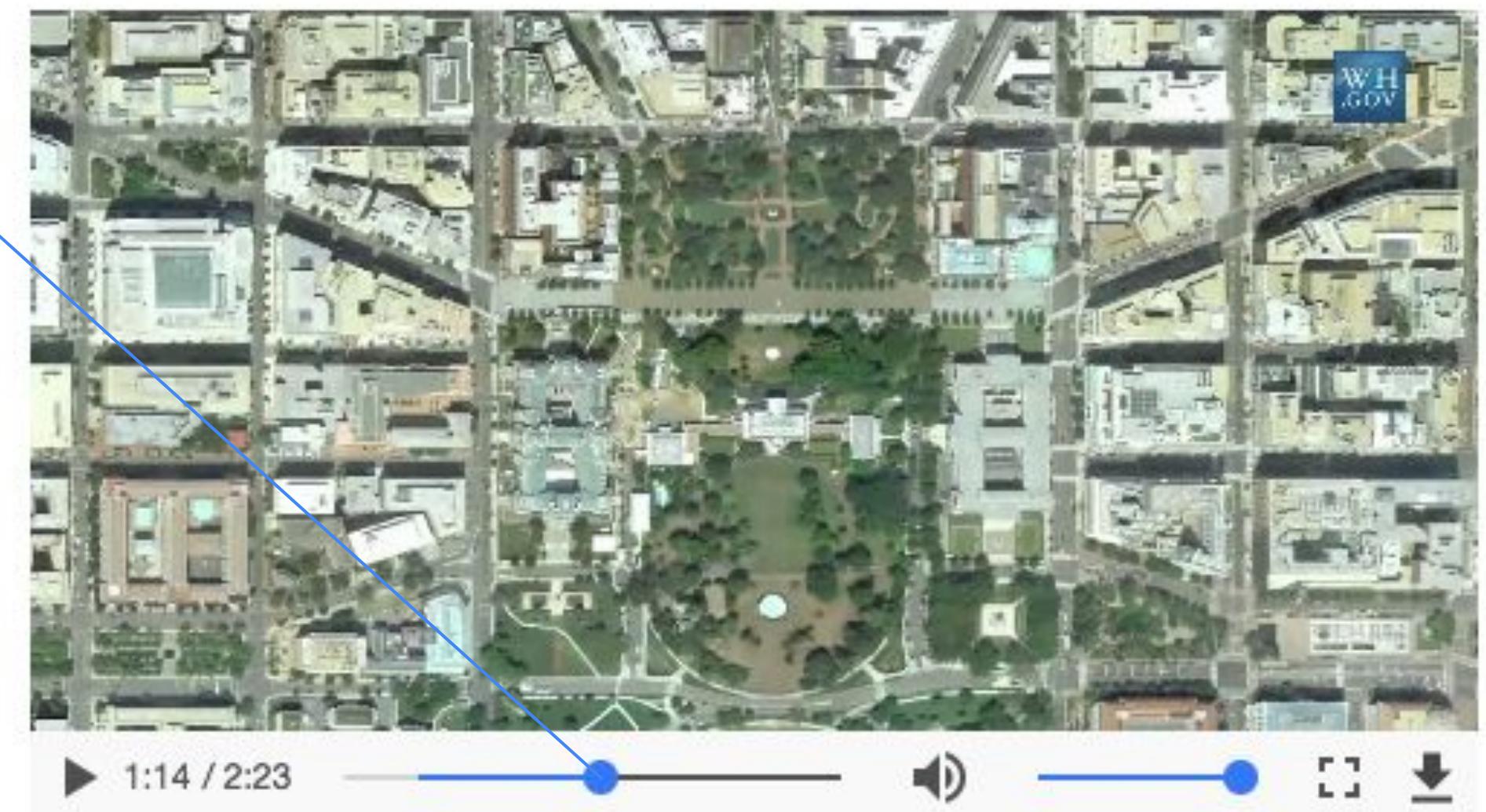
2

3 Like the Vision API, the Video Intelligence API can identify labels in

5 a video, along with a timestamp

6 {

7 "description": "Bird's-eye view",
8 "language_code": "en-us",
9 "locations": {
10 "segment": {
11 "start_time_offset": 71905212,
12 "end_time_offset": 73740392
13 },
14 "confidence": 0.96653205
15 }
16 }
17



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

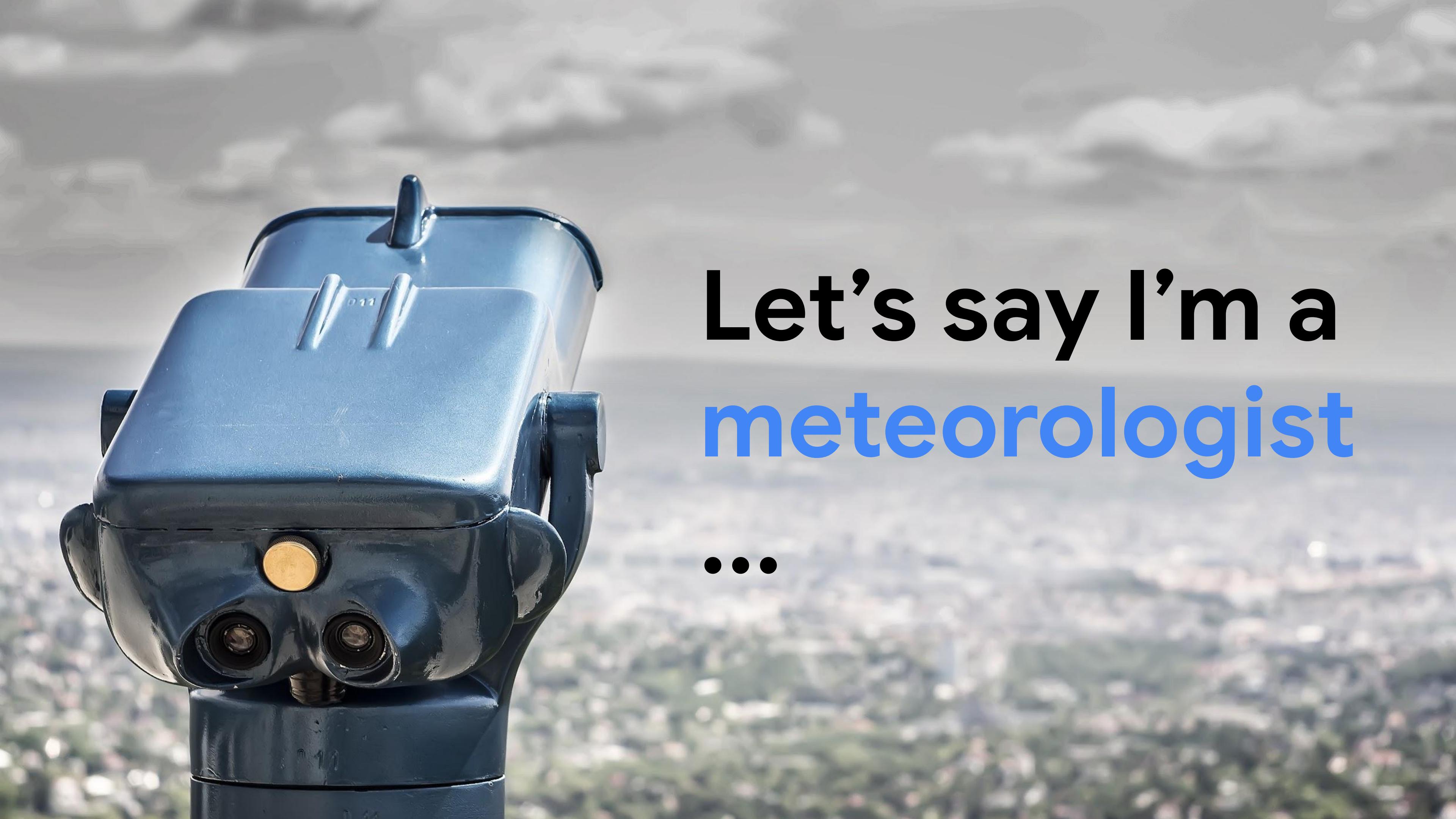
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Let's say I'm a
meteorologist

