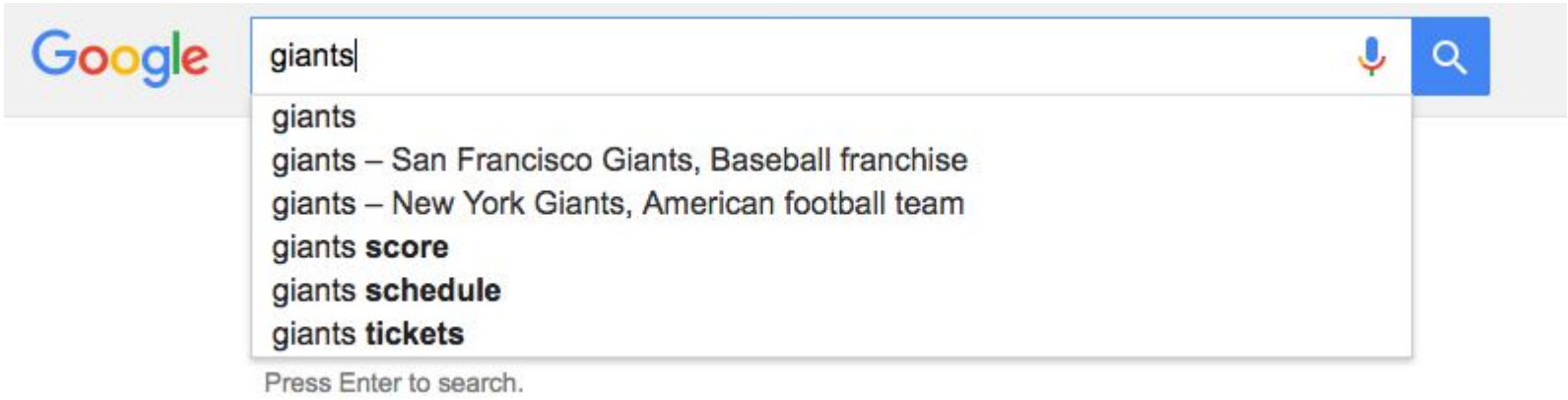
Google Cloud

Cloud Machine Learning: What's Next

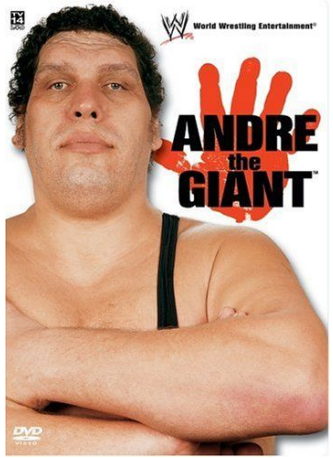
Justin Lawyer
Product lead, Machine Learning

Proprietary + Confidential

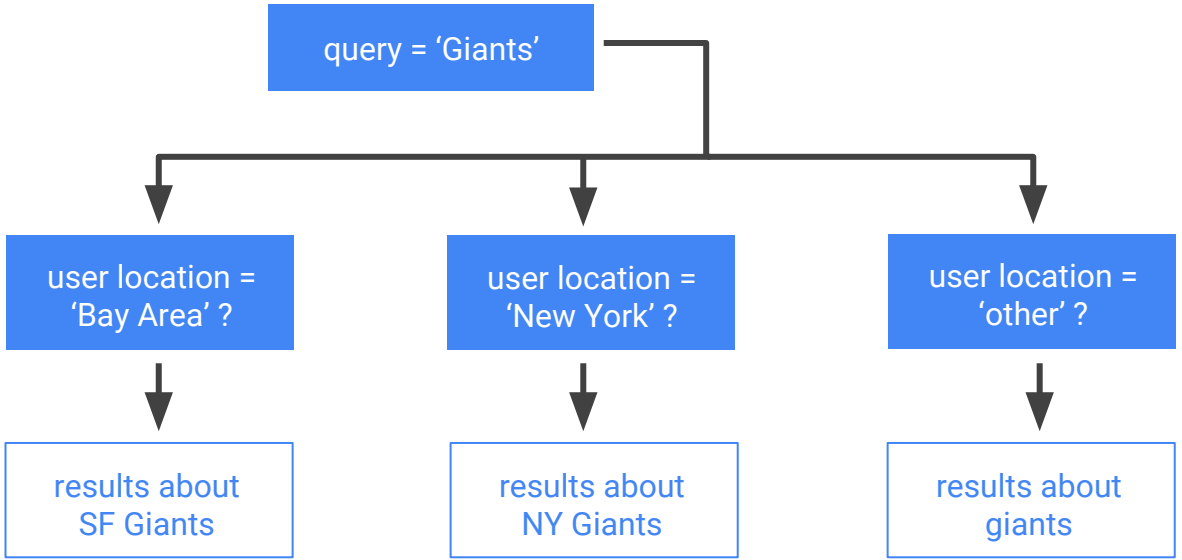


San Francisco

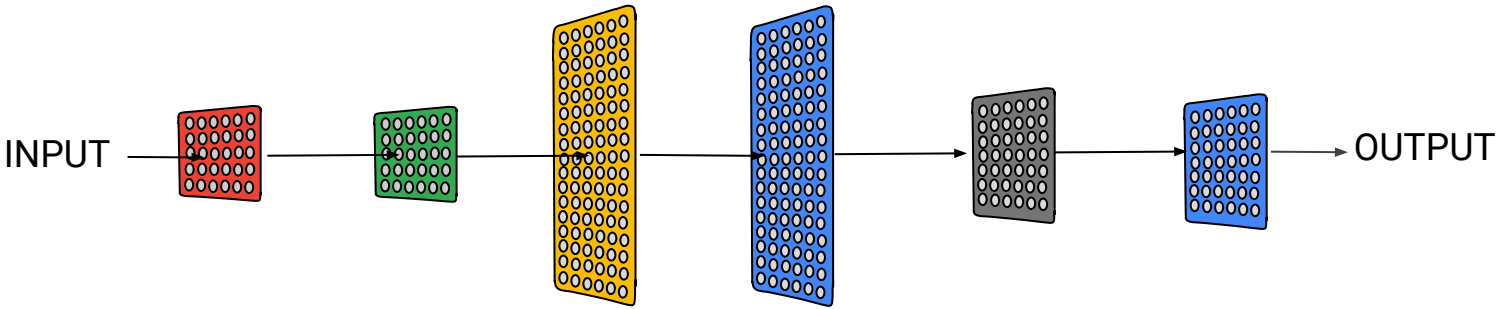
New York



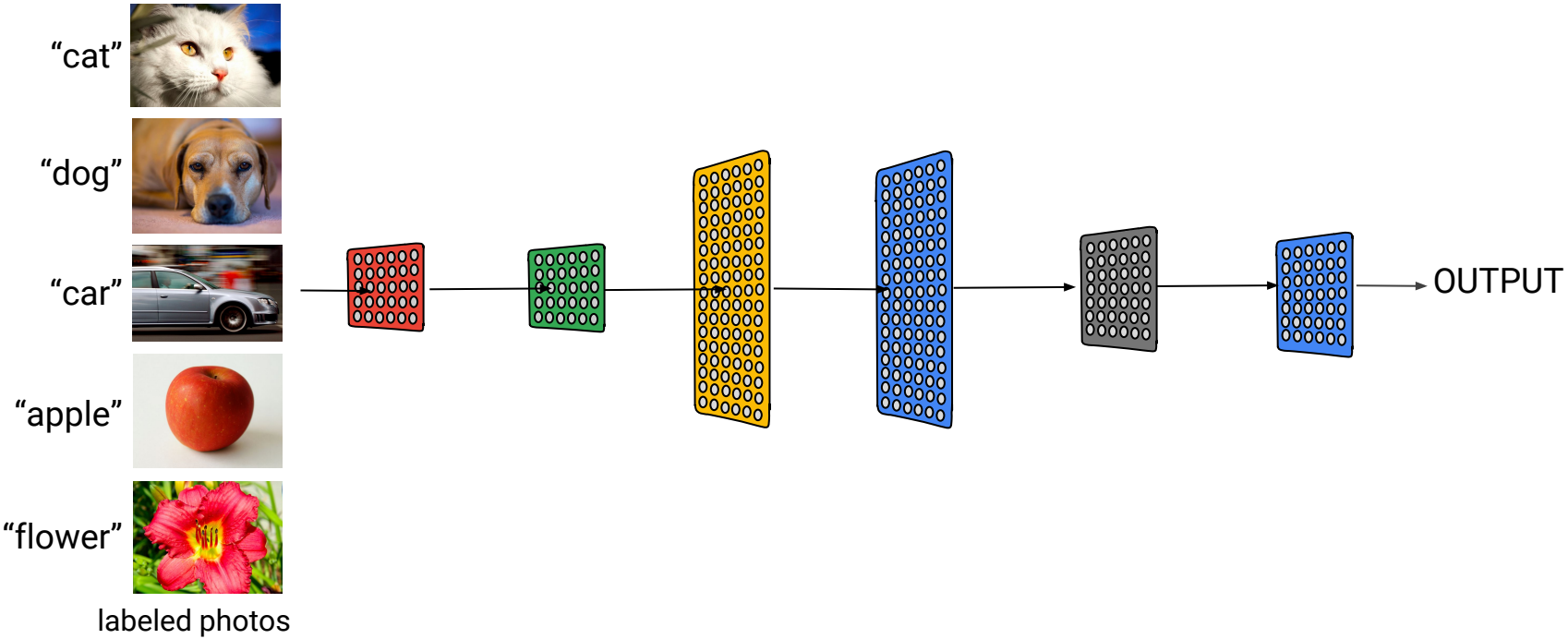
Machine learning scales better than hand-coded rules



