

# Google Cloud

## Stepping Stone for AI and Machine Learning



Dr. Szabolcs Rozsnyai

Customer Engineer

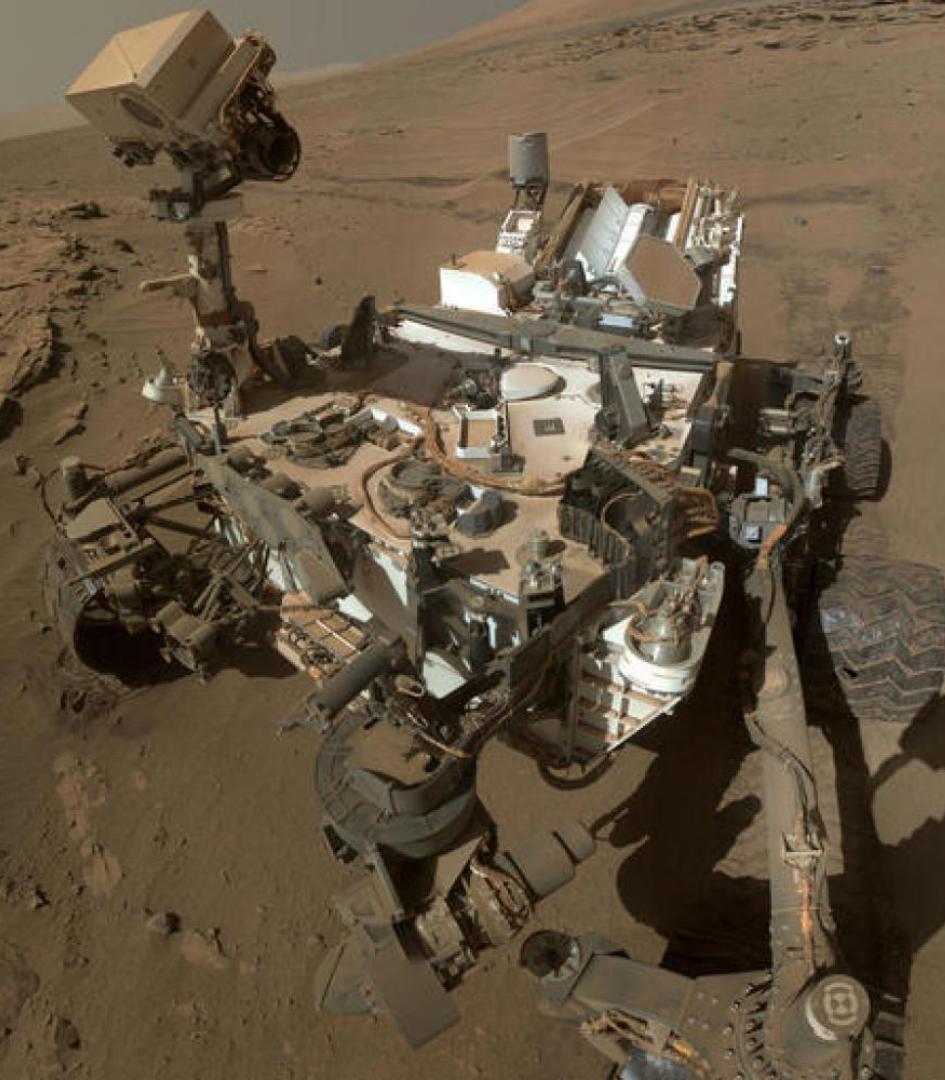
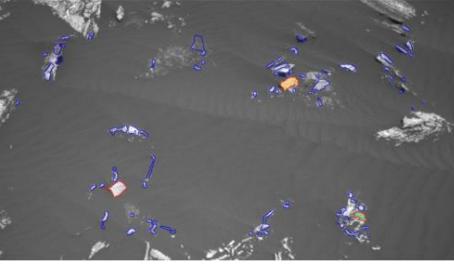
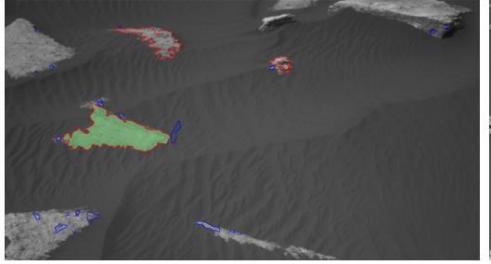
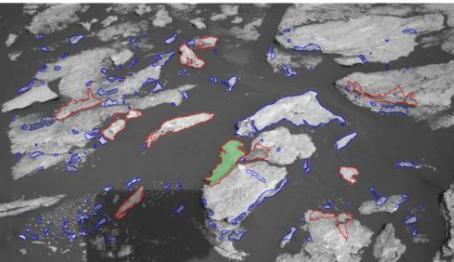
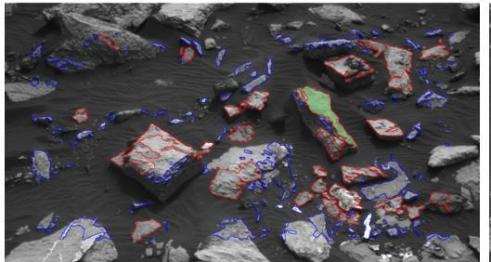
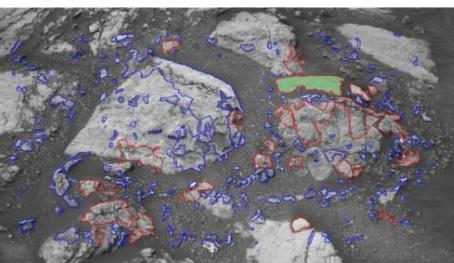
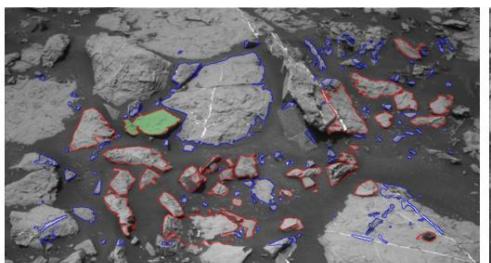
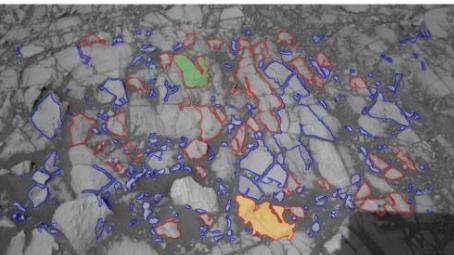
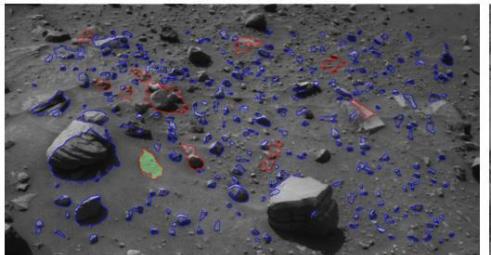
sroz@google.com