...

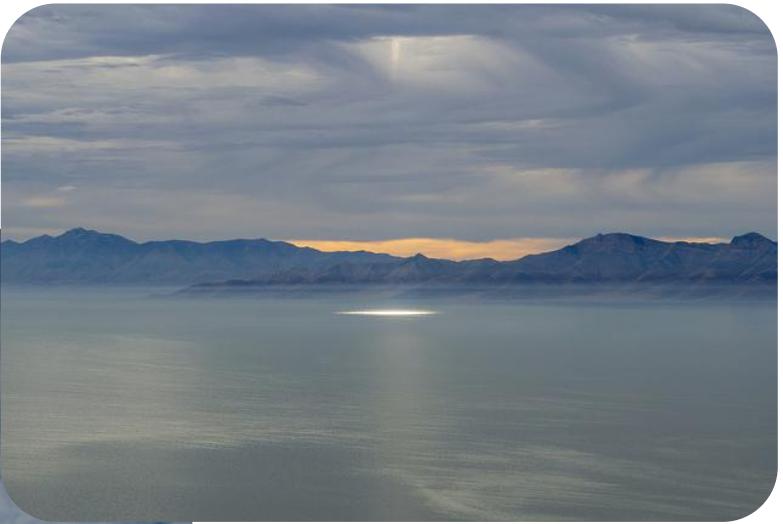


**I want to predict
weather trends
and flight plans
from images**

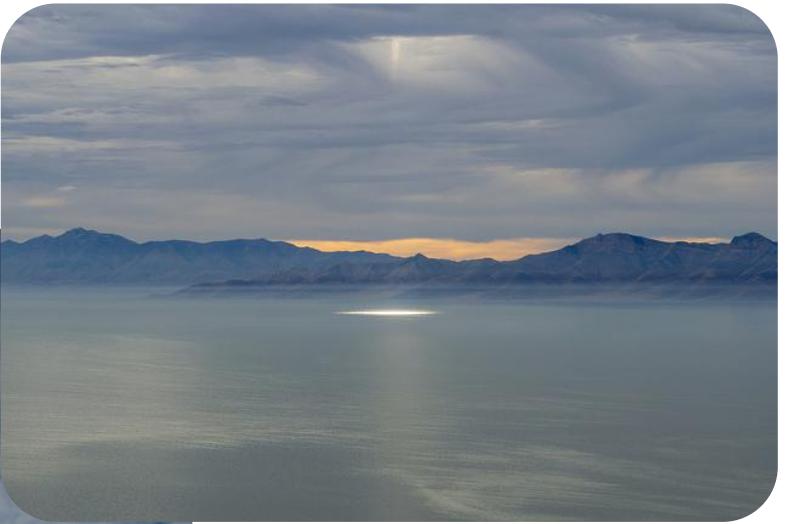
There are 10+ different types of clouds



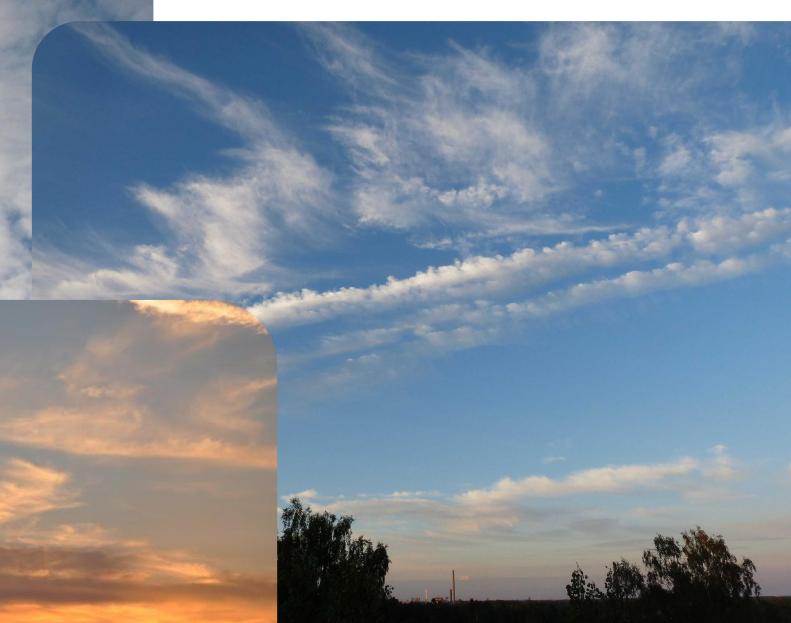
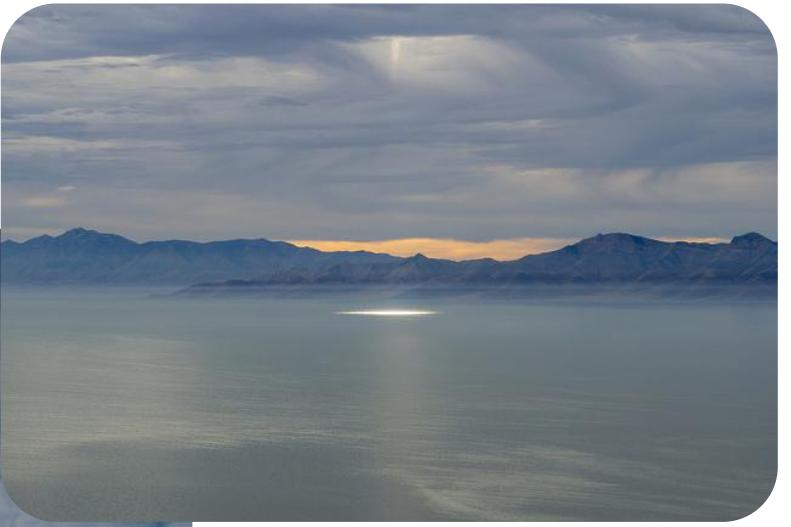
