

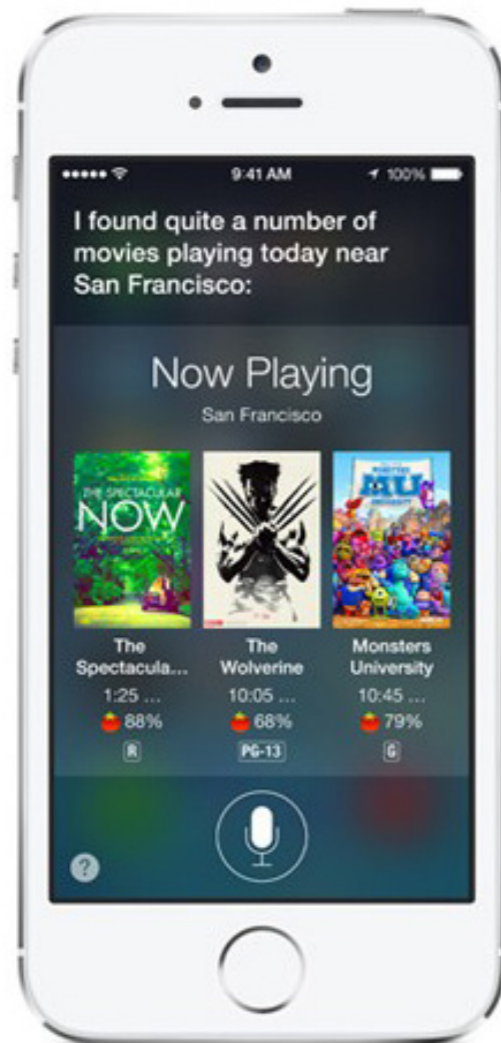
Lecture 1: Introduction to ML

Course: ES 654

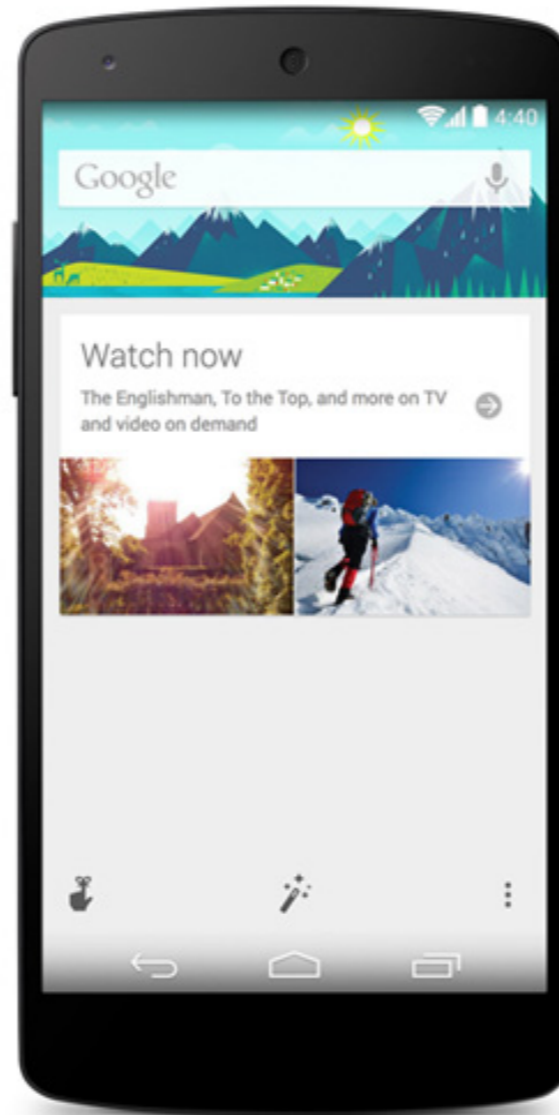
Nipun Batra
Jan 6, 2020