# A connected worker

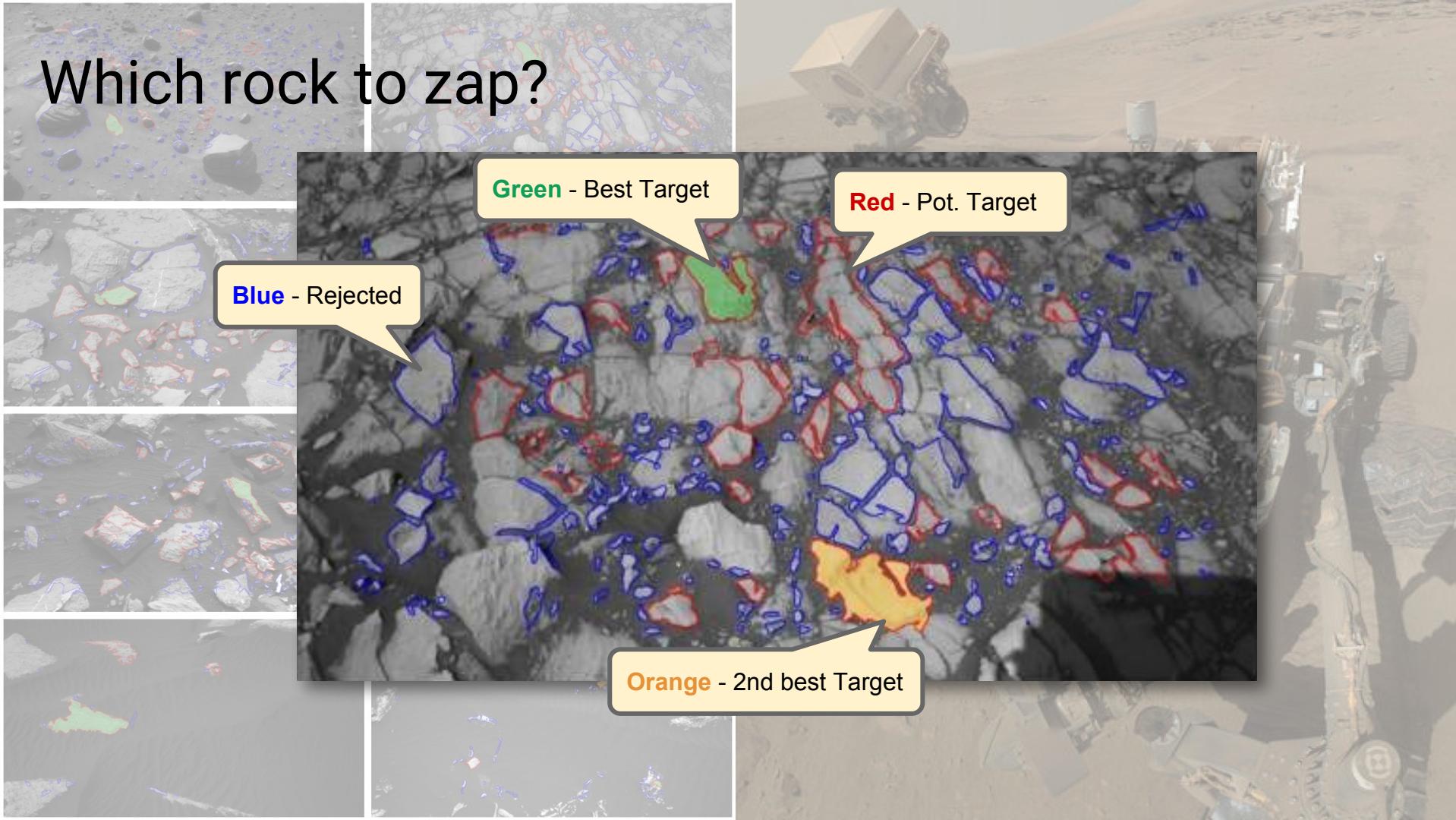
An **AI powered** connected and  
**very far away remote** worker

# Curiosity





# Which rock to zap?



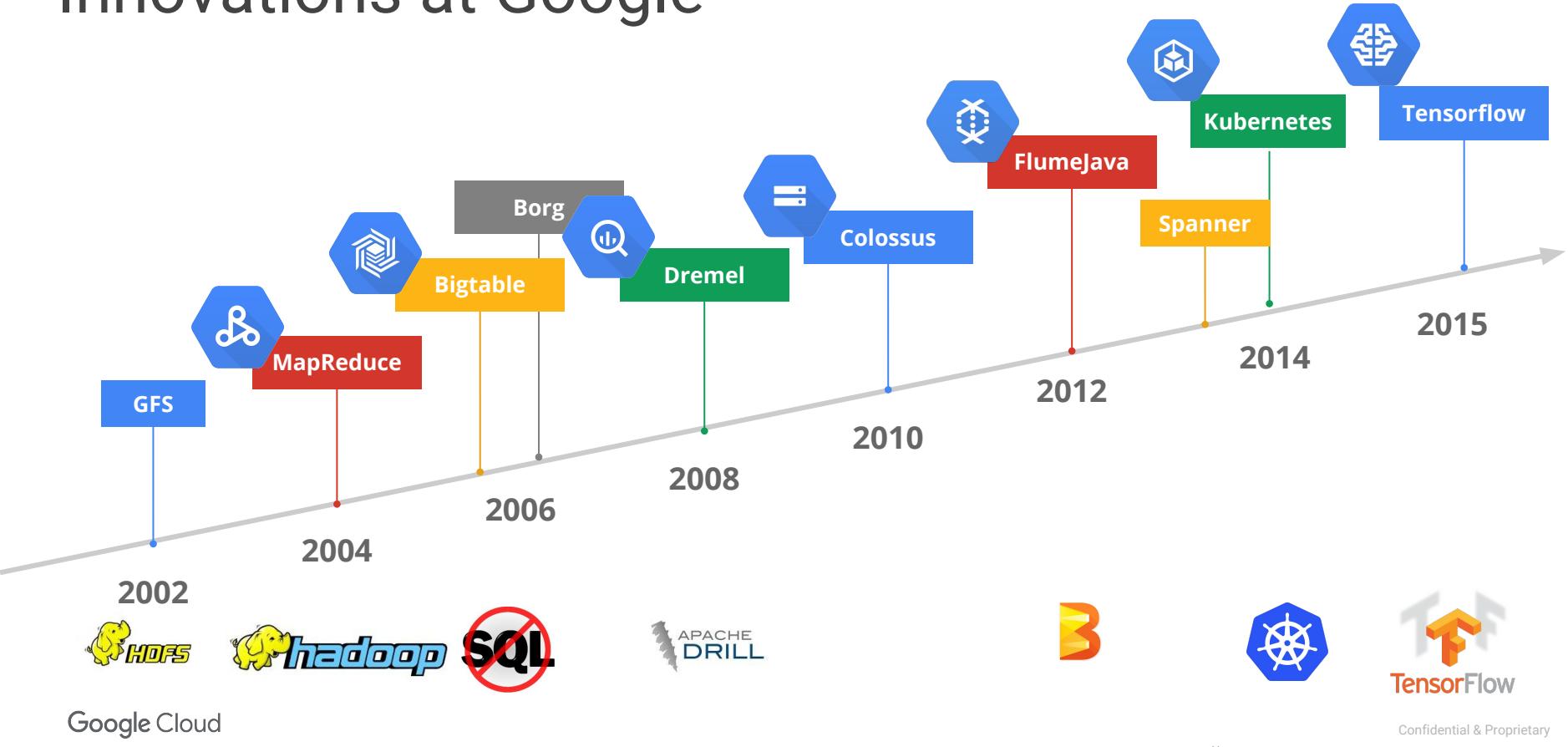
# Google's mission...

... to organize the **world's information** and  
make it **universally** accessible and **useful**

# Project Loon



# Innovations at Google

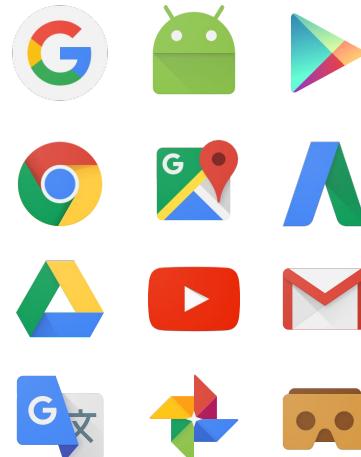
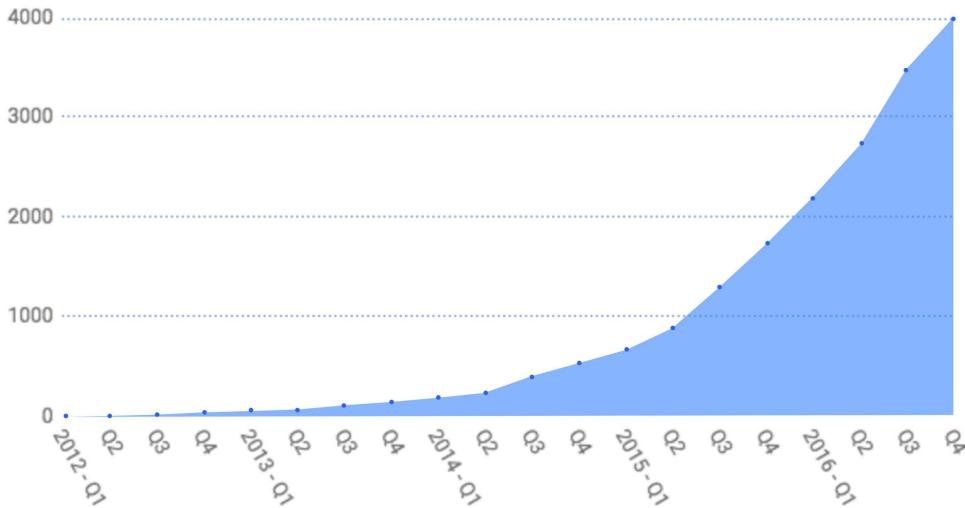