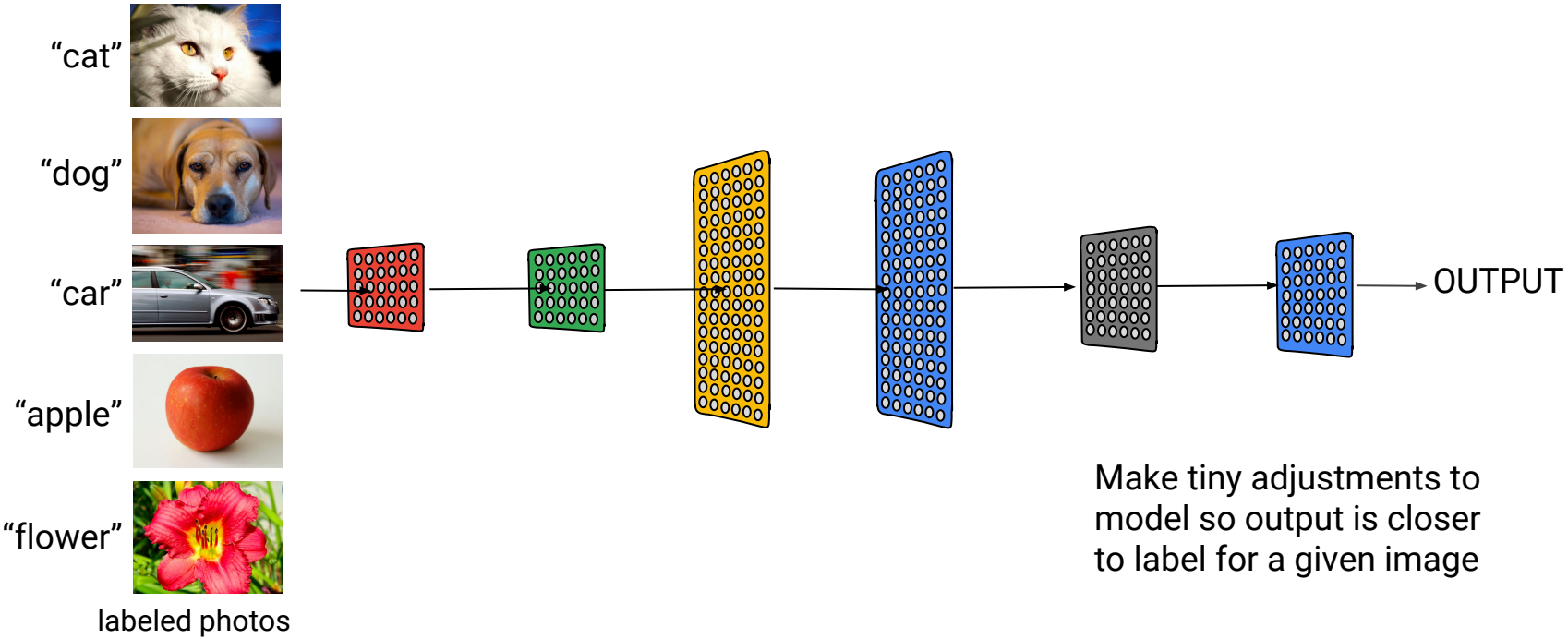
one important technology we use is neural networks



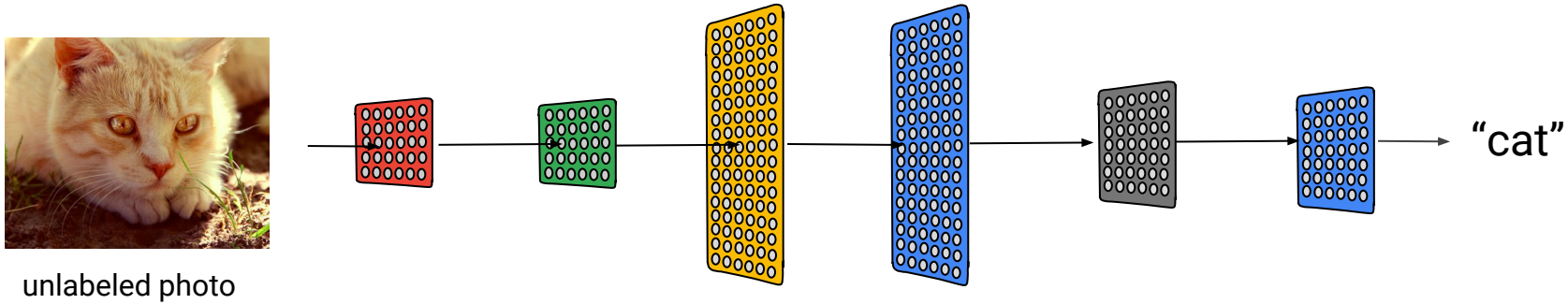
neural net models learn from examples



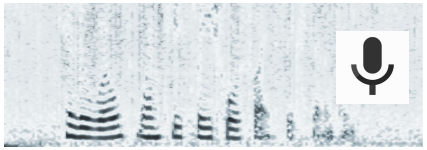
neural net models learn from examples



After a model is trained, you can test it



Powerful functions that neural nets can learn

Input	Output
	“rice”
	“restaurants in Seoul”
안녕하세요	“hello!”
	“A close up of a small child holding a stuffed animal.”

Search

machine learning for search engines

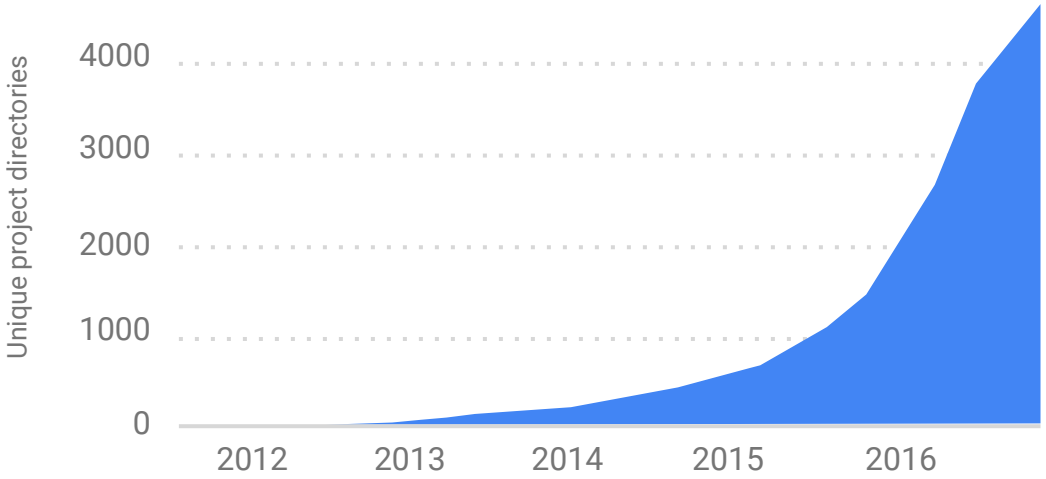
RankBrain: a deep neural network for search ranking

#3
signal
for search ranking,
out of hundreds

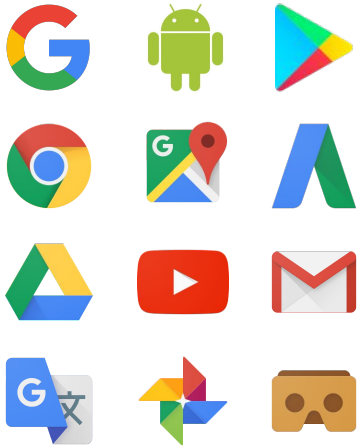
#1
improvement
to ranking quality
in 2+ years