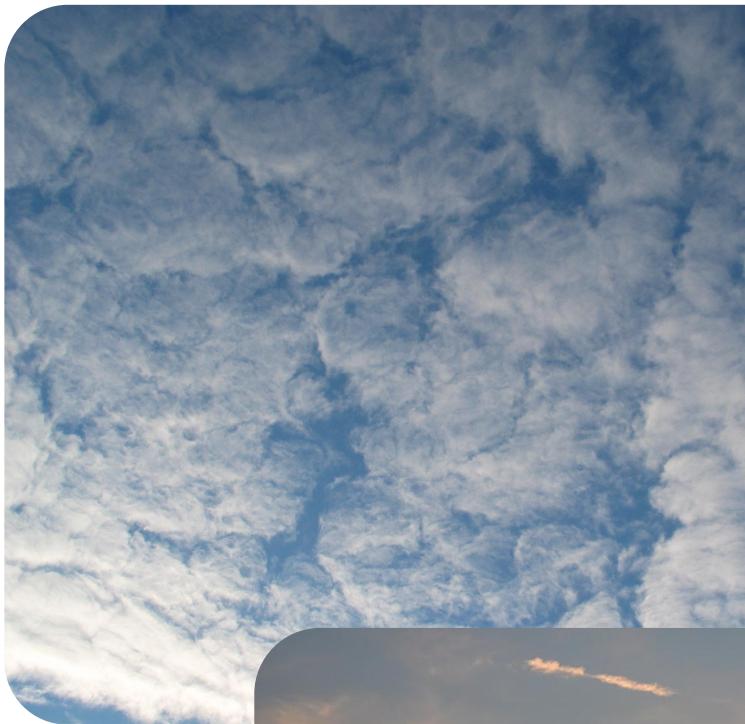
There are 10+ different types of clouds



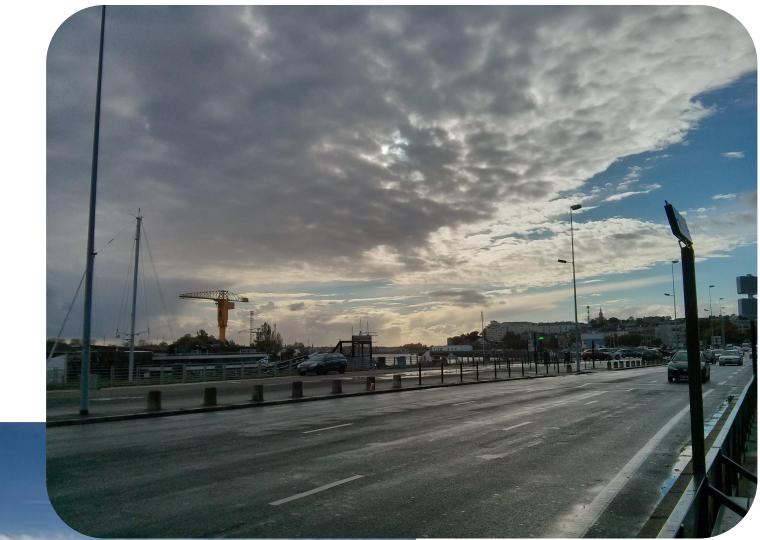
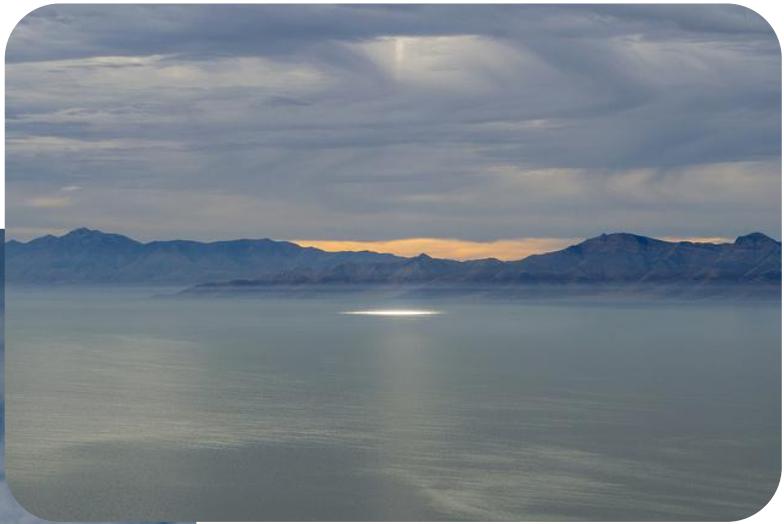
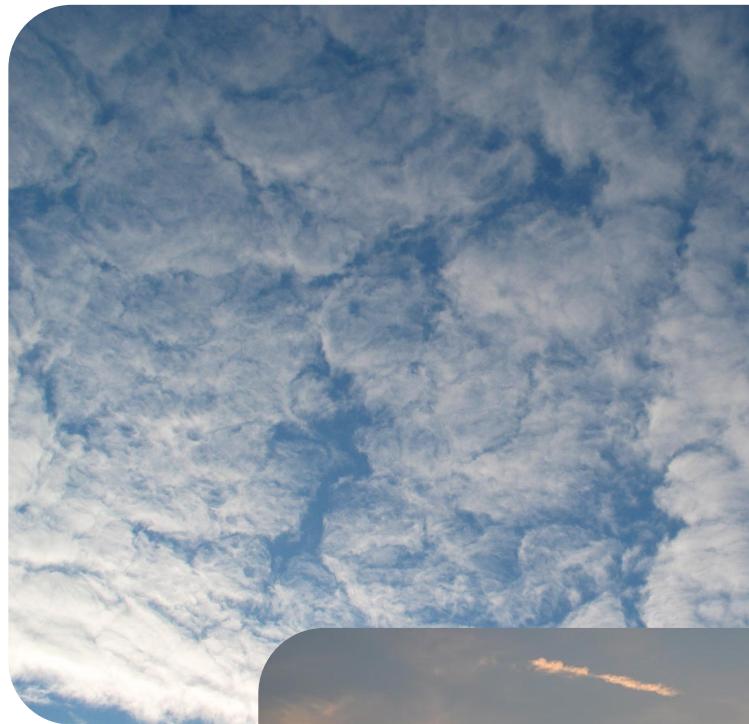
There are 10+ different types of clouds