Google Cloud

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\*)

# Rapid accelerated infusion of ML at Google

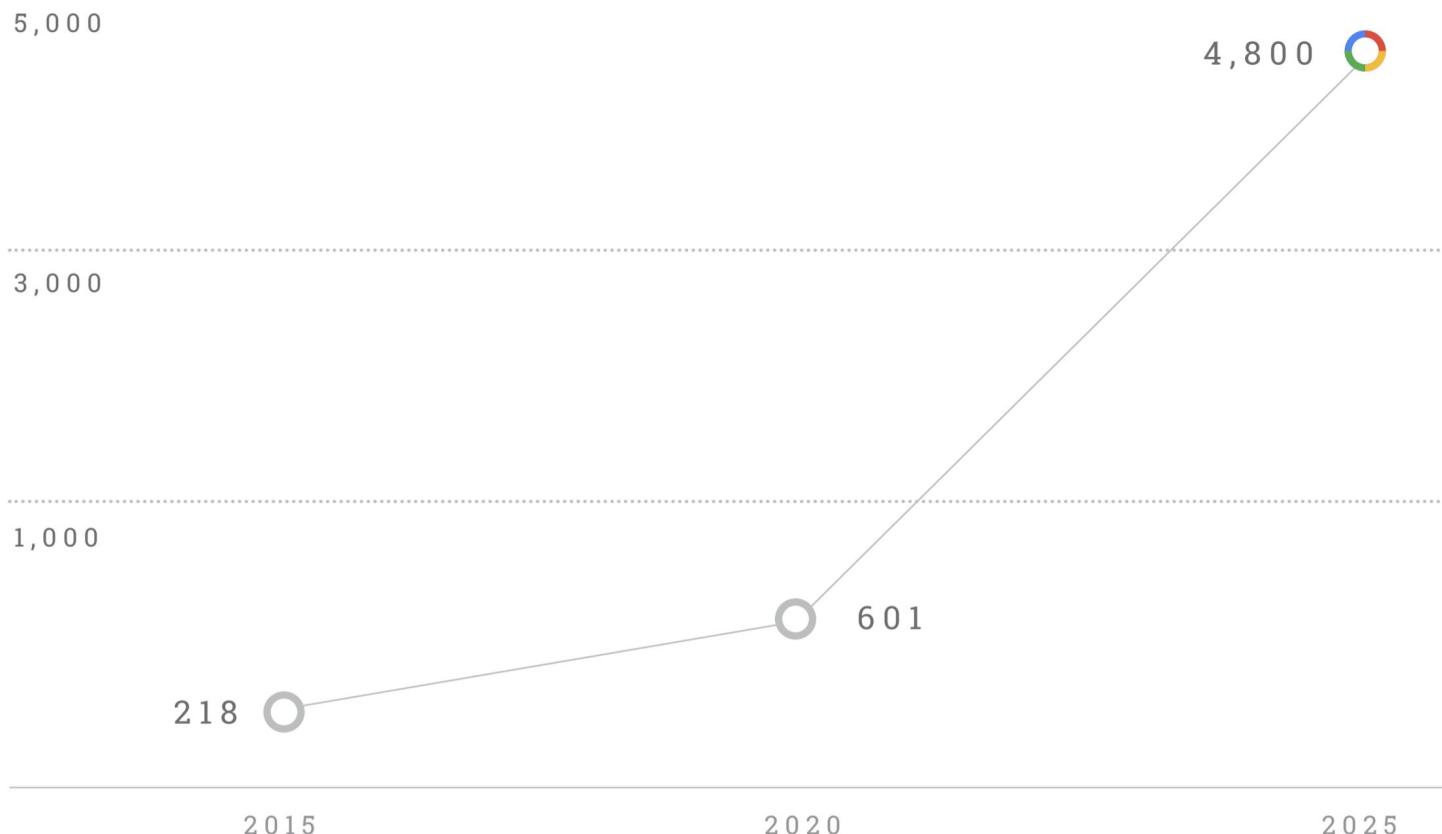


Used across products

Number of interactions/capita/day



## INTERACTIONS PER CONNECTED PERSON PER DAY



2015

2020

2025

confidential & Proprietary



## Artificial Intelligence

The science to make things smart

## Machine Learning

Building machines that can learn

## Neural Network

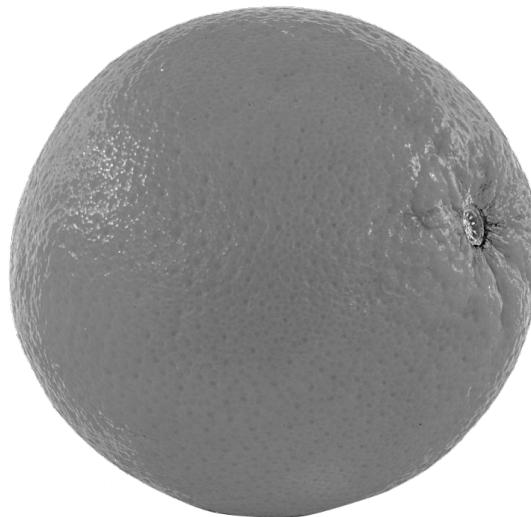
A type of algorithms in machine learning

# How do we do this without ML?



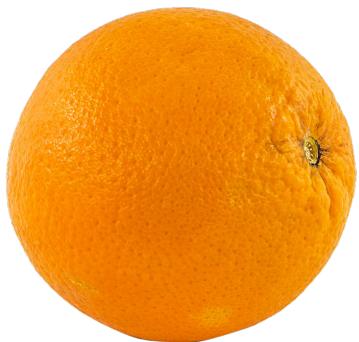
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# How do we do this without ML?



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# How do we do this without ML?



# Even Worse...



Sources: ComScore

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**Machine learning** is a field of computer science that  
gives computers the ability to learn  
without being explicitly programmed<sup>\*)</sup>

# Why so popular now?

1956



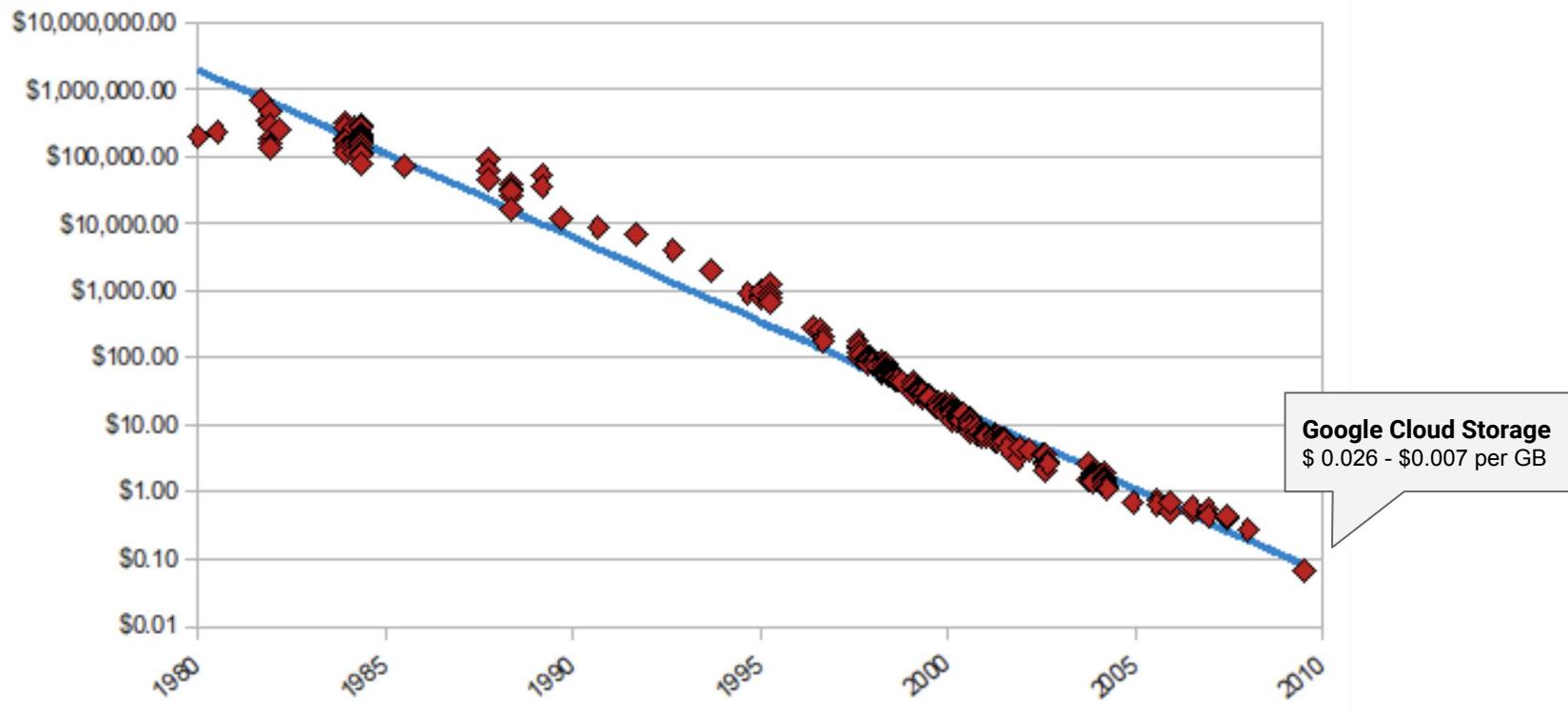
On February 24, 1956, Arthur Samuel's Checkers program, which was developed for play on the IBM 701, was demonstrated to the public on television