Rapidly accelerating use of deep learning at Google

Google3 directories containing **Brain Models**



Used across products:



DeepMind

Training a machine to play 100+ Atari games

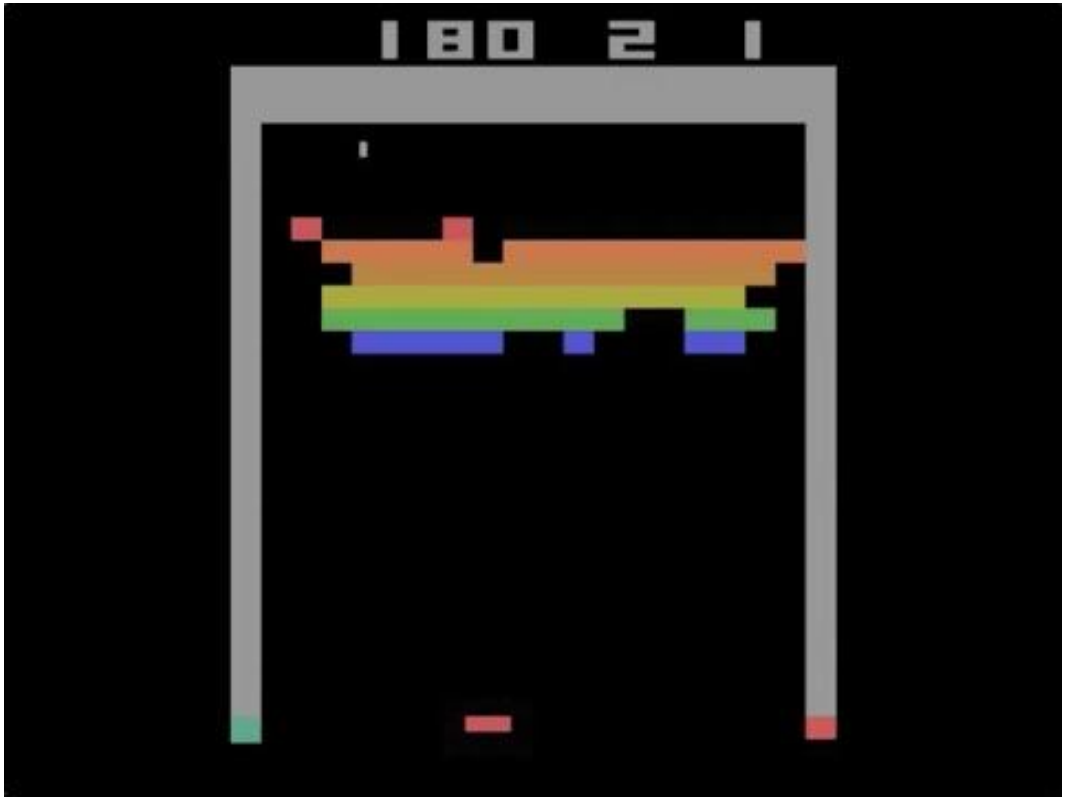
The environment:

- **Atari 2600 testbed:** 100+ Atari games from the 70/80s
- **Inputs:** Raw pixels (~30K)
- **Controls:** Action buttons but no meaning
- **Goal:** maximize score

The methodology:

- **Technique:** Reinforcement learning
- **No cheating:** Everything learnt from scratch, ZERO pre-programmed knowledge
- **One agent:** ONE set of parameters to play ALL the different games

General Atari player

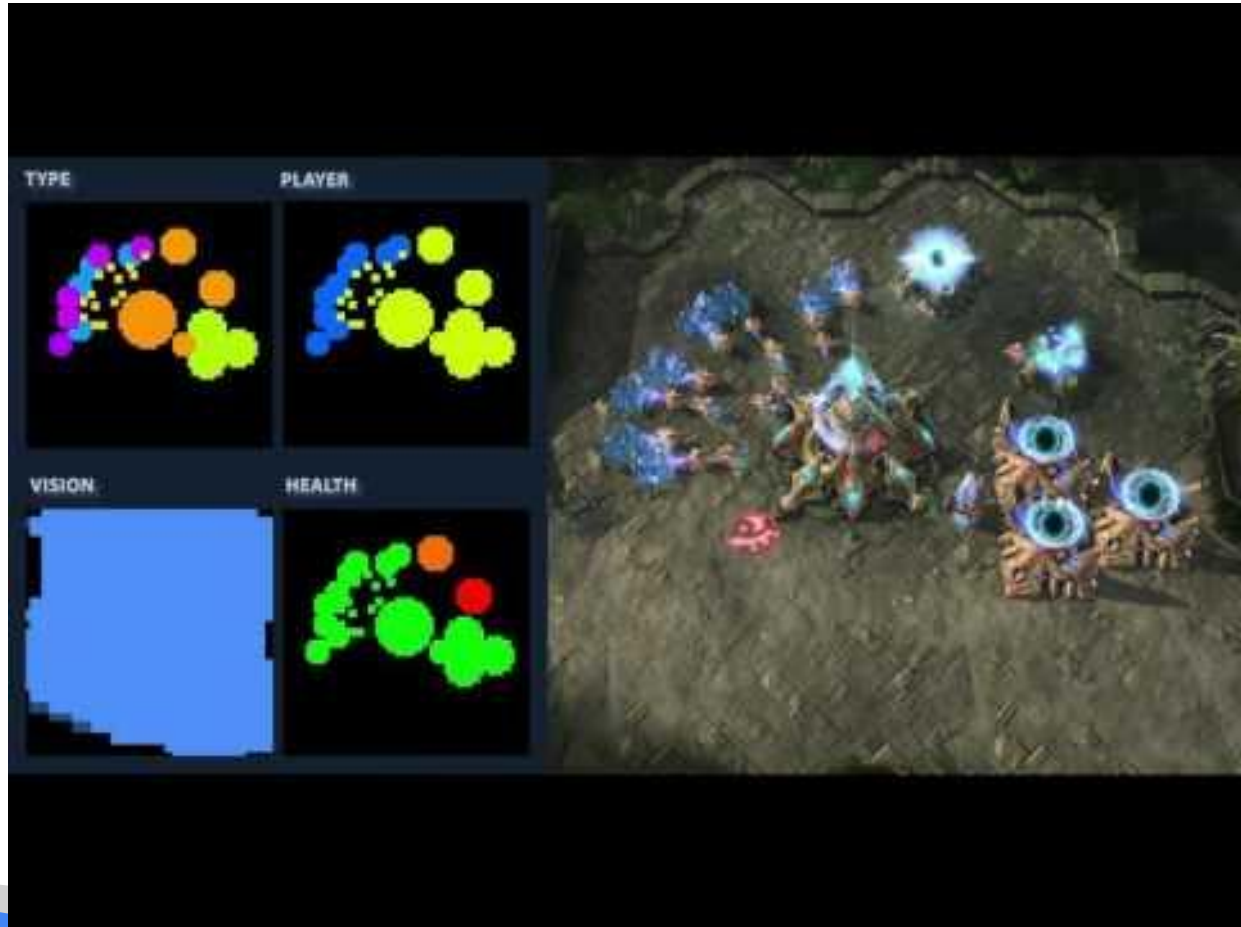


sites.google.com/a/deepmind.com/dqn
deepmind.com/blog/deep-reinforcement-learning
github.com/kuz/DeepMind-Atari-Deep-Q-Learner