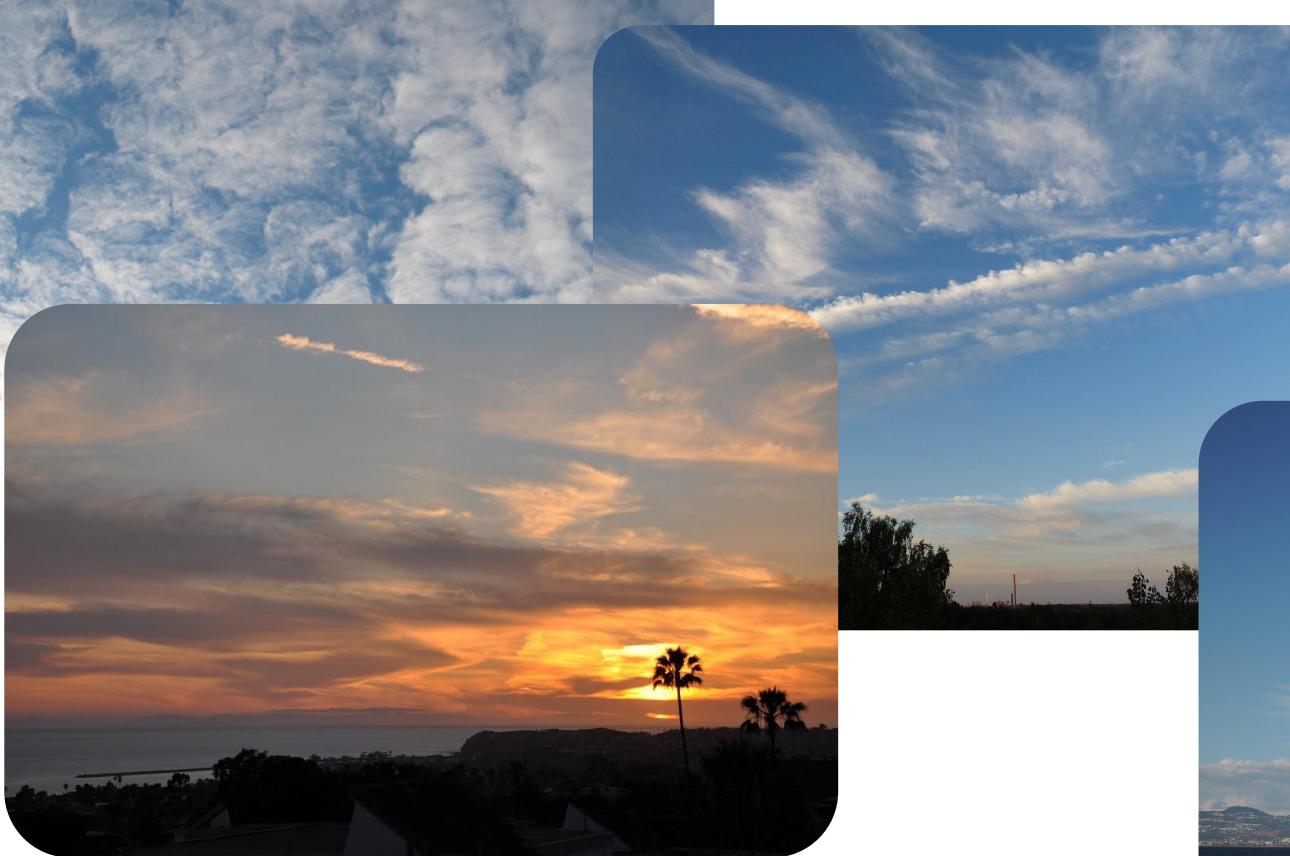
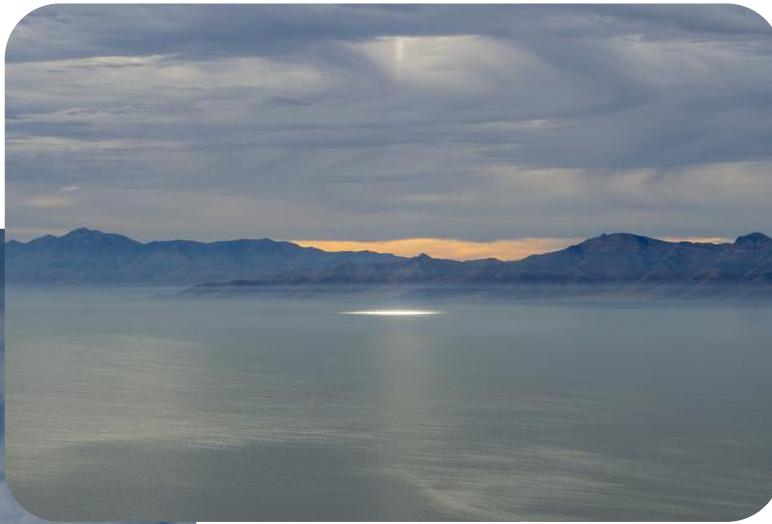
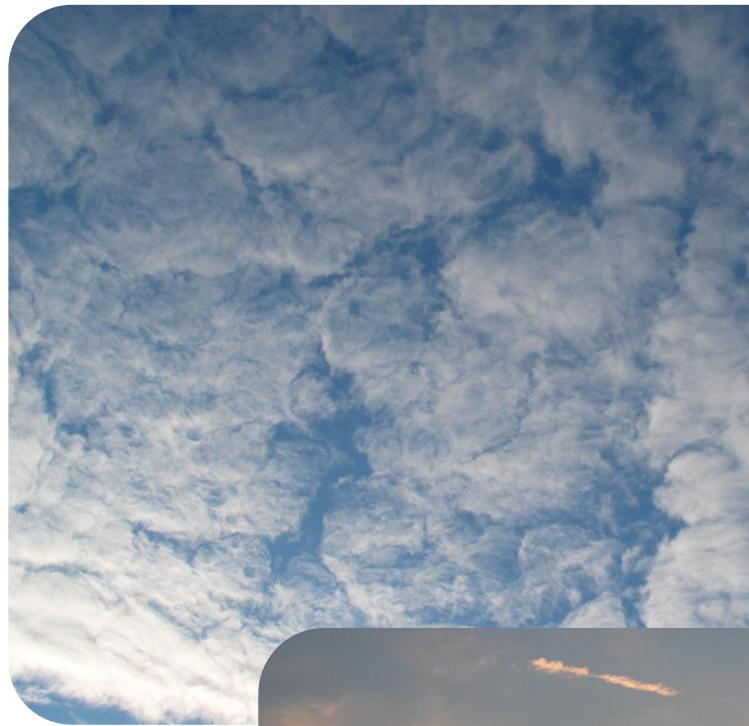
There are 10+ different types of clouds