<http://www.andreykurenkov.com/writing/a-brief-history-of-game-ai/>

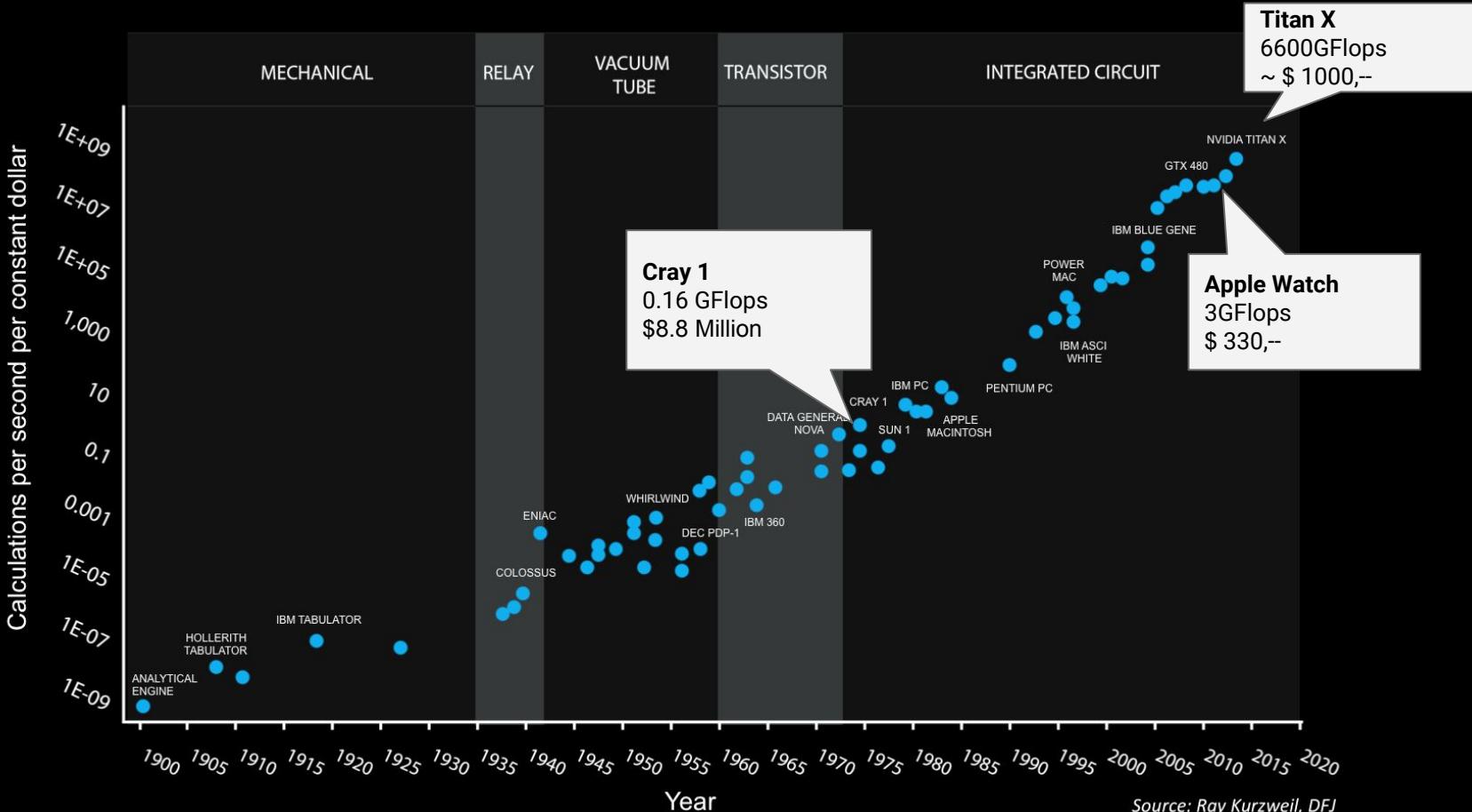
2017



## Hard Drive Cost per Gigabyte 1980 - 2009



# 120 Years of Moore's Law



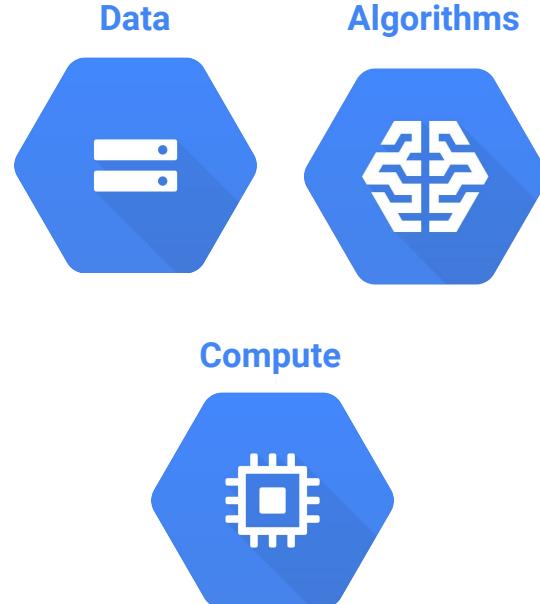
Source: Ray Kurzweil, DFI

# Why so popular now?



On February 24, 1956, Arthur Samuel's Checkers program, which was developed for play on the IBM 701, was demonstrated to the public on television