Machine Learning Applications

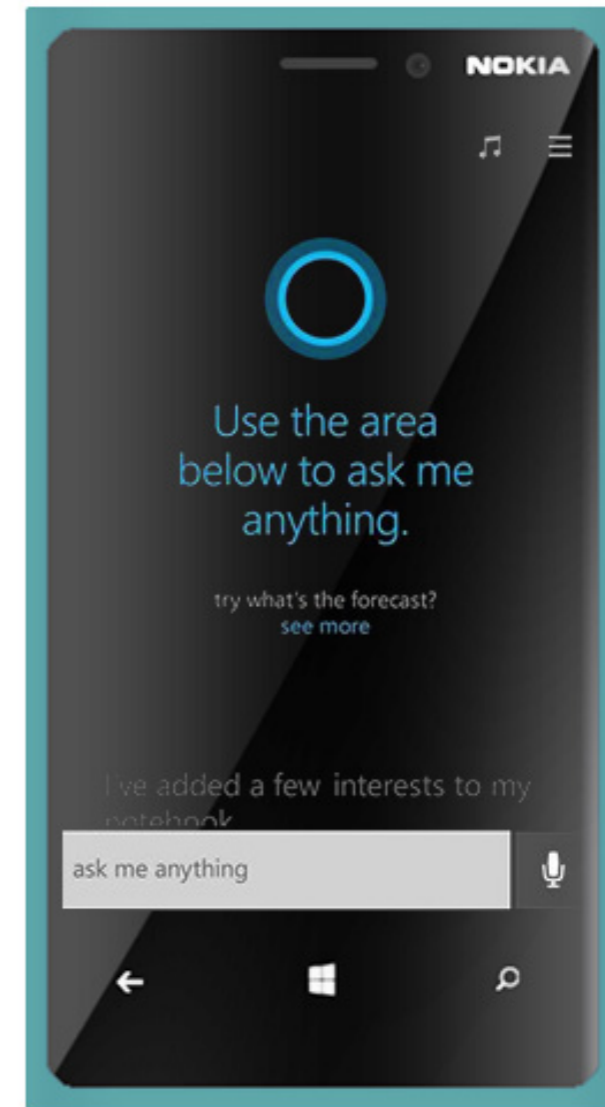
Apple Siri



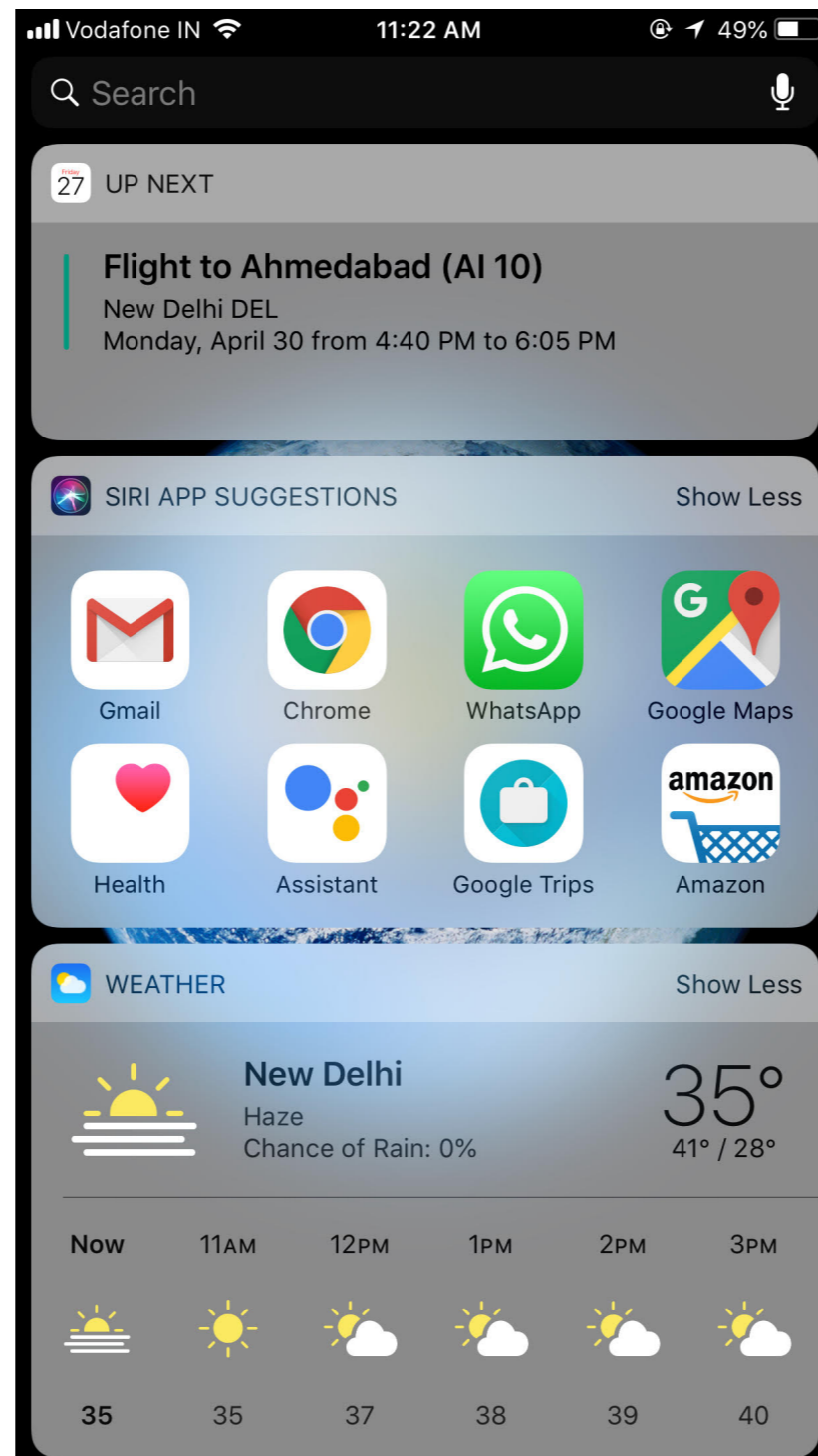
Google Now