There are 10+ different types of clouds



They all indicate different weather patterns



Yes, it's a cloud, but what type?



Cumulonimbus

versus



Cirrus



Let's try the Vision API

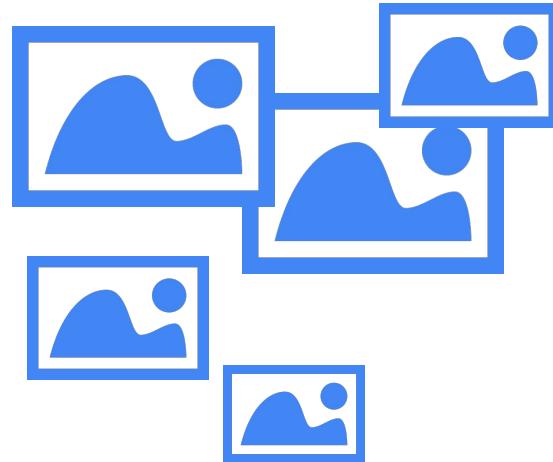


Let's try the Vision API

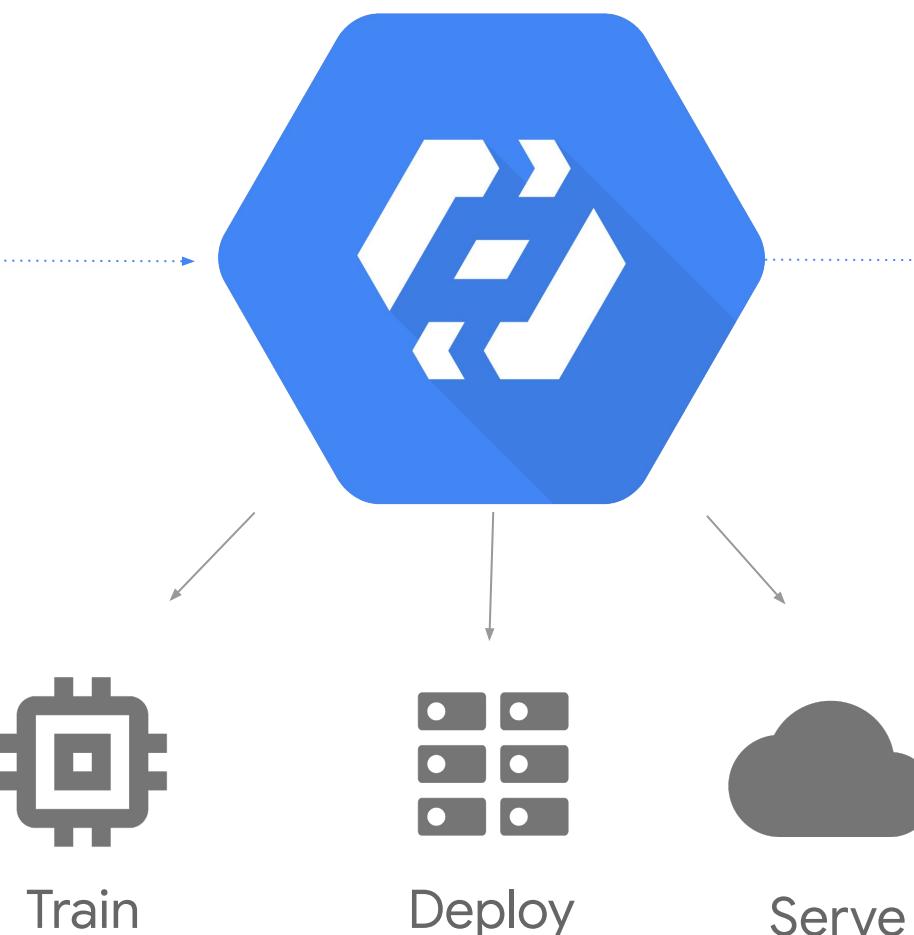


AutoML to the rescue

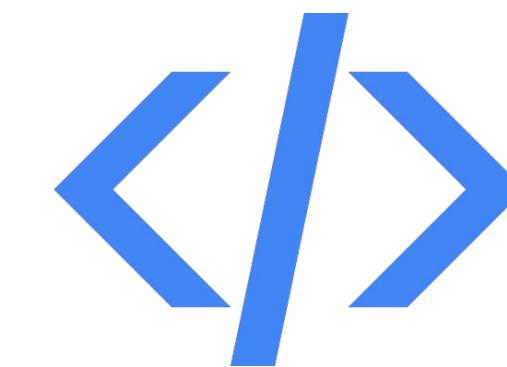
Photo dataset



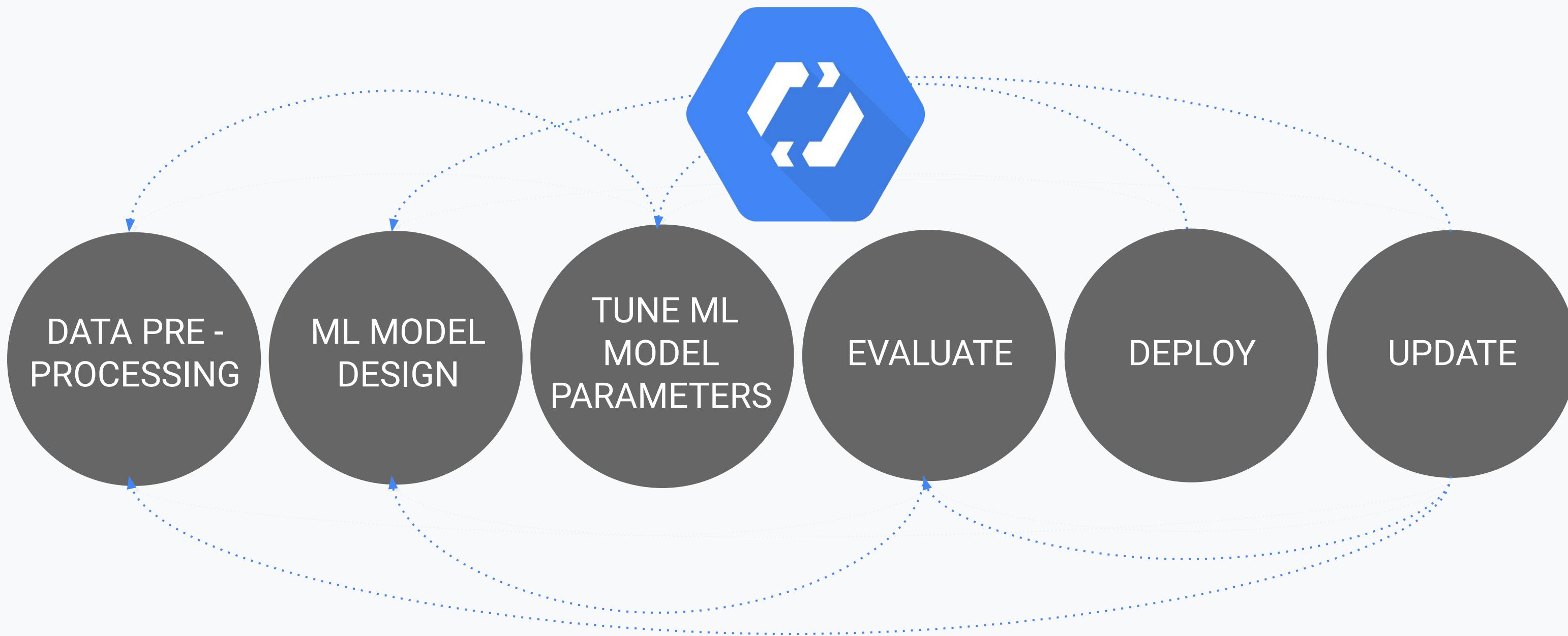
AutoML Vision



**Generate predictions
with a REST API**

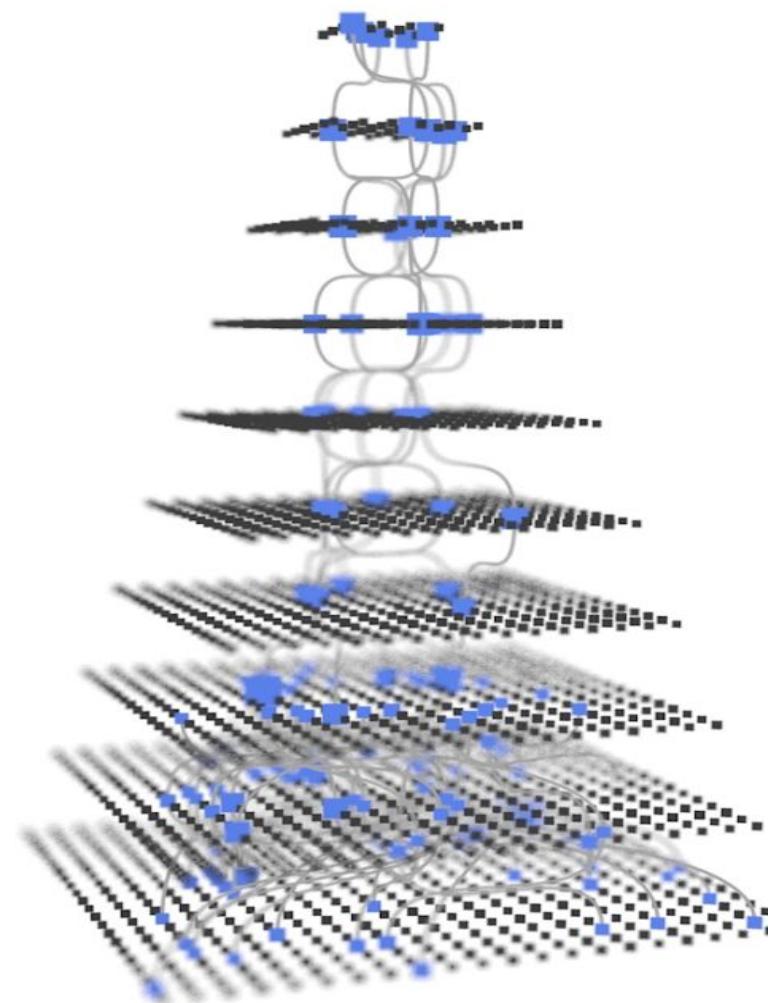