Starcraft II API

AI research environment
Announced BlizzCon, Nov 2016

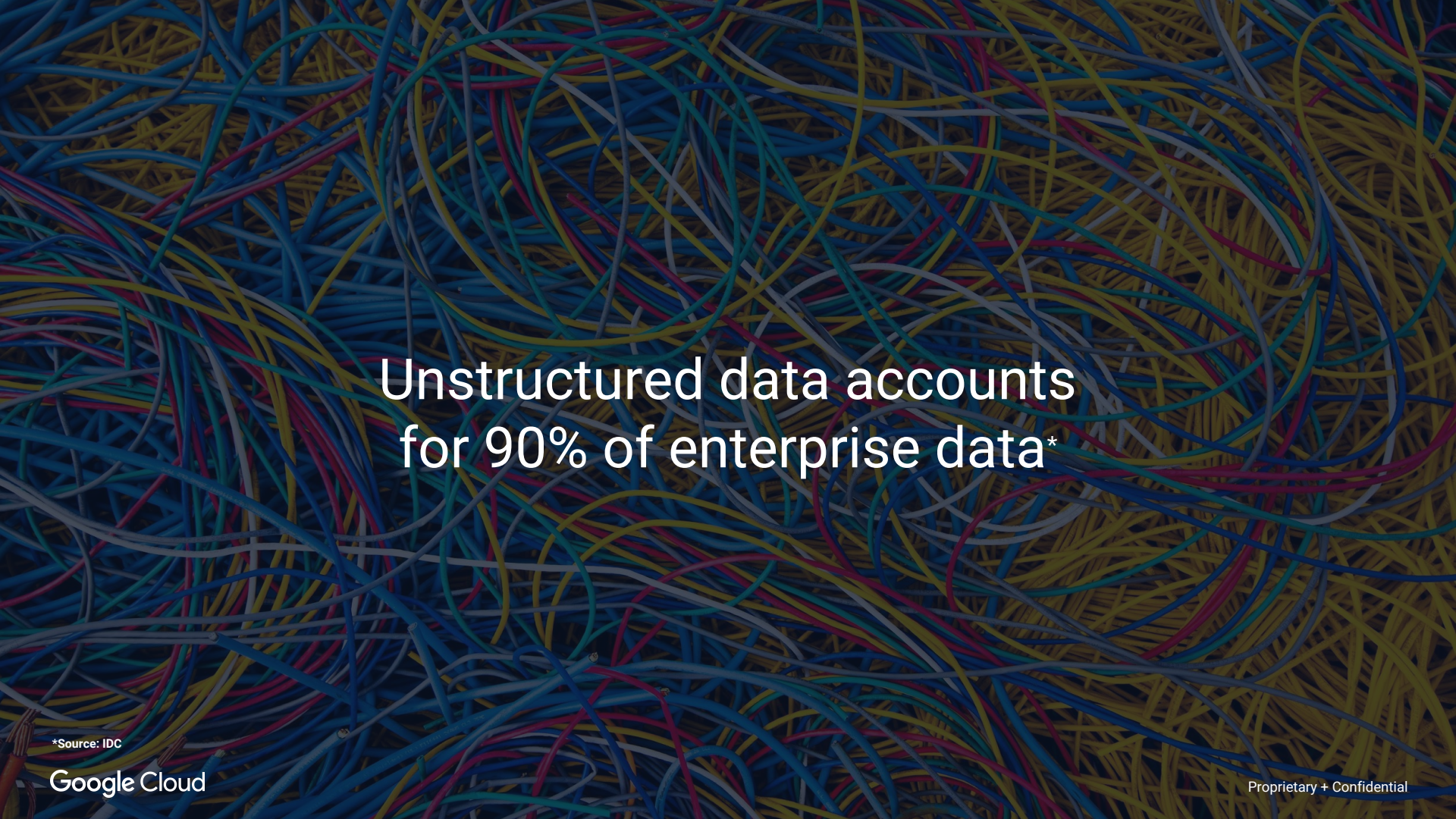
DeepMind



“a useful bridge to the messiness of the real-world.”

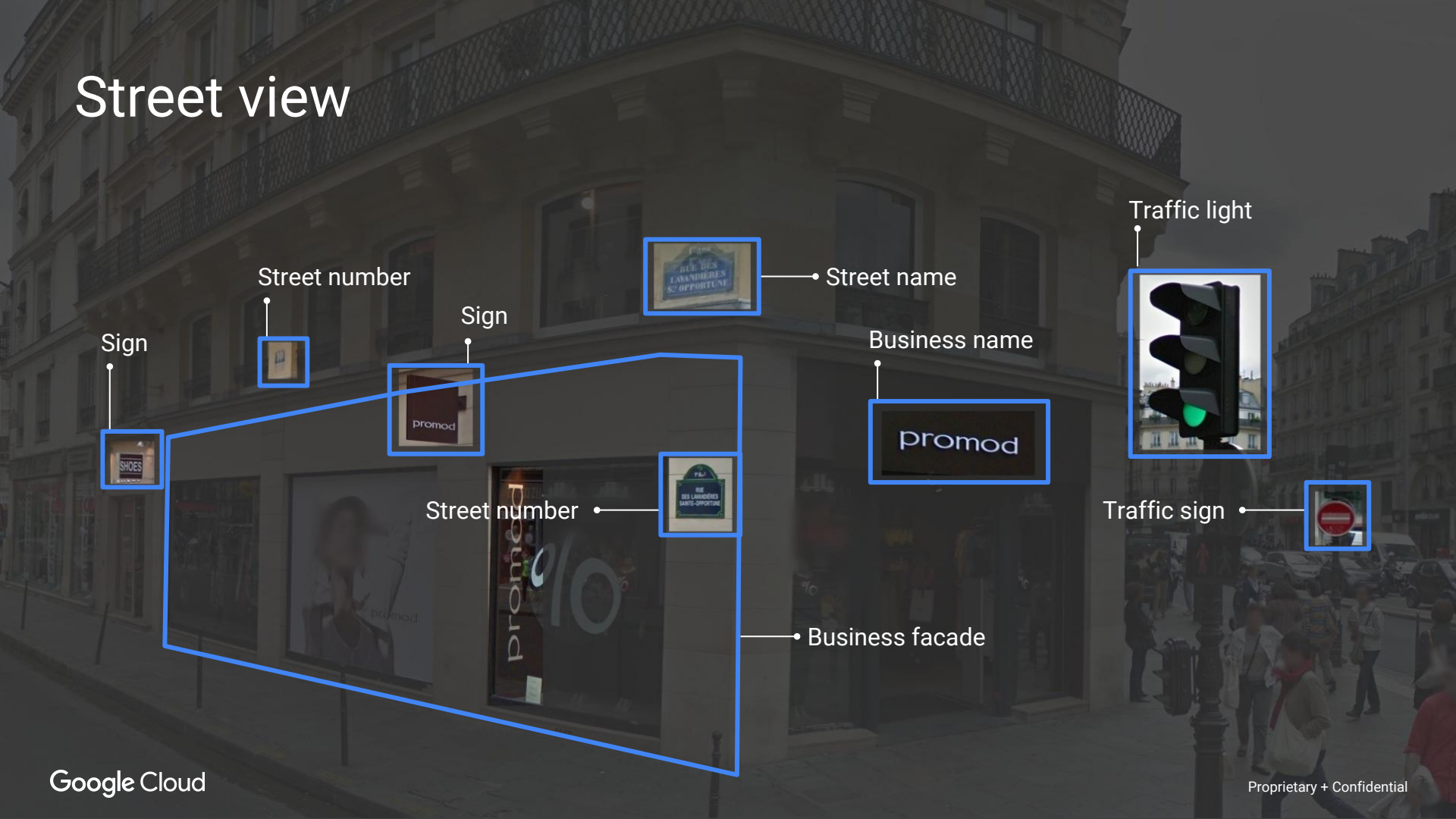
~DeepMind Blog, posted Nov, 2016

Google Cloud



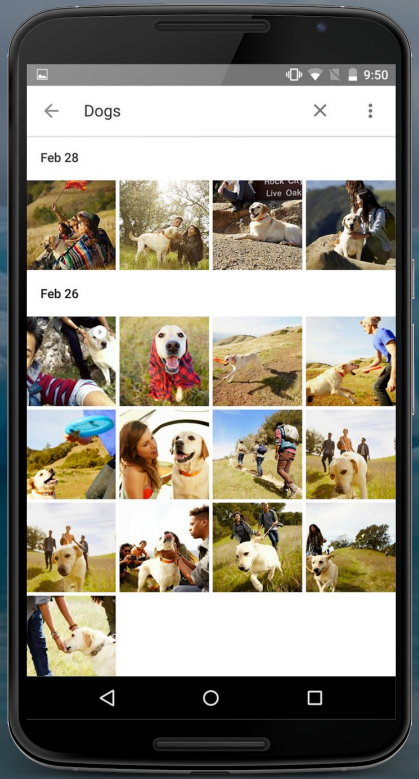
*Source: IDC

Street view



Proprietary + Confidential

Google photos



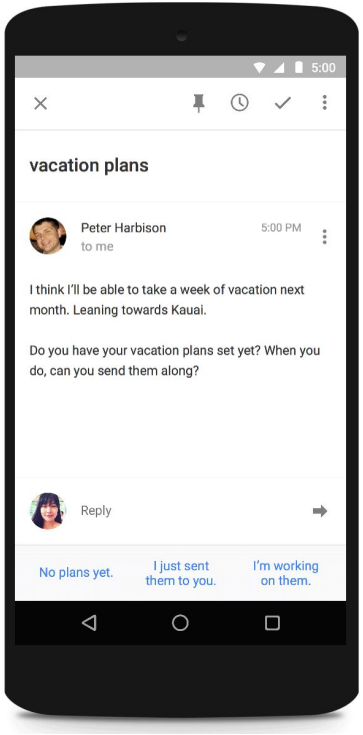
[glacier]