Windows Cortana



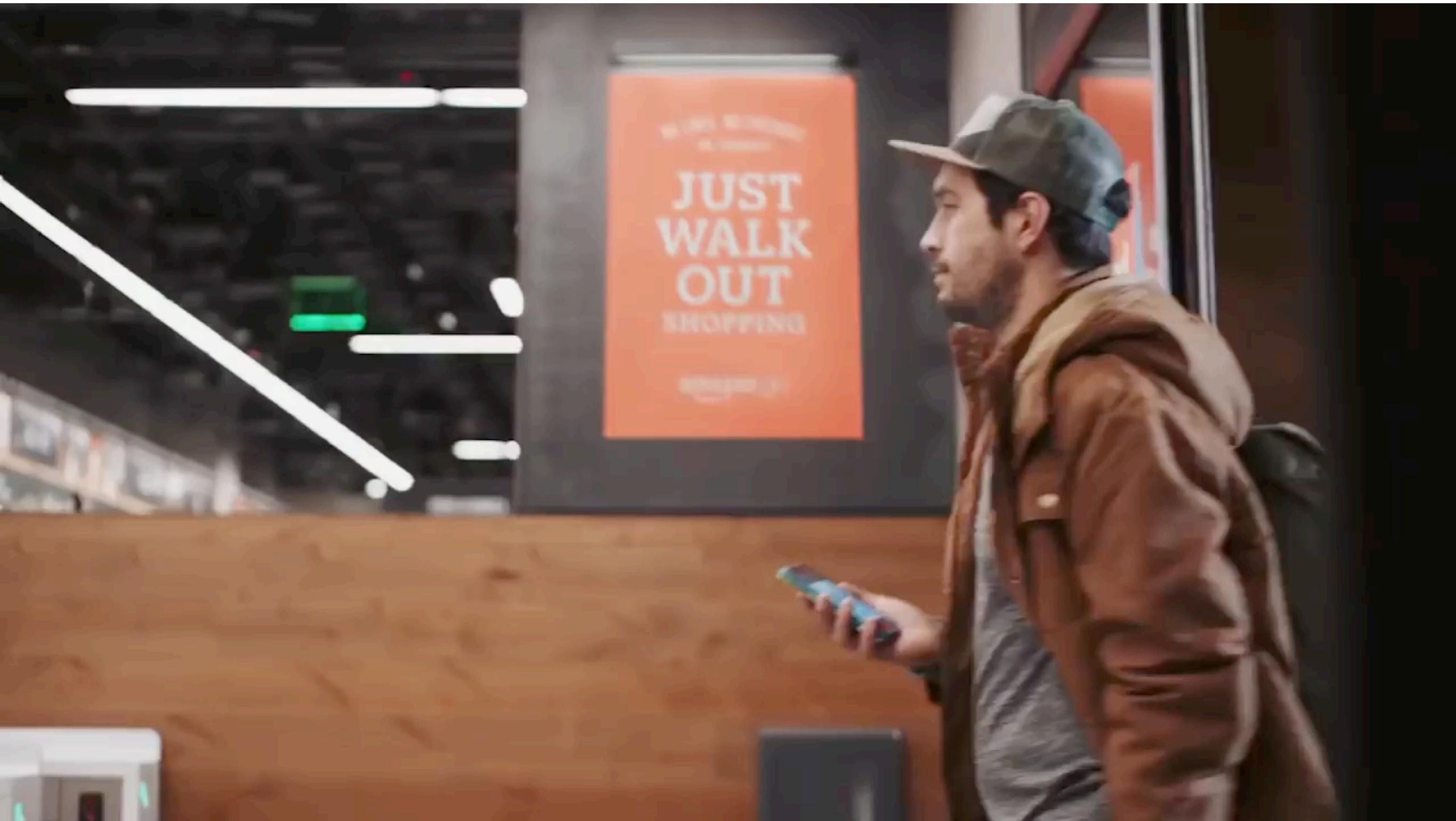
Machine Learning Applications



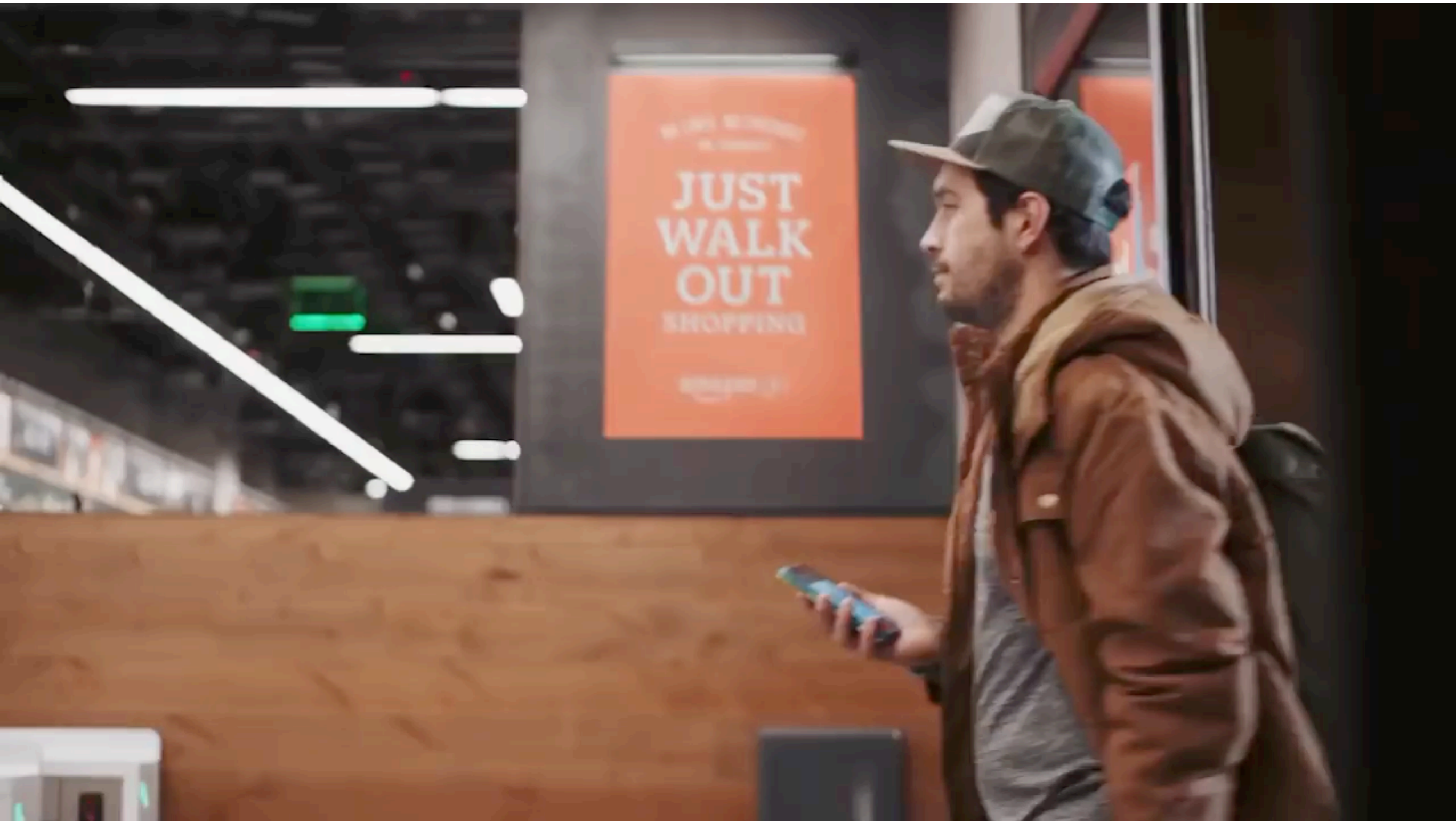
The Long Wait ...