Codeless model building with Cloud AutoML



Cloud AutoML is built with Neural Architecture Search

Controller: proposes ML models



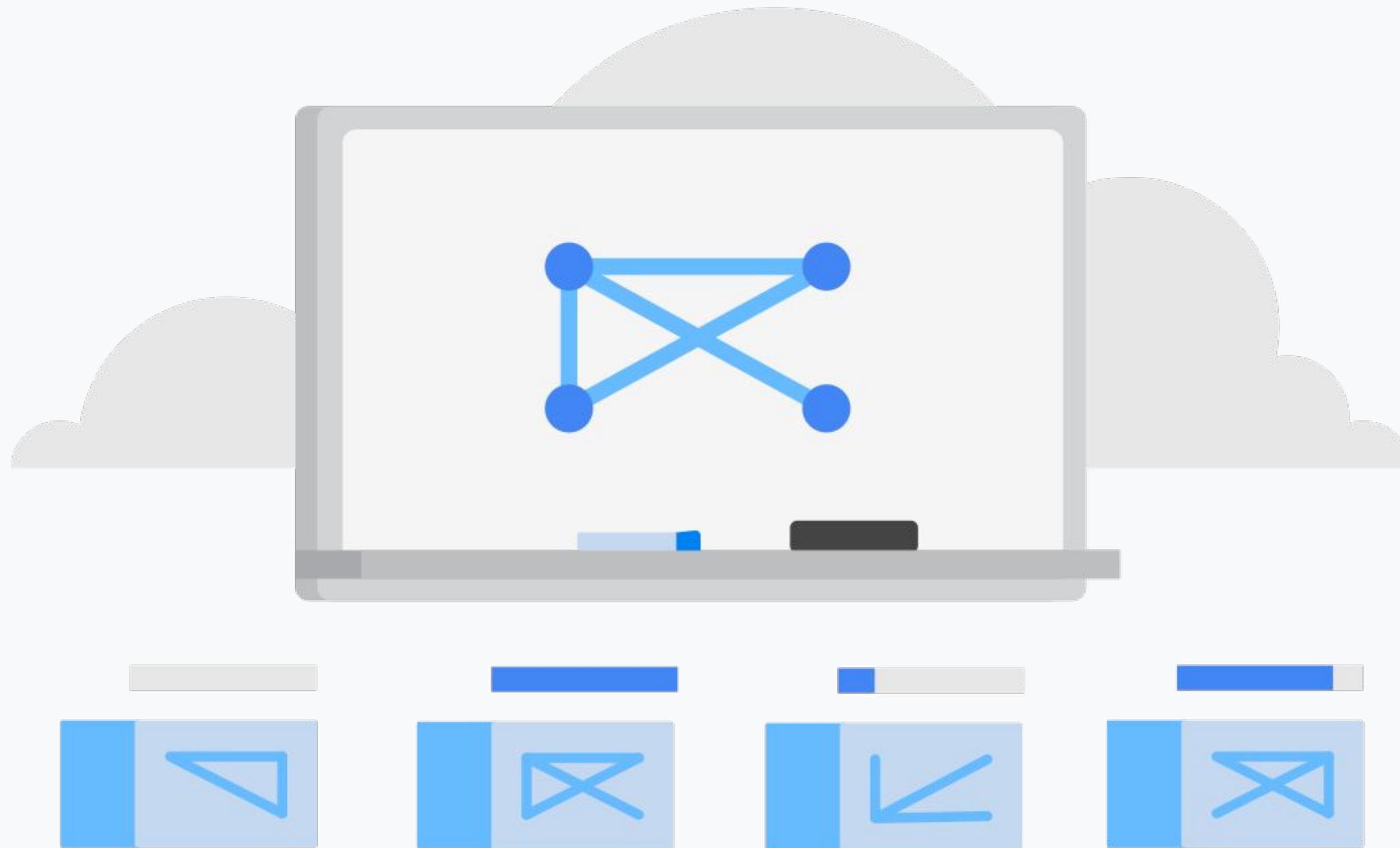
20K
times

Iterate to
find the
most
accurate
model

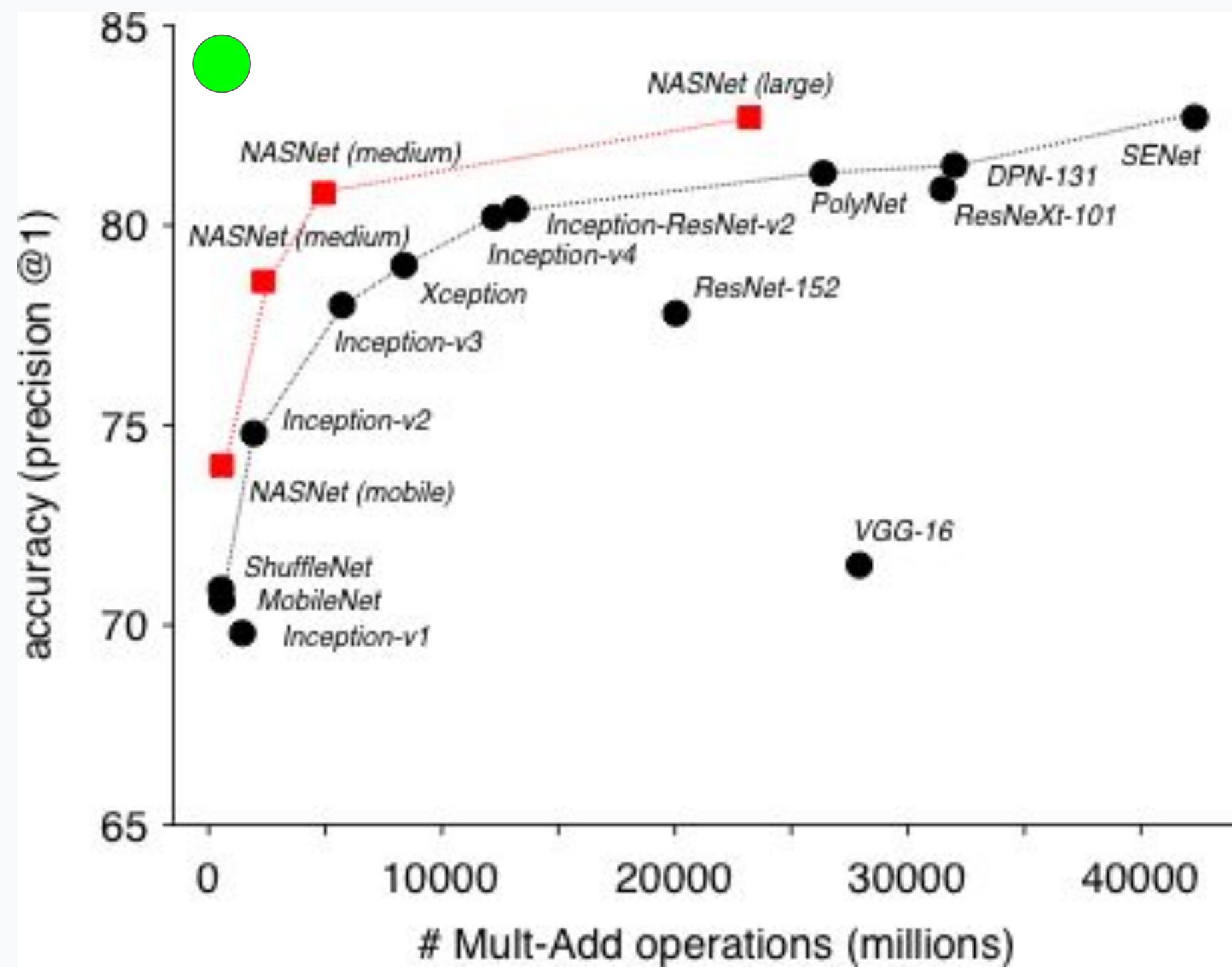
Train & evaluate models



ML models creating ML models



Inception network for image classification



AutoML Vision vs Vision API

Attribute	AutoML Vision	Vision API
Objective	Enabling developers with no ML expertise to build state of the art ML models for Images	Enabling ML practitioners to harness power of Google's ML for Images