Google translate

Gmail - smart reply inbox

10%

of all responses
sent on mobile



Beyond core products, into areas like health and robotics

"Deep Learning for Robots: Learning from Large-Scale Interaction",

~Google Research Blog, posted March, 2016

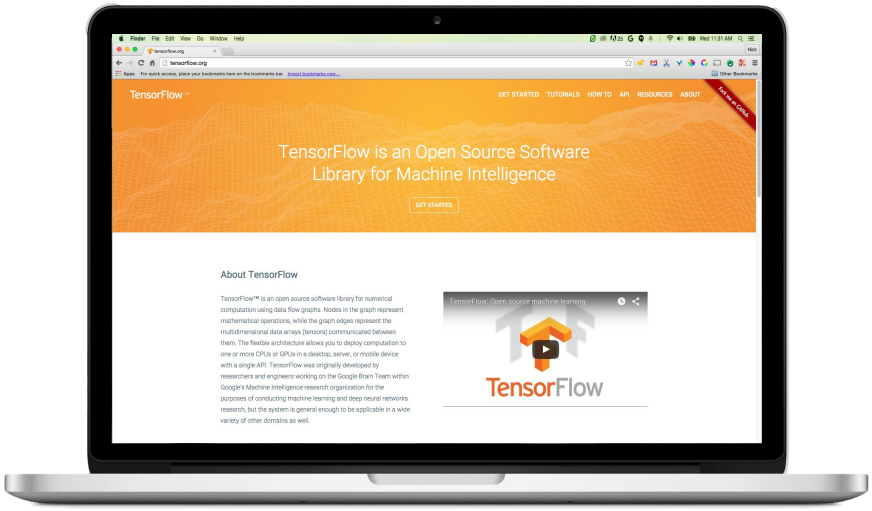
Sharing our tools with researchers and developers around the world

#1

repository

for “machine learning” category on GitHub

Released in Nov. 2015



Machine learning use cases

Manufacturing

- Predictive maintenance or condition monitoring
- Warranty reserve estimation
- Propensity to buy
- Demand forecasting
- Process optimization
- Telematics

Retail

- Predictive inventory planning
- Recommendation engines
- Upsell and cross-channel marketing
- Market segmentation and targeting
- Customer ROI and lifetime value

Healthcare and Life Sciences

- Alerts and diagnostics from real-time patient data
- Disease identification and risk satisfaction
- Patient triage optimization
- Proactive health management
- Healthcare provider sentiment analysis

Travel and Hospitality

- Aircraft scheduling
- Dynamic pricing
- Social media – consumer feedback and interaction analysis
- Customer complaint resolution
- Traffic patterns and congestion management

Financial Services

- Risk analytics and regulation
- Customer Segmentation
- Cross-selling and up-selling
- Sales and marketing campaign management
- Credit worthiness evaluation

Energy, Feedstock and Utilities

- Power usage analytics
- Seismic data processing
- Carbon emissions and trading
- Customer-specific pricing
- Smart grid management
- Energy demand and supply optimization

Proprietary + Confidential

Manufacturing

When should I replace parts on my equipment?

How do I know what products to manufacture?

Proprietary + Confidential

Financial Services

How can I provide customer support with automated financial advisors and planners?

How can I make better lending decisions?