Machine Learning Applications



Machine Learning Applications



Machine Learning Applications



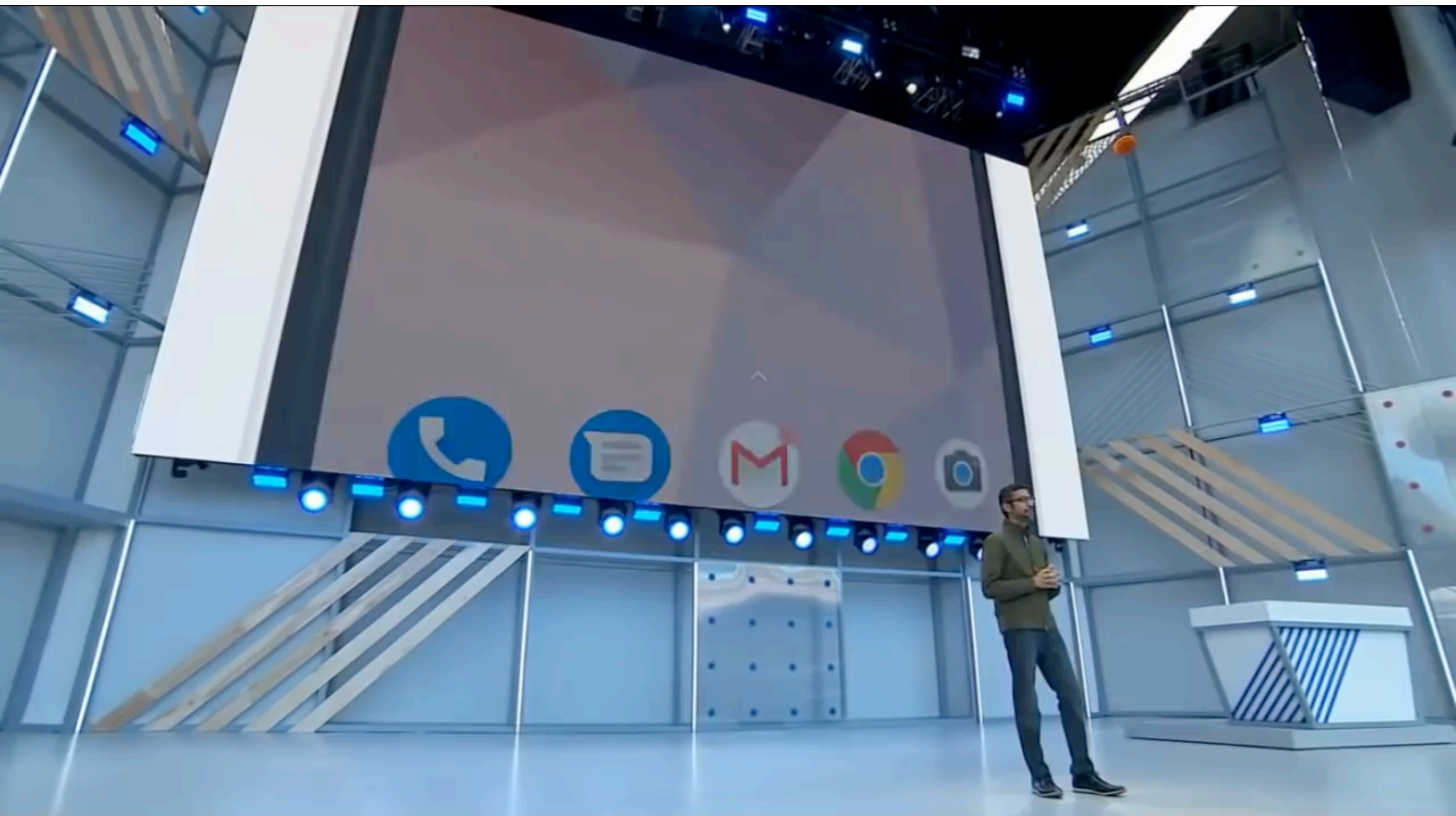