Primary use case	Classification	Face detection, OCR, Object detection etc.
Data requirements	Images with labelled data	Just Images (may or may not required labelled data)
Output format	Labels with probability	As per the problem
Custom requirements	Can't be customized	Can be used for any custom made solutions
Efforts	Low for solution designing	High for end to end model development
Status	In public beta program	Publically available

Agenda

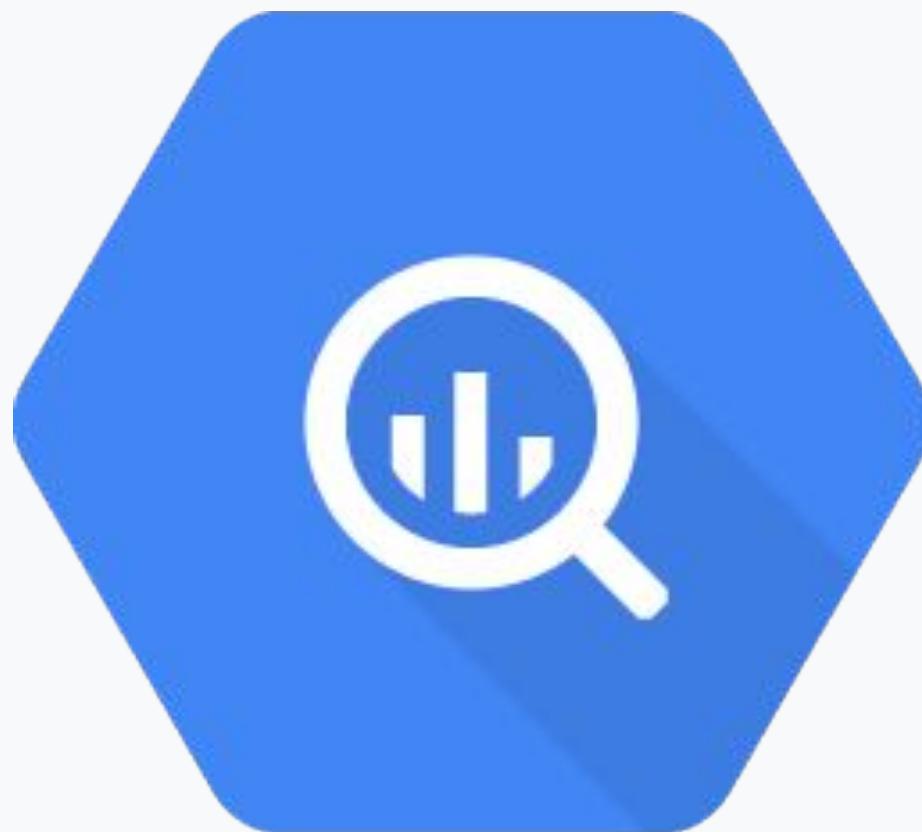