<http://www.andreykurenkov.com/writing/a-brief-history-of-game-ai/>



# Common believe...



Sharing our tools with  
people around the world

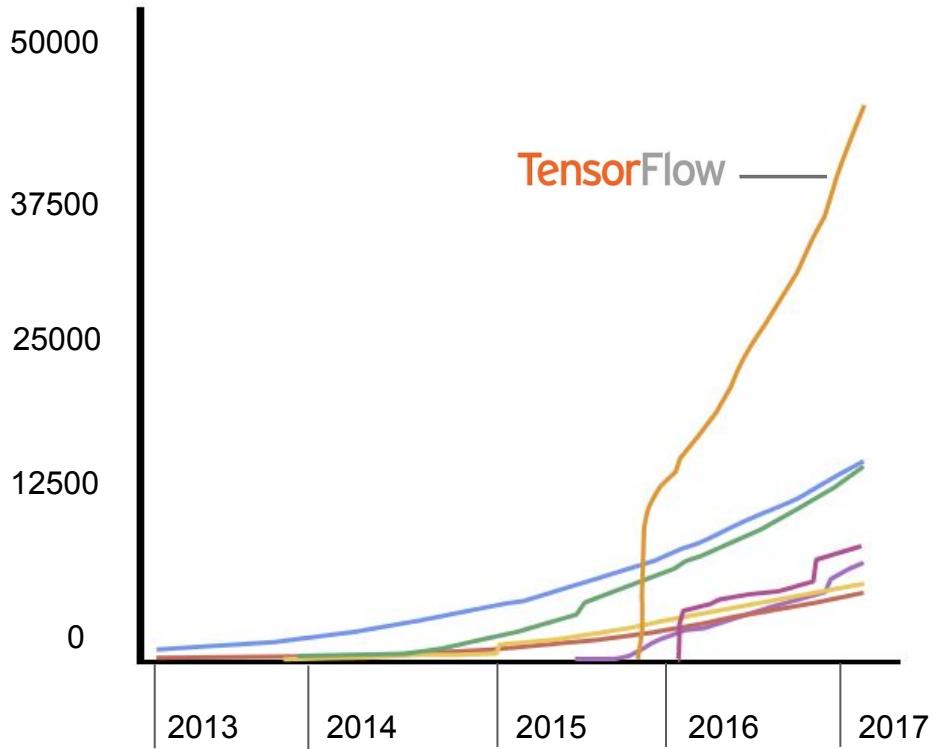
**TensorFlow**  
released in Nov. 2015  
**#1 Repository**  
for machine learning  
on GitHub



Google

Proprietary & Confidential

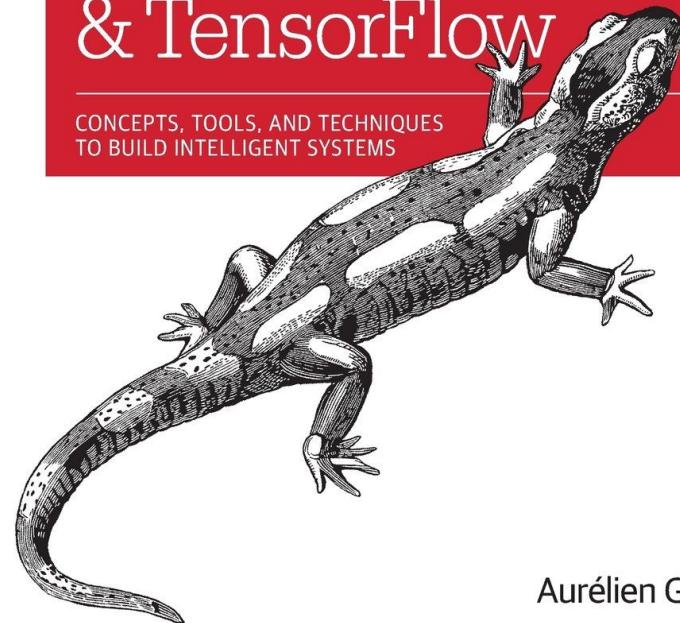
# TensorFlow



Google Cloud

## Hands-On Machine Learning with Scikit-Learn & TensorFlow

CONCEPTS, TOOLS, AND TECHNIQUES  
TO BUILD INTELLIGENT SYSTEMS



Aurélien Géron

# Two ways Google Cloud can help you Benefit from Machine Learning

Use your own data to train models



TensorFlow



Cloud Machine Learning Engine

Ready to use Machine Learning models



Cloud Vision API



Cloud Speech API



Cloud Jobs API



Cloud Translation API



Cloud Natural Language API



Cloud Video Intelligence

Use/extend OSS SDK

Build custom models

Use pre-built models



ML researcher

Data Scientist

App Developer

# Array of tools and solutions to enable ML

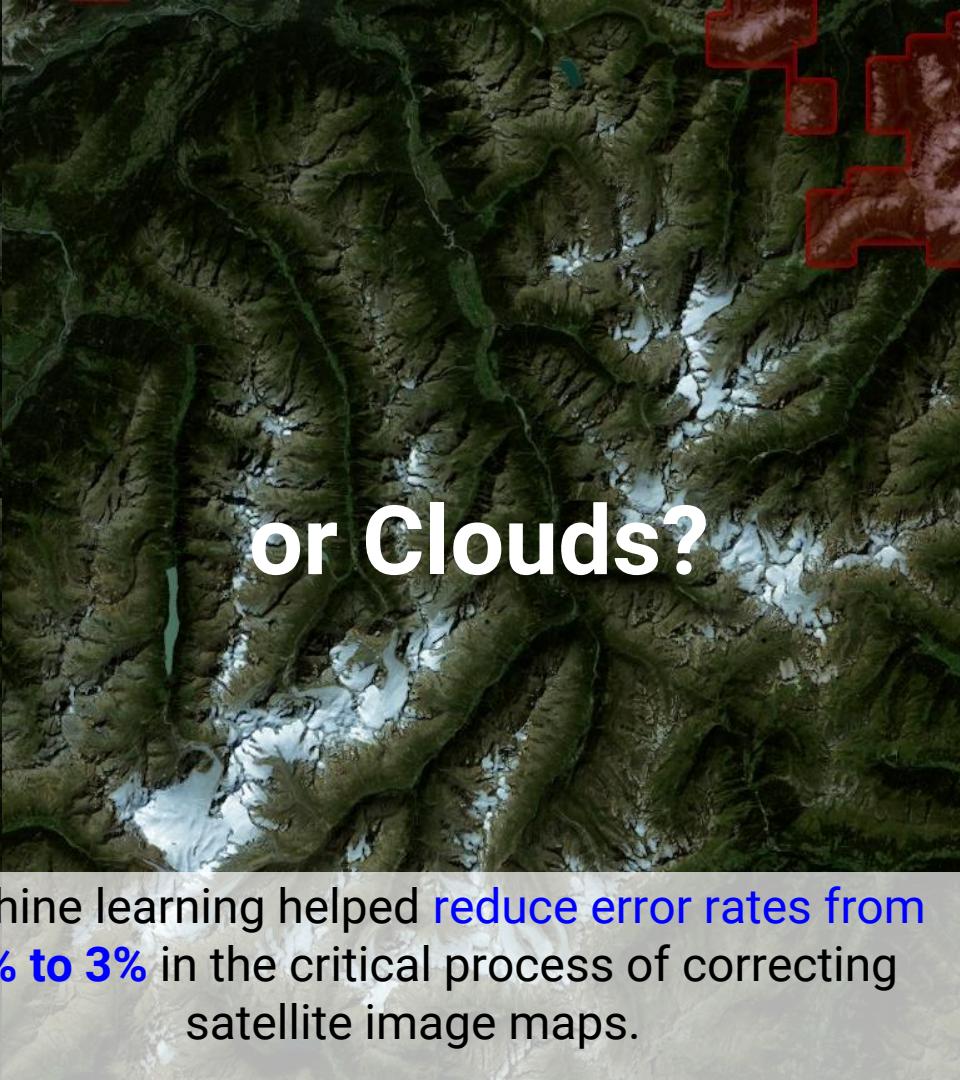
Transfer	Store	Process	Analyze	Visualize
 Pub/Sub  Transfer Service   On/Offline options  App Engine	 Cloud Storage (objects)  Cloud SQL (SQL)  BigQuery Storage (structured)  Cloud Bigtable (NoSQL HBase)  Cloud Datastore (NoSQL)	 Cloud Dataprep   Cloud Dataflow (stream and batch)	 BigQuery (SQL)   Cloud Machine Learning	 Cloud DataLab (iPython/Jupyter)   Data Studio 360