Machine Learning Applications



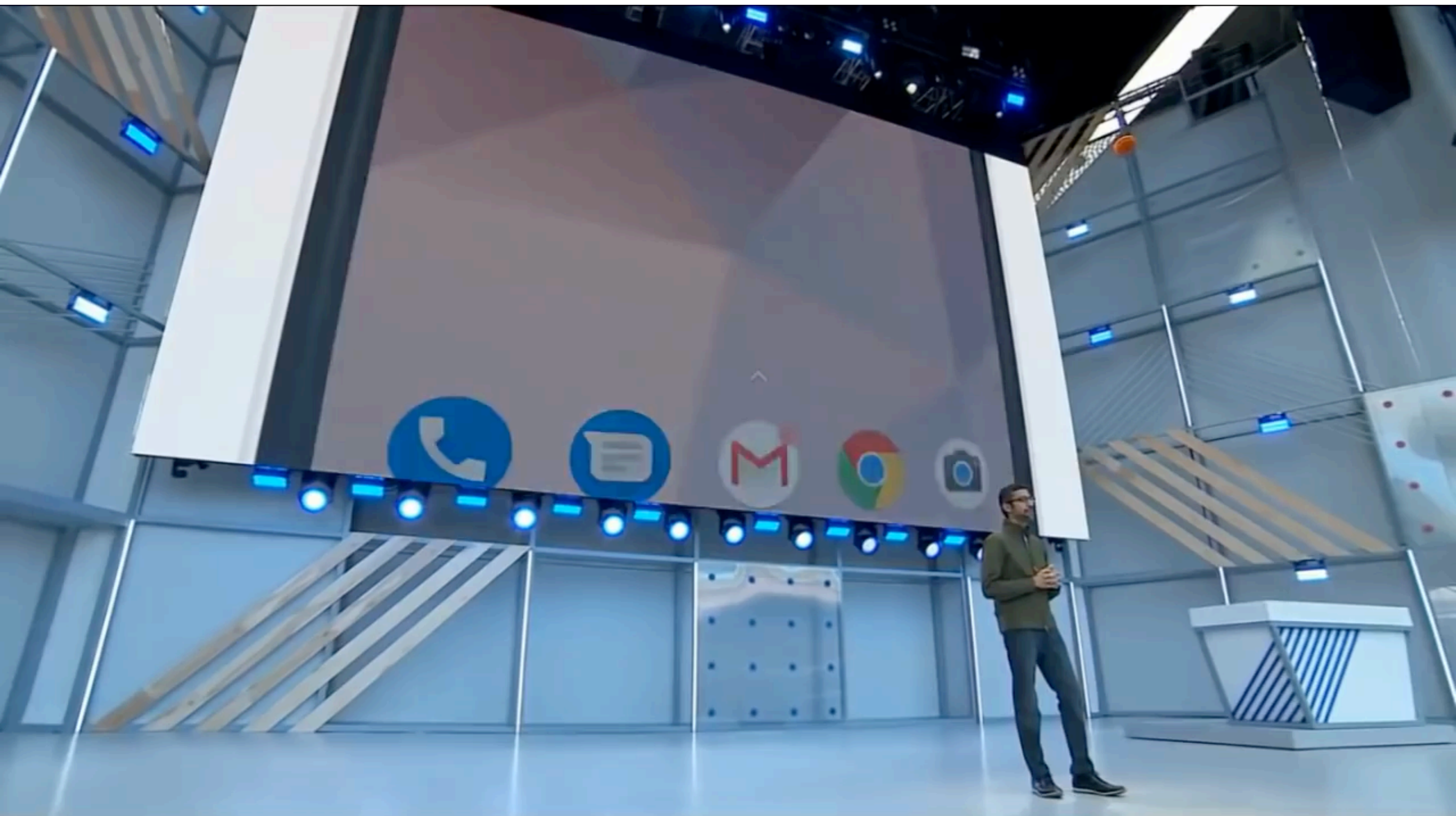
Never Liked To Call People!



Google Duplex!



Google Duplex!