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Train and run custom ML in the familiar
BigQuery UI



BigQuery ML



Create custom ML models with TensorFlow



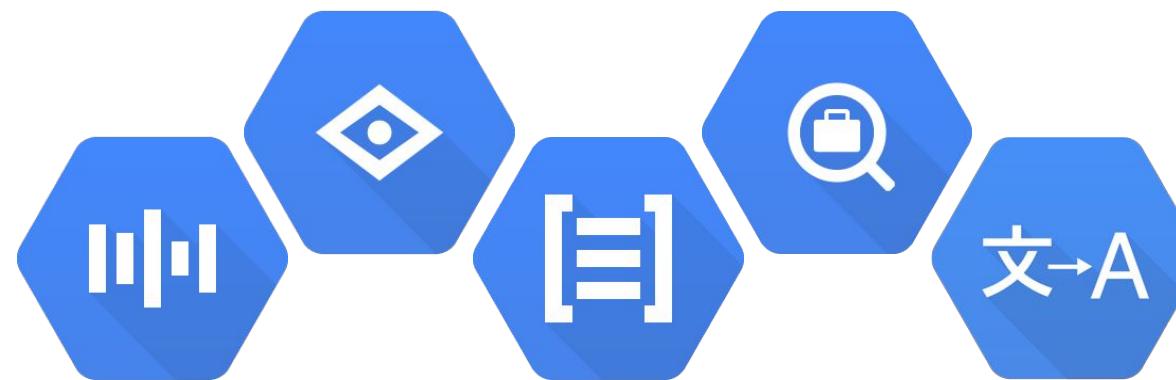
TensorFlow



Lab: Classify images with ML two-ways using pre-built models



How can I leverage pre-trained models for image classification? What about my own image datasets?



ML APIs



Cloud
AutoML

Lab

Classifying Unstructured Data with Pre-Built ML Models

- Cloud Vision API (no data required)
- AutoML (create your own custom model with no code)