AIRBUS  
DEFENSE & SPACE



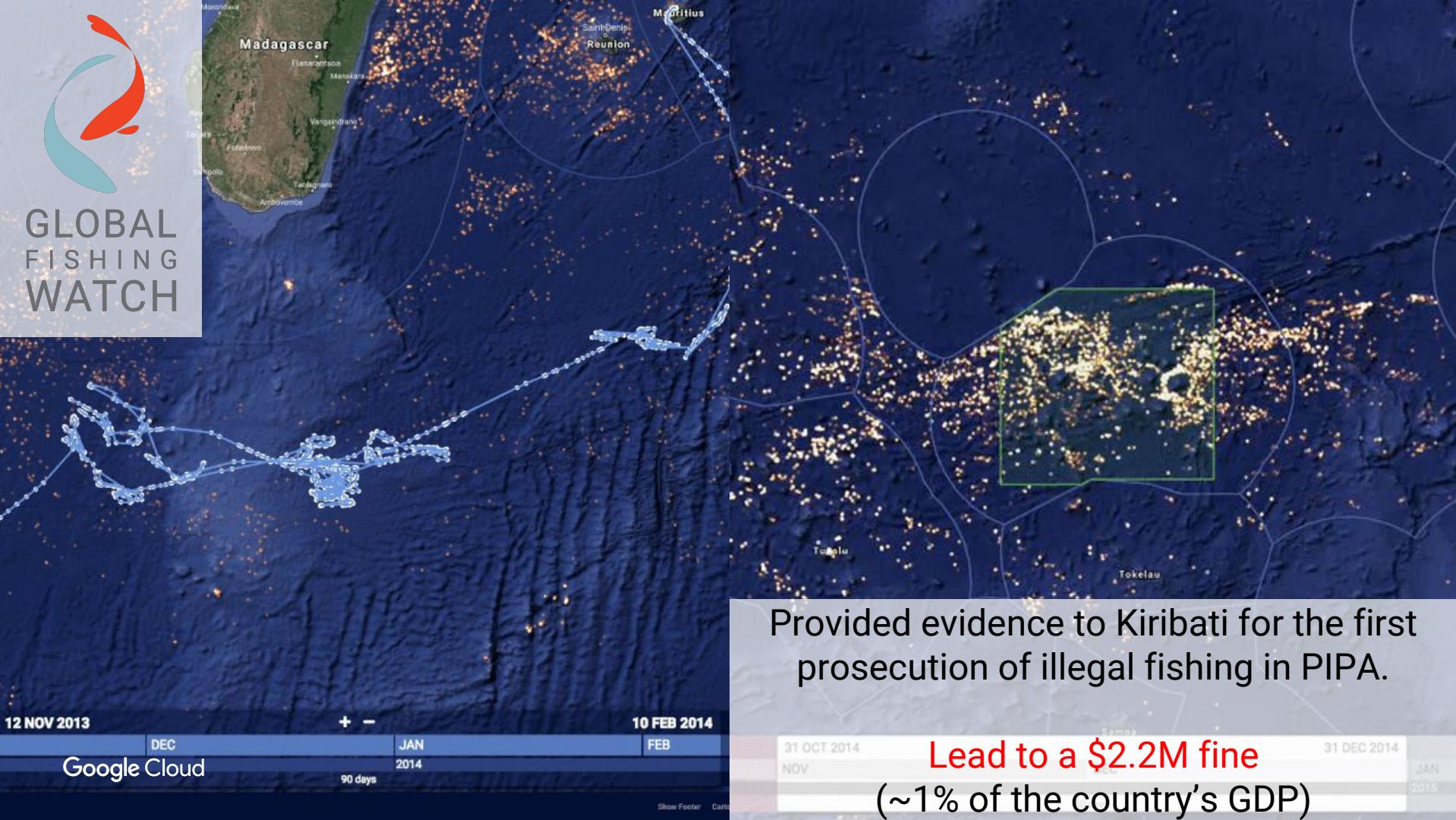
Snow?

This panel shows a satellite image of a mountainous terrain with several white, irregular patches of snow or ice. The surrounding land is a dark green color, likely representing vegetation or rocky ground.

or Clouds?

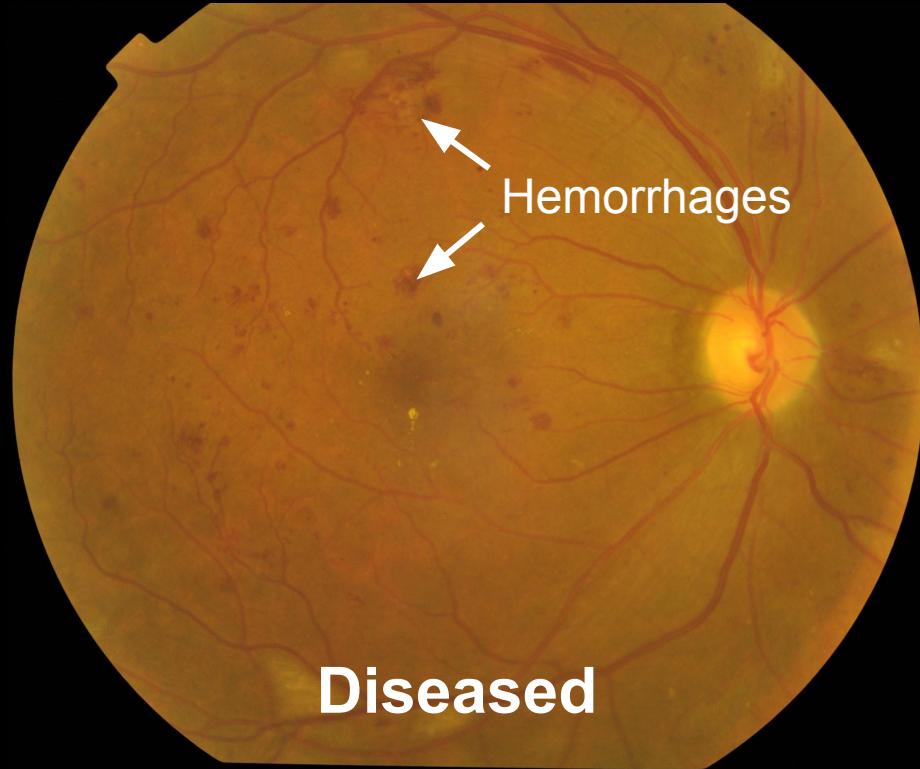
This panel shows the same mountainous terrain as the first, but with several red rectangular boxes overlaid on the image. These boxes are positioned around the white patches, likely indicating areas where machine learning has detected clouds or snow.

Machine learning helped **reduce error rates from 11% to 3%** in the critical process of correcting satellite image maps.