Saving The Planet - One Watt A time

Saving The Planet - One Watt A time

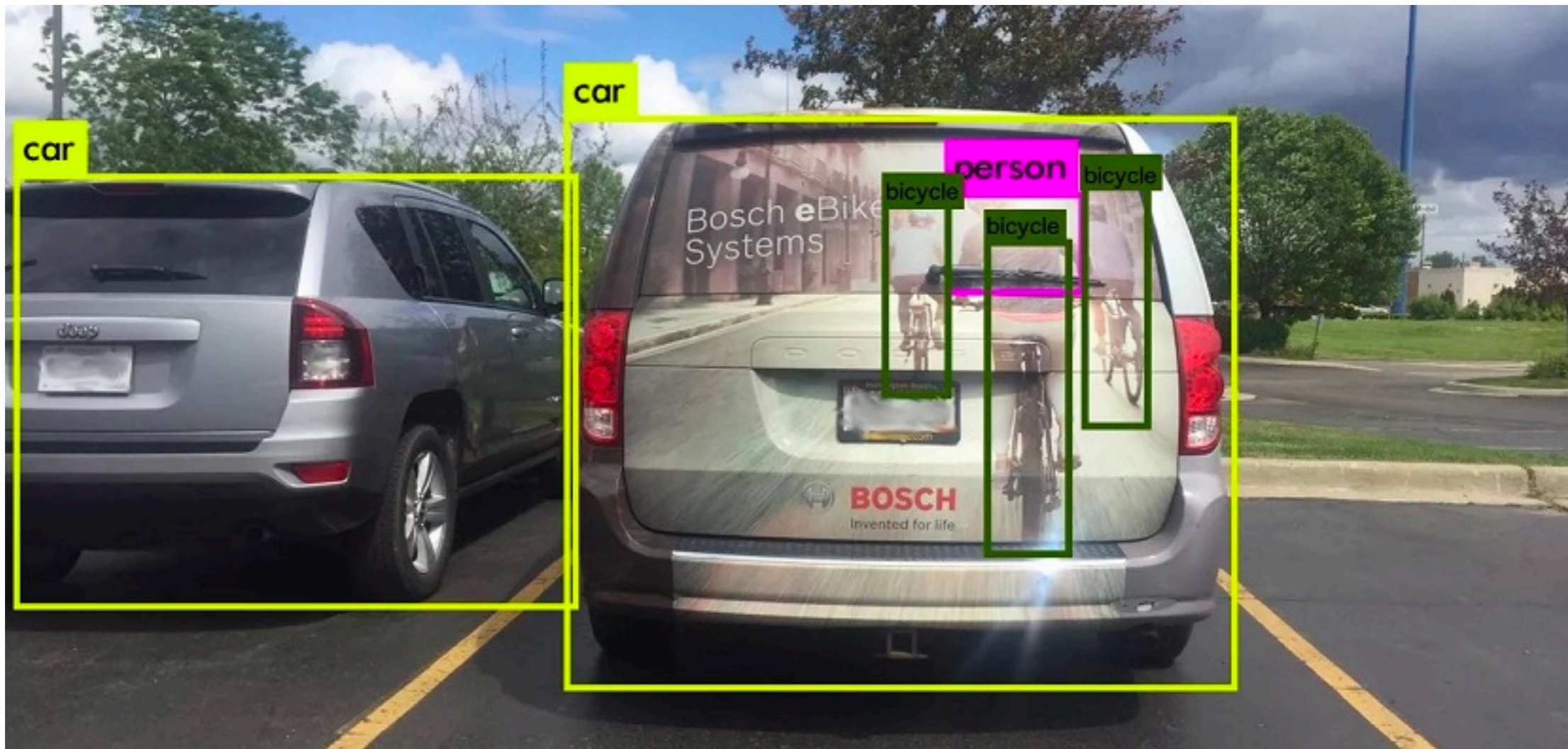
Self Driving Car



Self Driving Car



Self Driving Car



Courtesy: Cognata

ML for Farm



ML for Farm