Proprietary + Confidential

Ready to use Machine Learning models

Cloud
Translation API

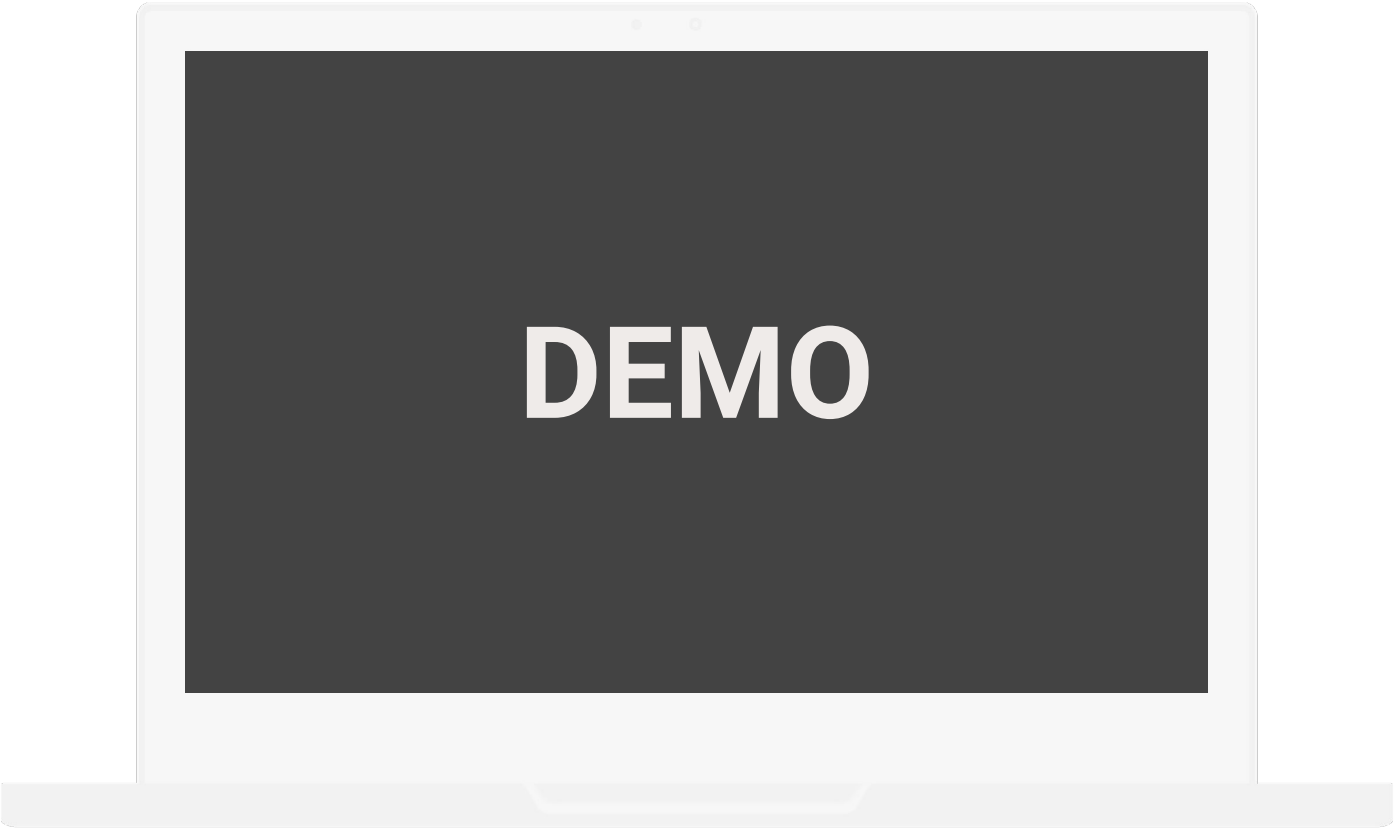
Cloud
Natural
Language API

Cloud Video
Intelligence

Cloud
Vision API

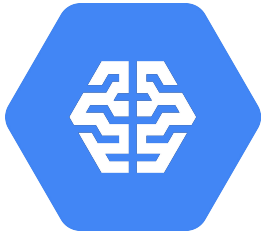
Cloud
Speech API

Cloud
Jobs API


DEMO

Three steps for success with Machine Learning

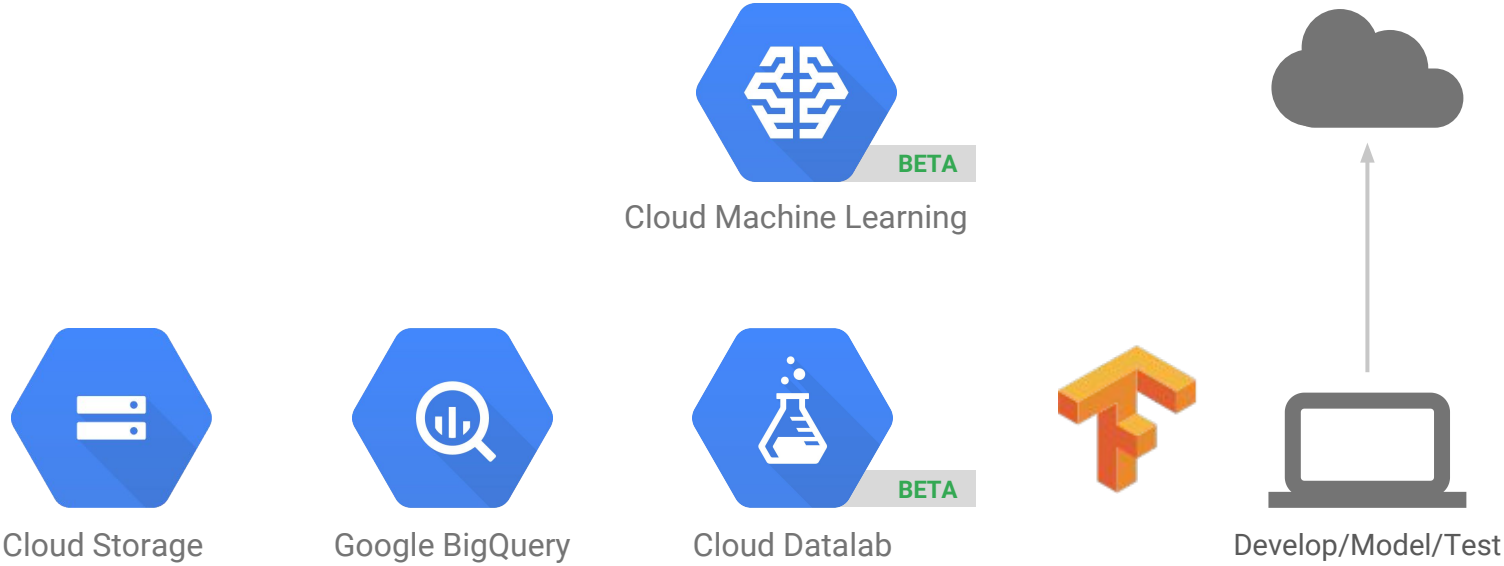
Get your arms around
Big Data.



Invest time in understanding
Machine Learning.

Work with us.
Best practices, partners to help you.

Use your own data to train models



20 year problem: Cloud detection

Background:

- 10k images/day
- manually classified

Model on Cloud ML Engine:

- **Time to POC:** 1 month
- **Error rate:** ↓ 70%
- **GPU:** 40x speedup over CPUs!
- **Training time:** 50 hours on desktop → 30 min in the CLoud

Detecting illegal fishing

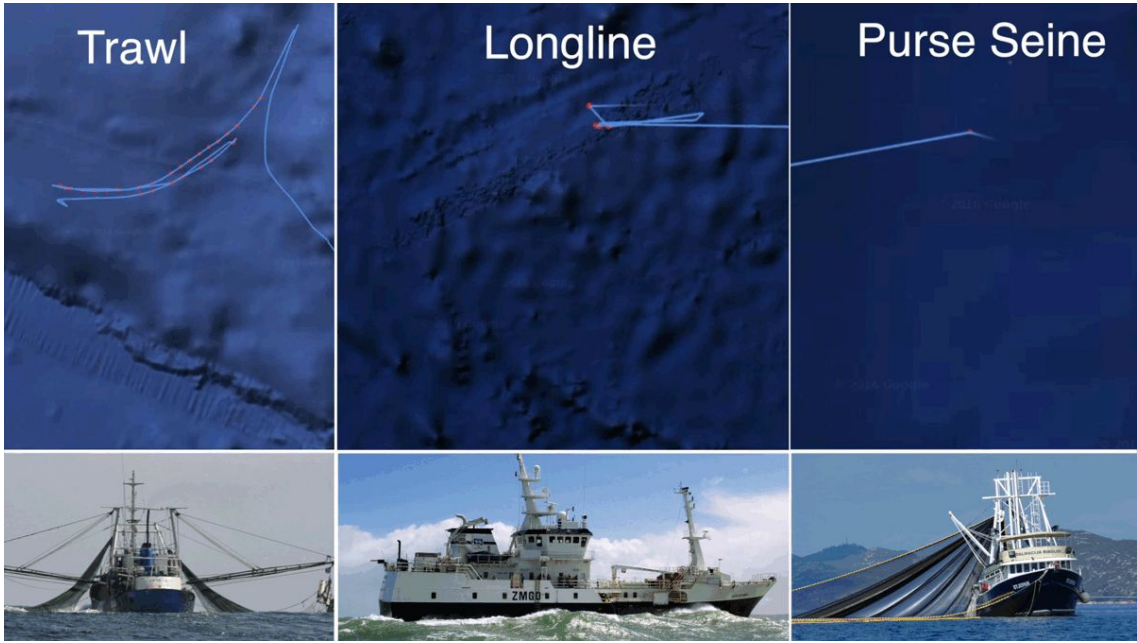
GLOBAL FISHING WATCH

Background:

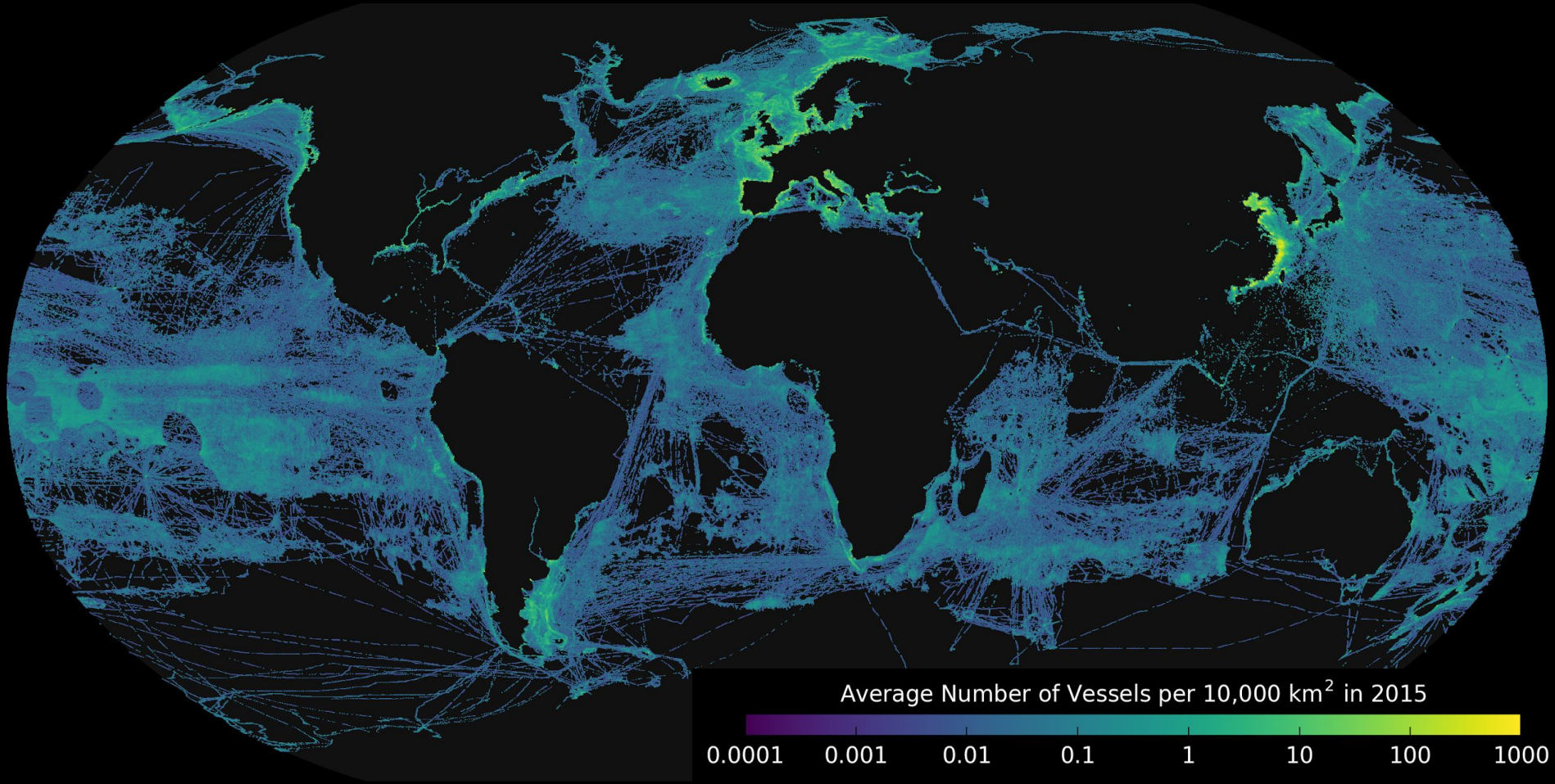
- AIS GPS position data
- 140 million sq. miles of ocean
- 20M GPS coordinates/day