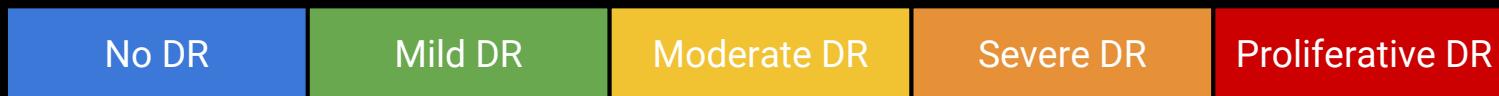




Healthy



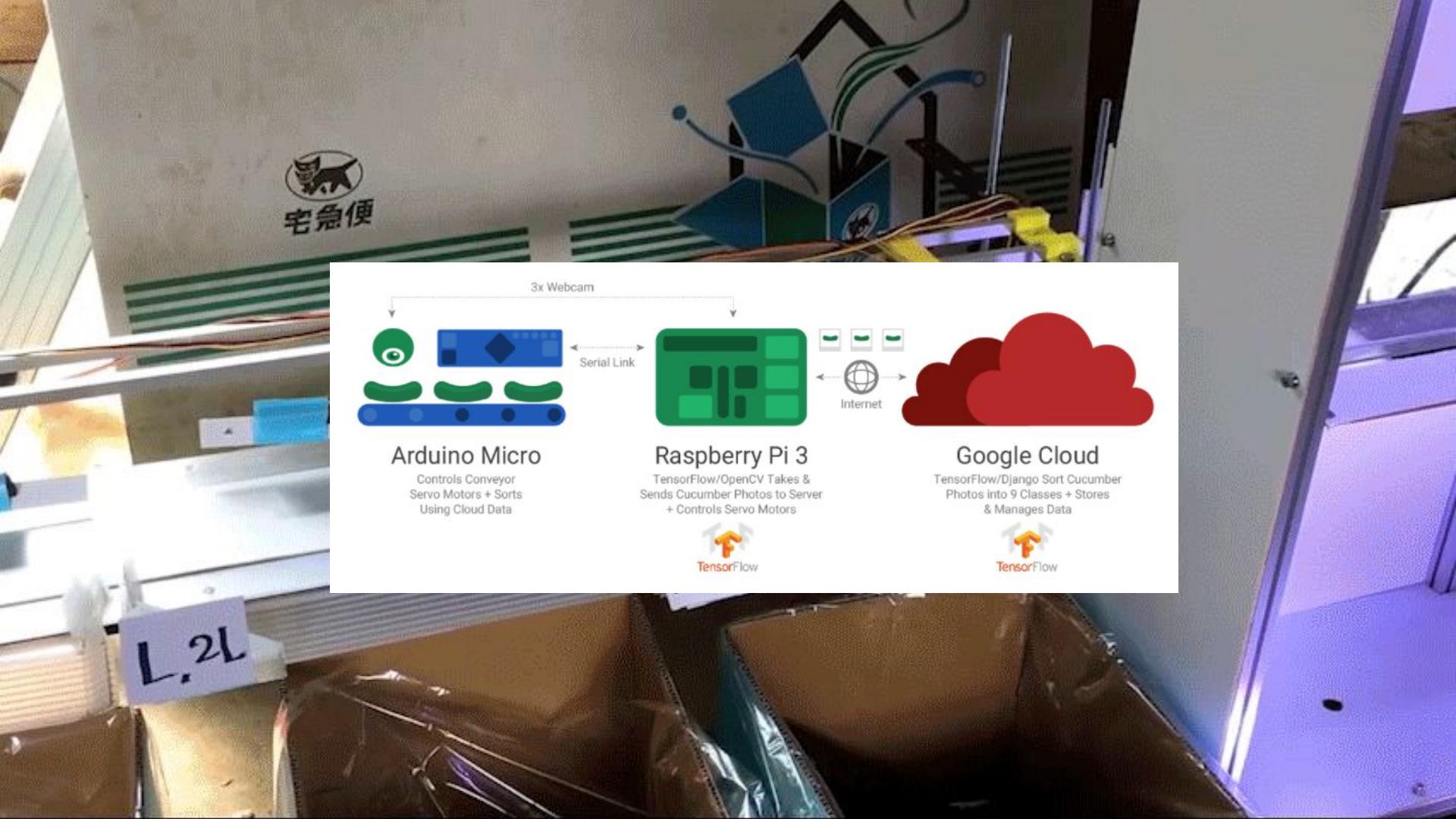
Diseased



Makomoto (Cucumber Farmer):

*"Farmers want to focus and spend their time on growing delicious vegetables."*

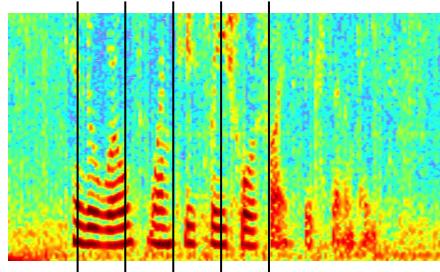




# Understanding Speech



Google Cloud



Powered by **deep learning neural networking** to power your applications.

old: PBMT

new: GNMT

A screenshot of the Google Translate mobile application. The top bar shows "Google Translate" with "Chinese" and "English" selected. Below, a Chinese sentence "请问，洗手间在哪里？" is translated to English as "Where is the restroom?". Another translation below shows "Excuse me, where is the toilet?". The interface includes a camera icon, microphone icon, and other UI elements.



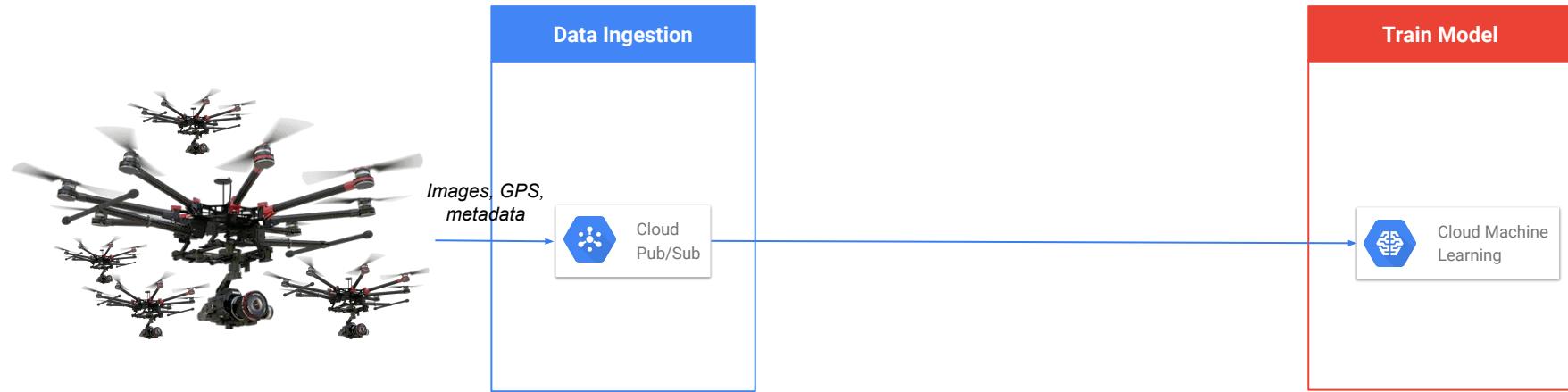
# From Data to Deployment



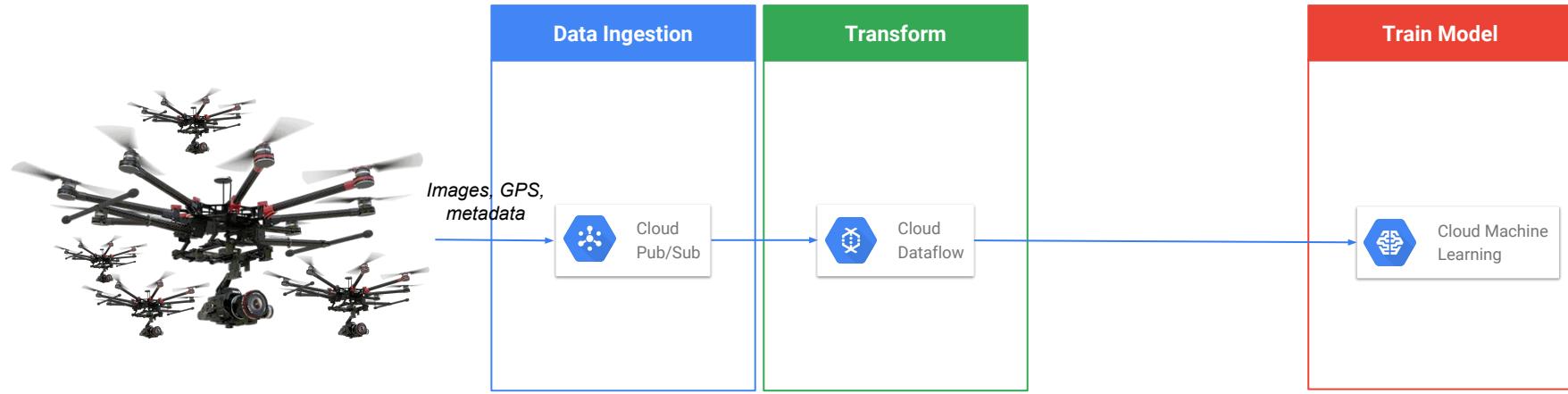
# Ingest data



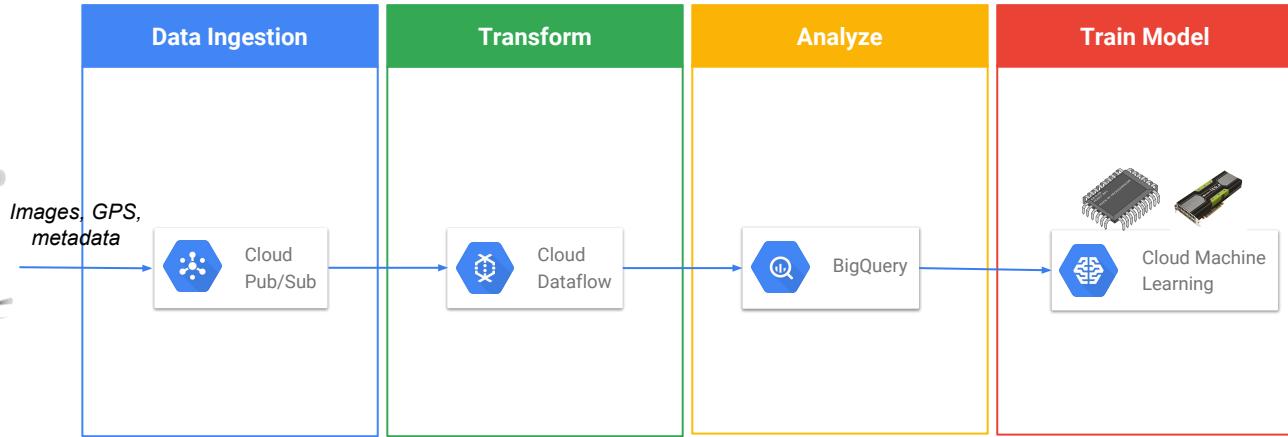
# Ingest data (serverless, at-scale)