ML for Healthcare

WORLD
ECONOMIC
FORUM

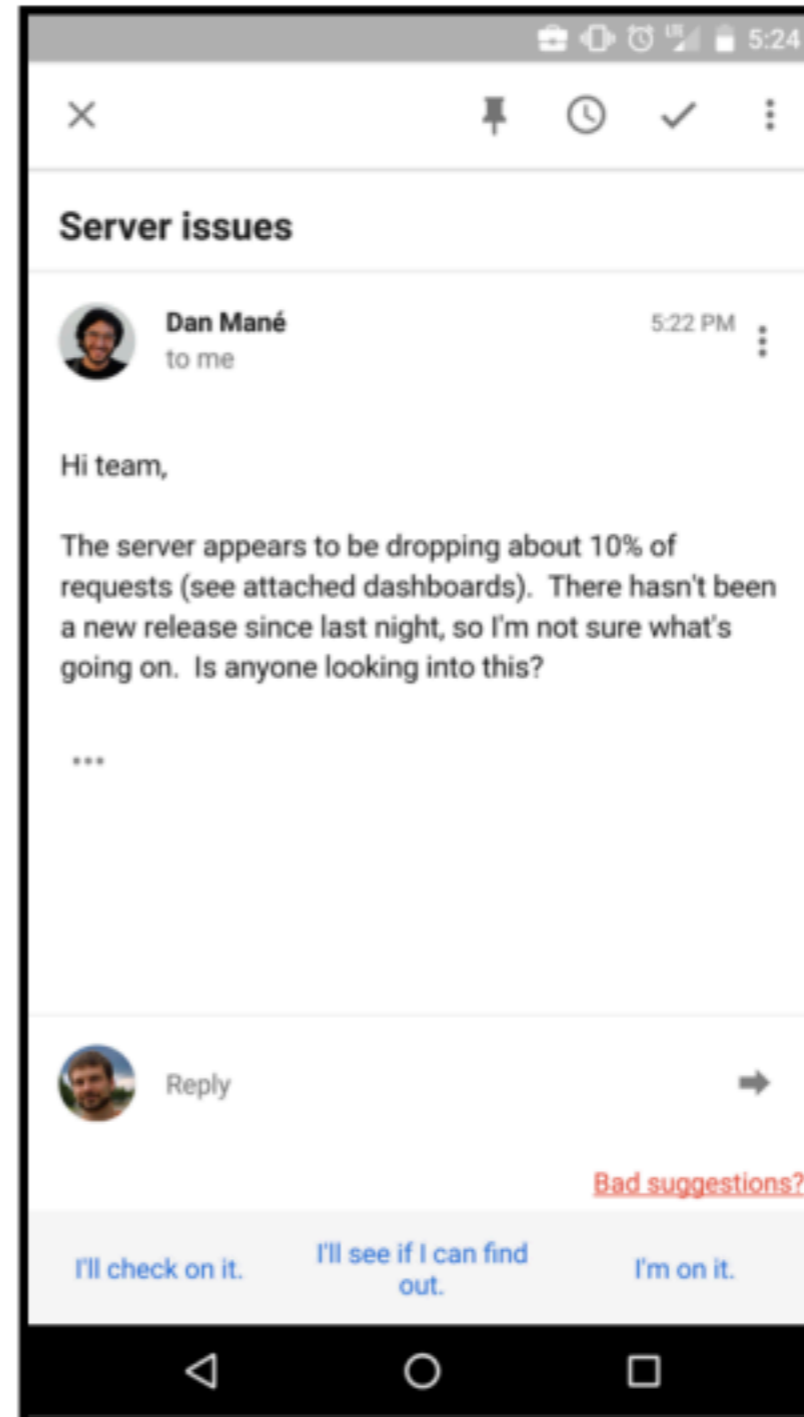
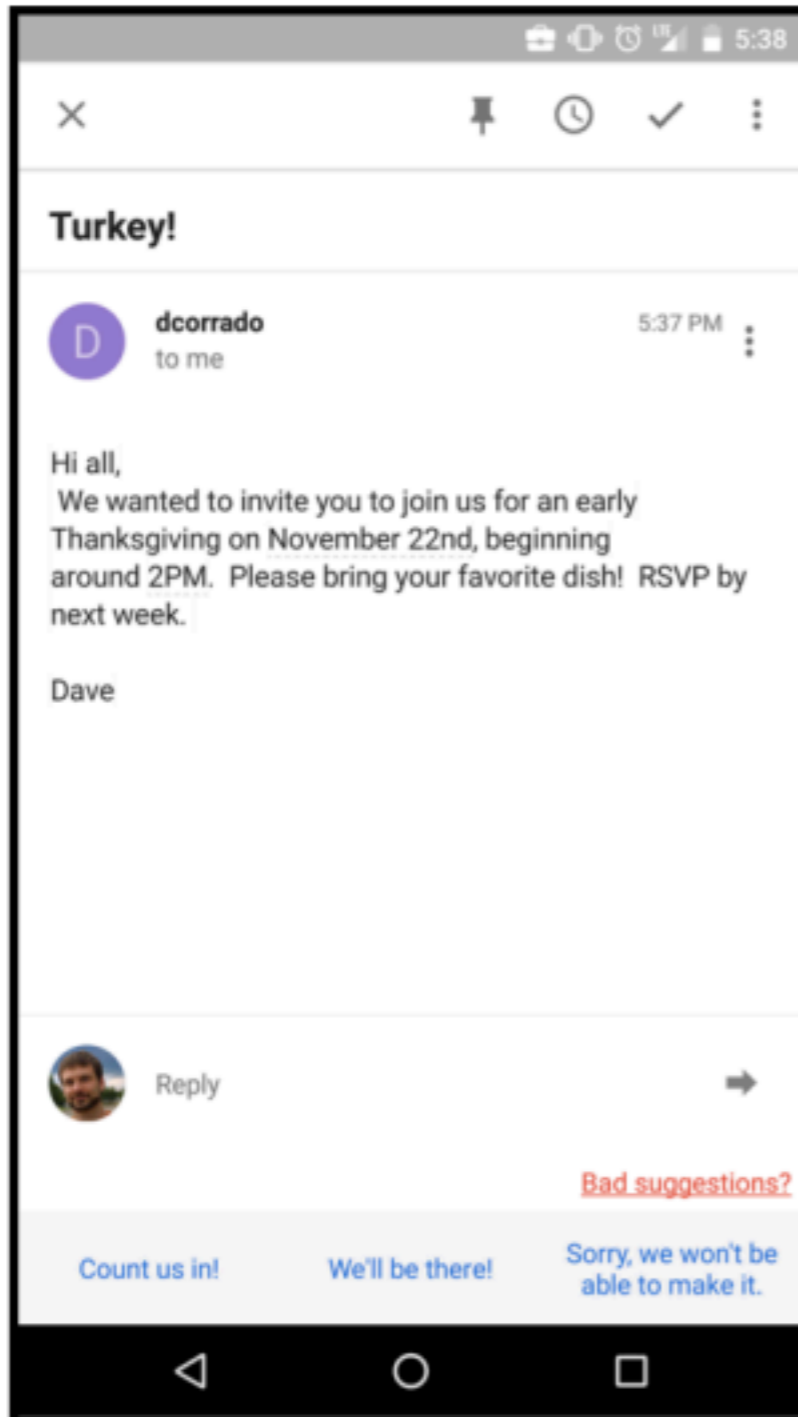
The logo for the World Economic Forum, featuring a blue arc that forms a partial circle around the text.