CNN Model on Cloud ML Engine:

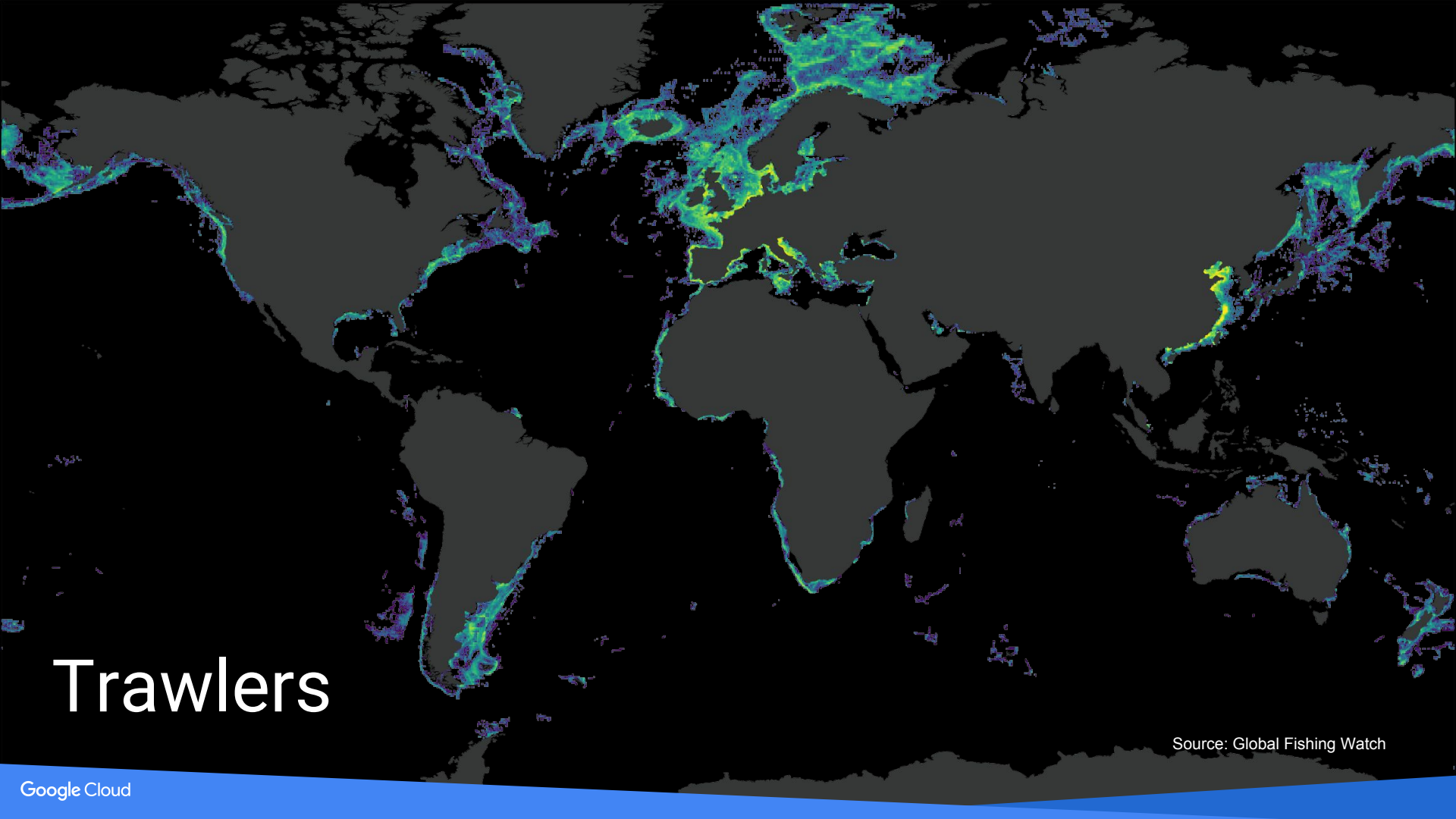
- **Features:** 100k/vessel
- **GPU:** 10x speedup over CPUs!
- **Step time:** 19 sec → 1.8 sec