# Transform data (stream or batch)



# Analyze Data (Petabyte)



# Tensor Processing Units

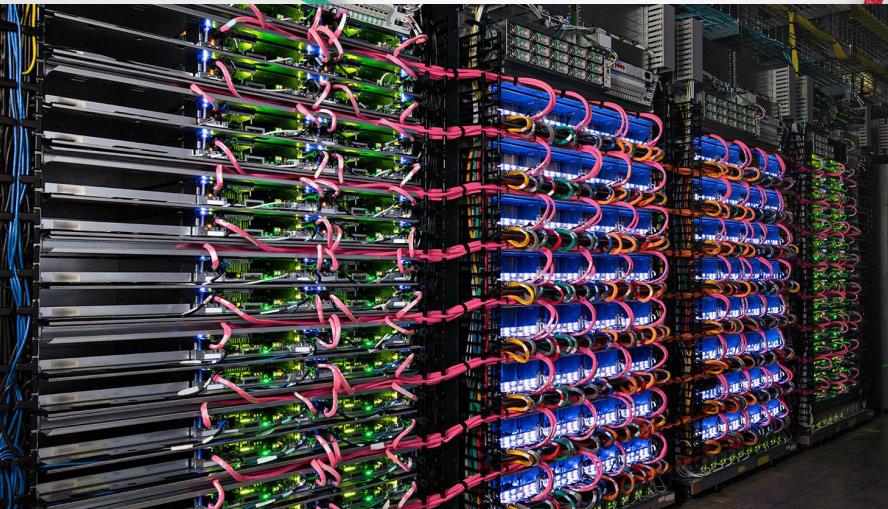
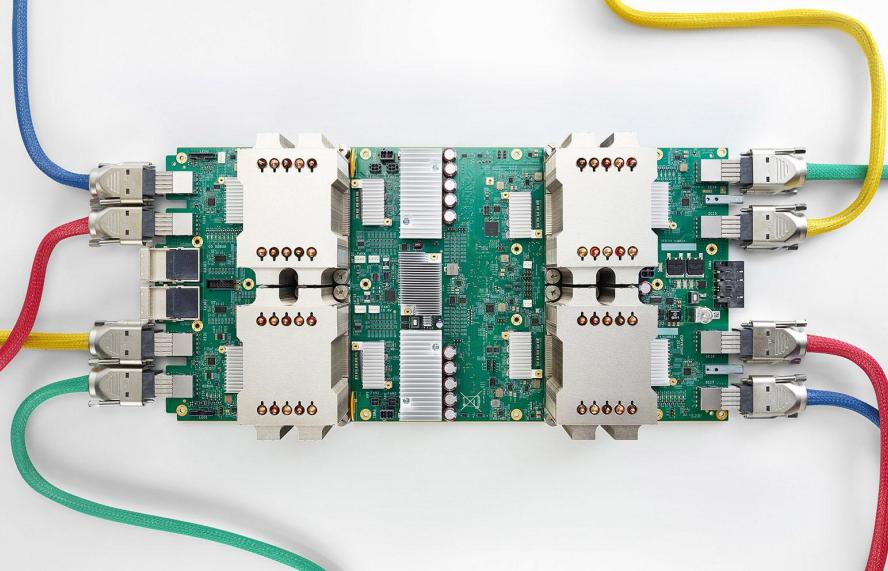
Google-designed custom ASIC  
built and optimized for  
TensorFlow

1st generation used in  
production for over 16 months

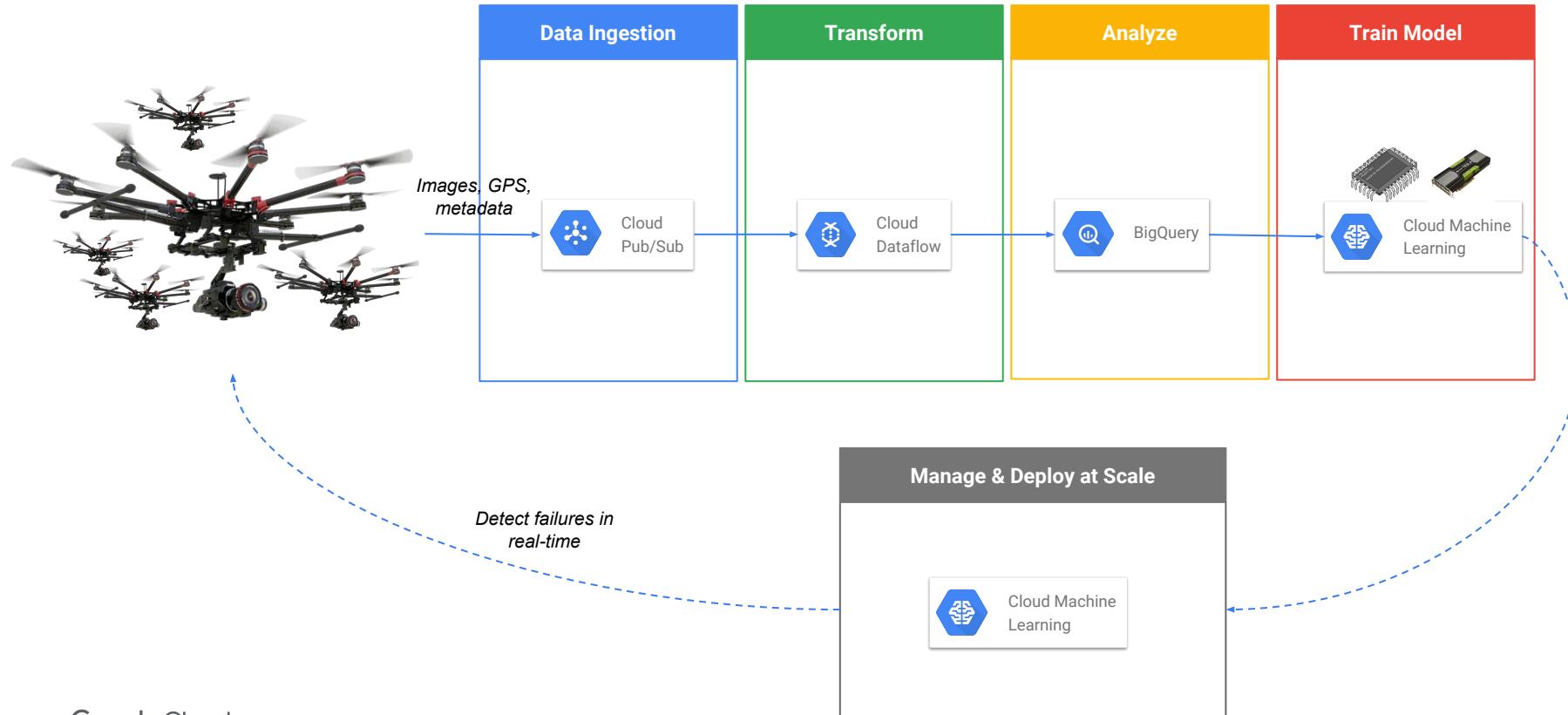
Now on 2nd generation—180  
Teraflops per TPU

**24 hours on 32 GPUs**

**6 hours on  $\frac{1}{8}$  of a TPU Pod**



# Deploy Model



# Build quickly ... but not use enough data

 **David**  
@david\_\_kha

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If there's ketchup, it's a hotdog  
@FunnyAsianDude #nohotdog  
#NotHotdogchallenge



Retweets Likes  
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8:34 AM - 18 May 2017

1 8 18

# Questions?



[sroz@google.com](mailto:sroz@google.com)