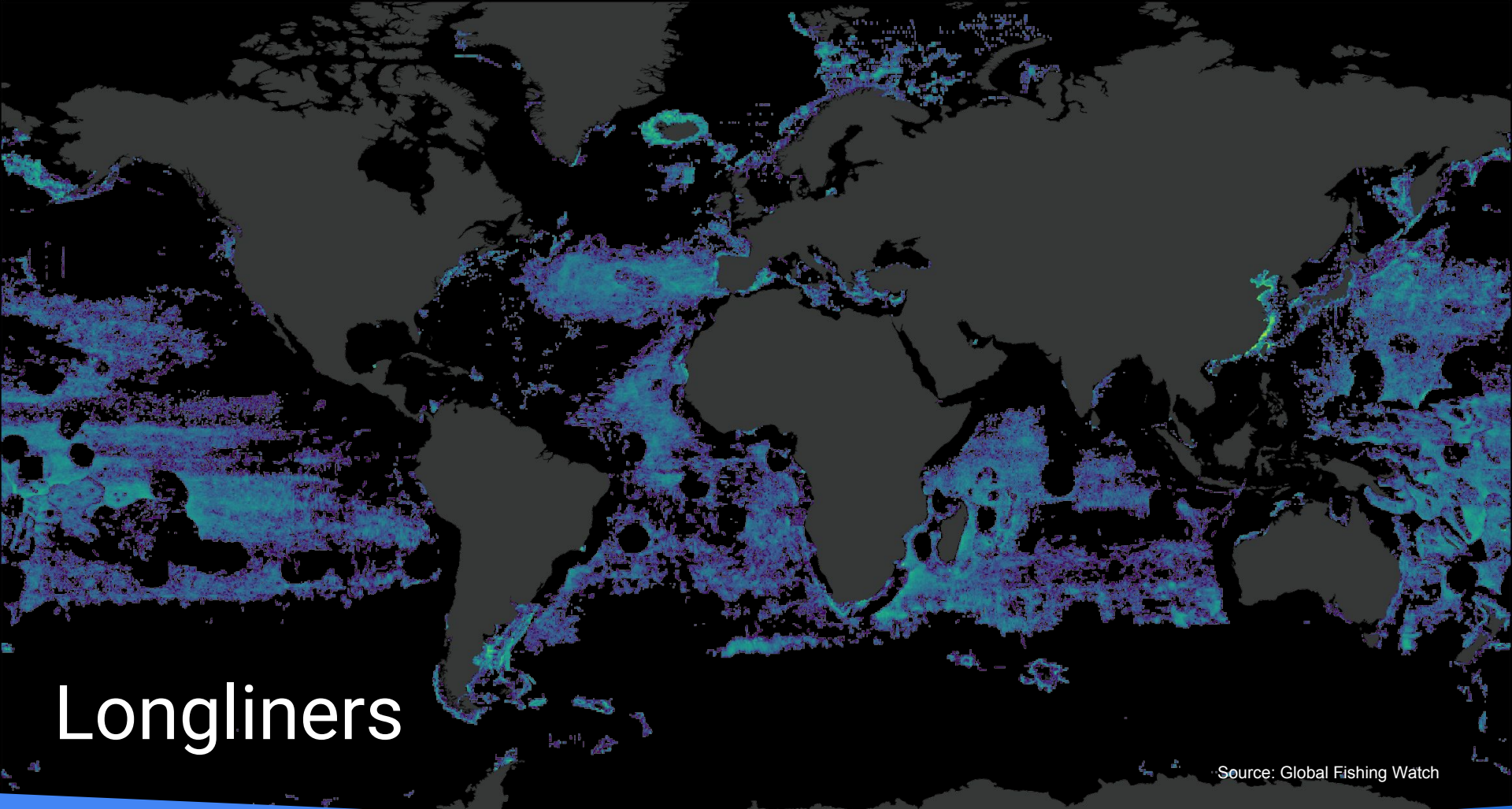


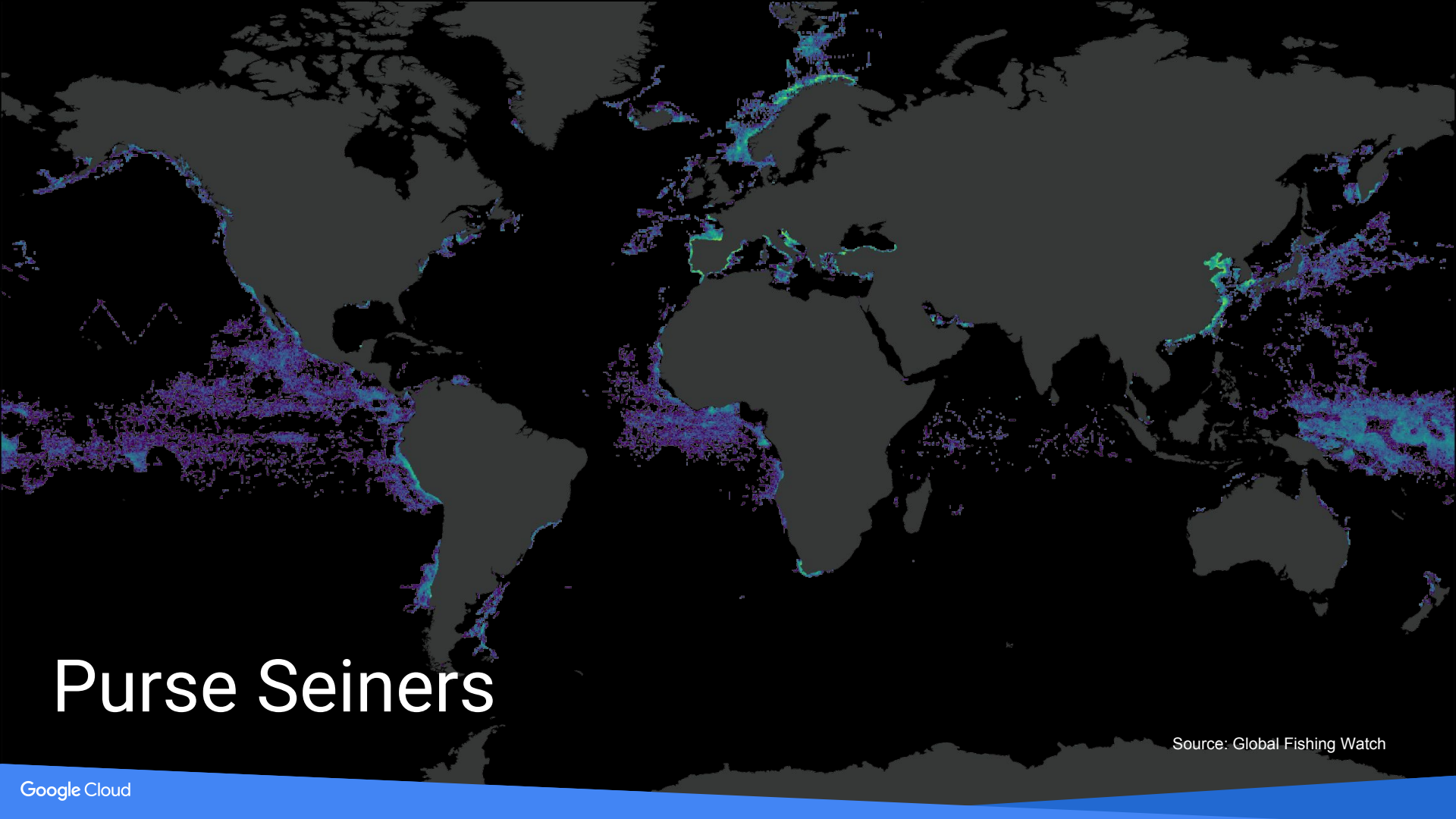
Density of Fishing Vessels with AIS in 2015



GLOBAL FISHING WATCH BETA
Madagascar
Mauritius
Saint-Denis
Reunion
Swaziland
Lesotho
Durban
Pretoria
Maputo
Richards Bay
12 NOV 2013
10 FEB 2014
CT
NOV
DEC
JAN
FEB
MAR
2014
90 days
-39.6226, 27.9053
OCEANA
SKYTRUTH
Google
Slow Footer
CartoDB
Map data ©2016 Google, INEGI Imagery ©2016 NASA, TerraMetrics
Terms of use
Support


Trawlers
Source: Global Fishing Watch

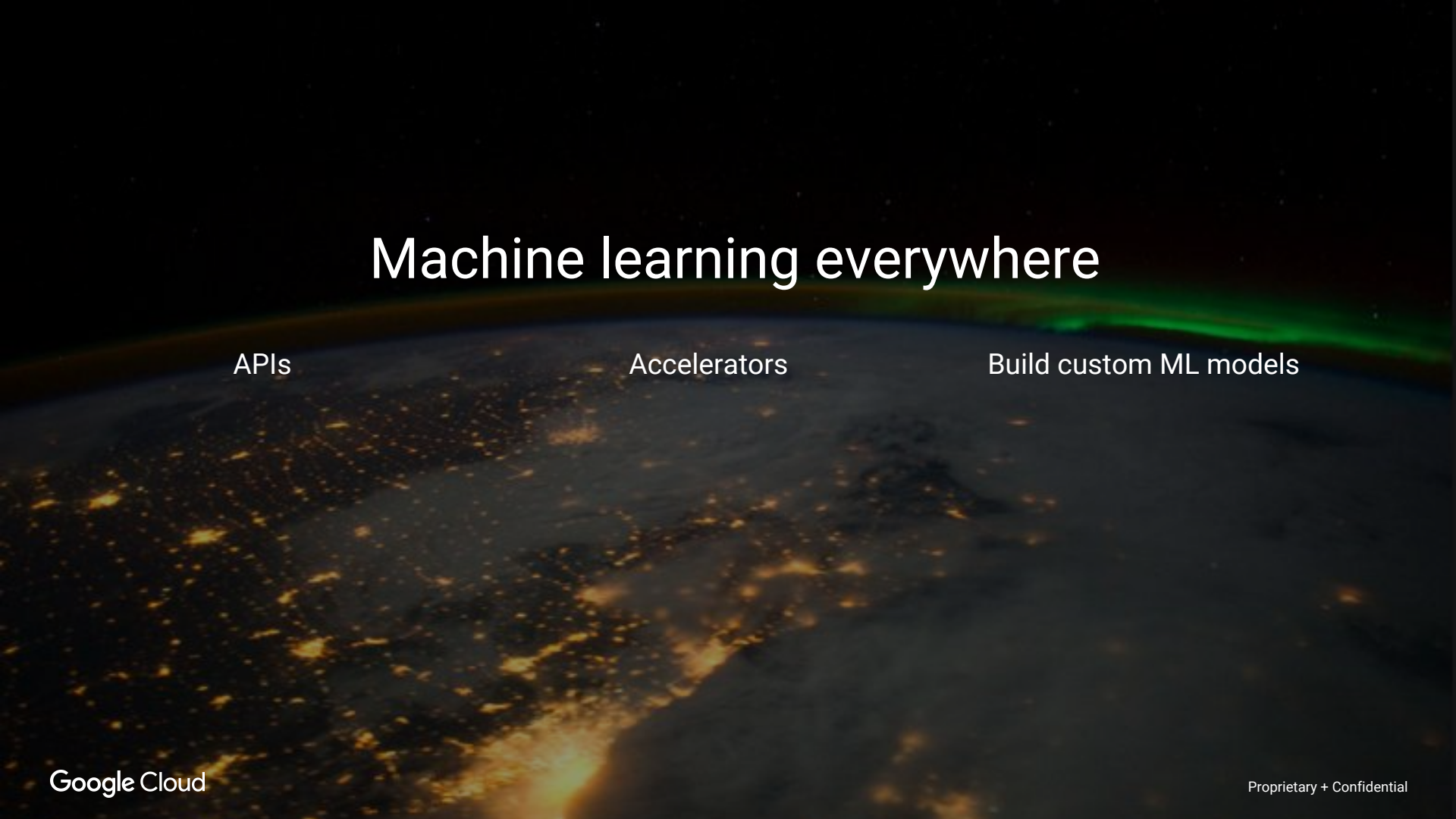

Longliners
Source: Global Fishing Watch



Source: Global Fishing Watch

GPUs on GCP

Google Cloud Platform is making **GPUs available worldwide**.


Machine learning everywhere
APIs
Accelerators
Build custom ML models
Google Cloud
Proprietary + Confidential

Thank You!

cloud.google.com/ml