ML for Healthcare

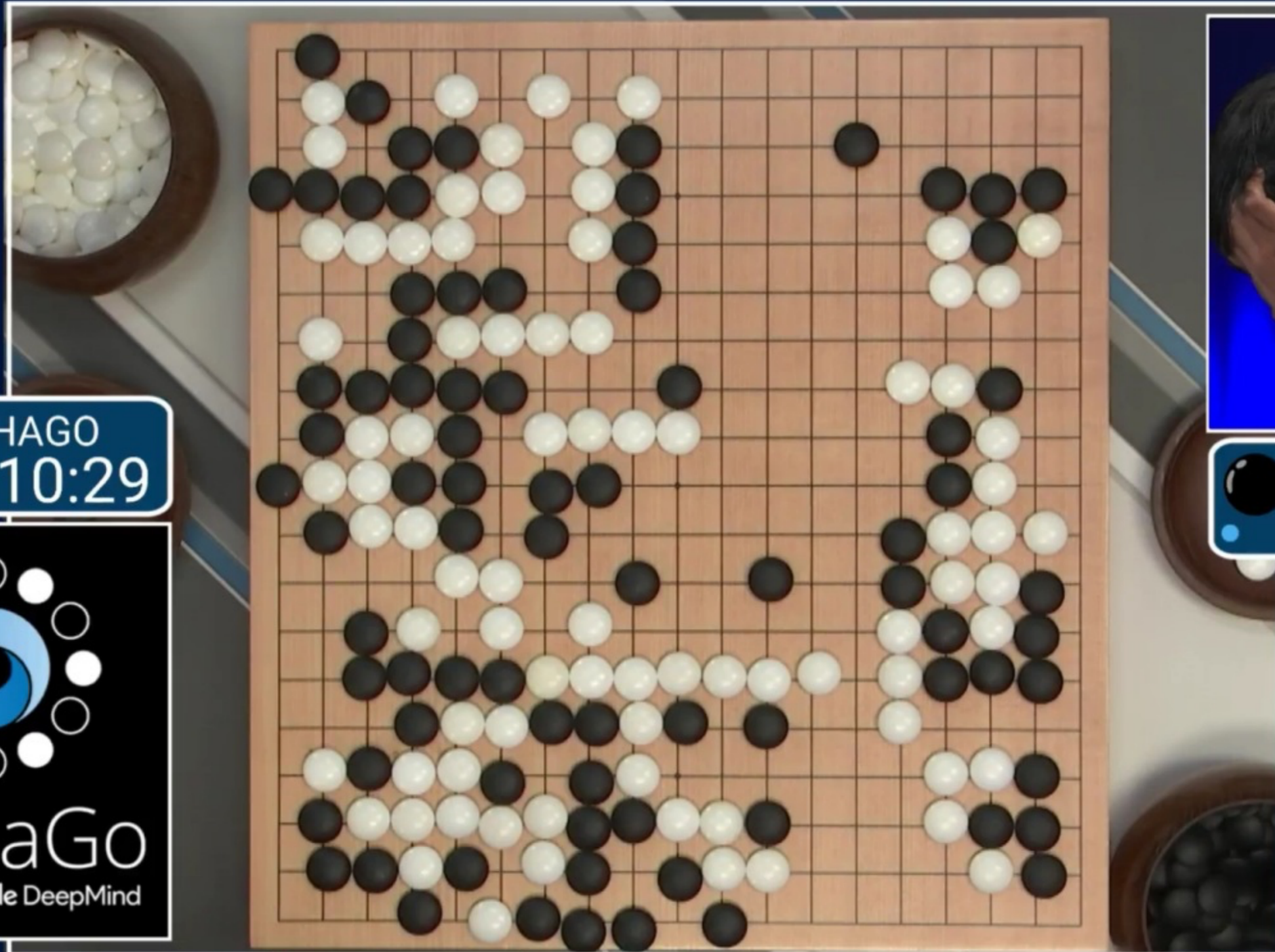
WORLD
ECONOMIC
FORUM

The logo for the World Economic Forum, featuring a blue arc that curves around the text.

Auto Reply



Machine Learning Applications



● ALPHAGO
00:10:29



● LEE SEDOL
00:01:00

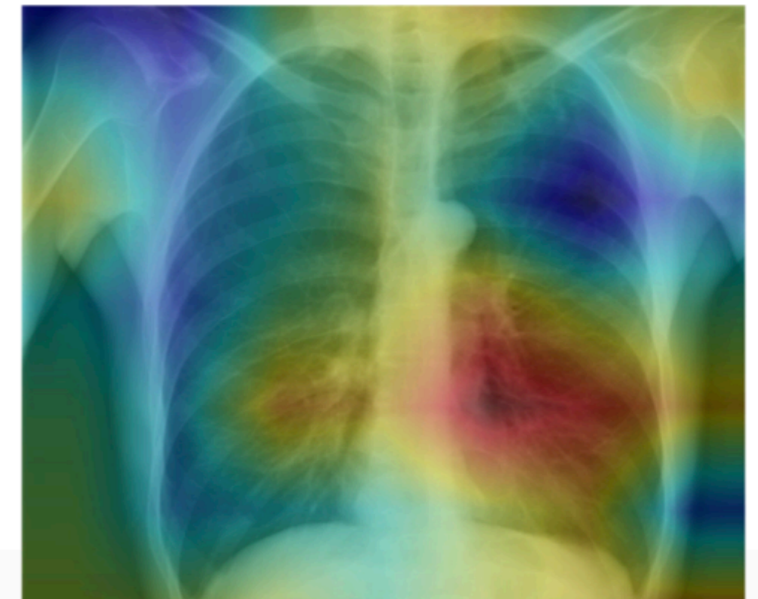
Machine Learning Applications



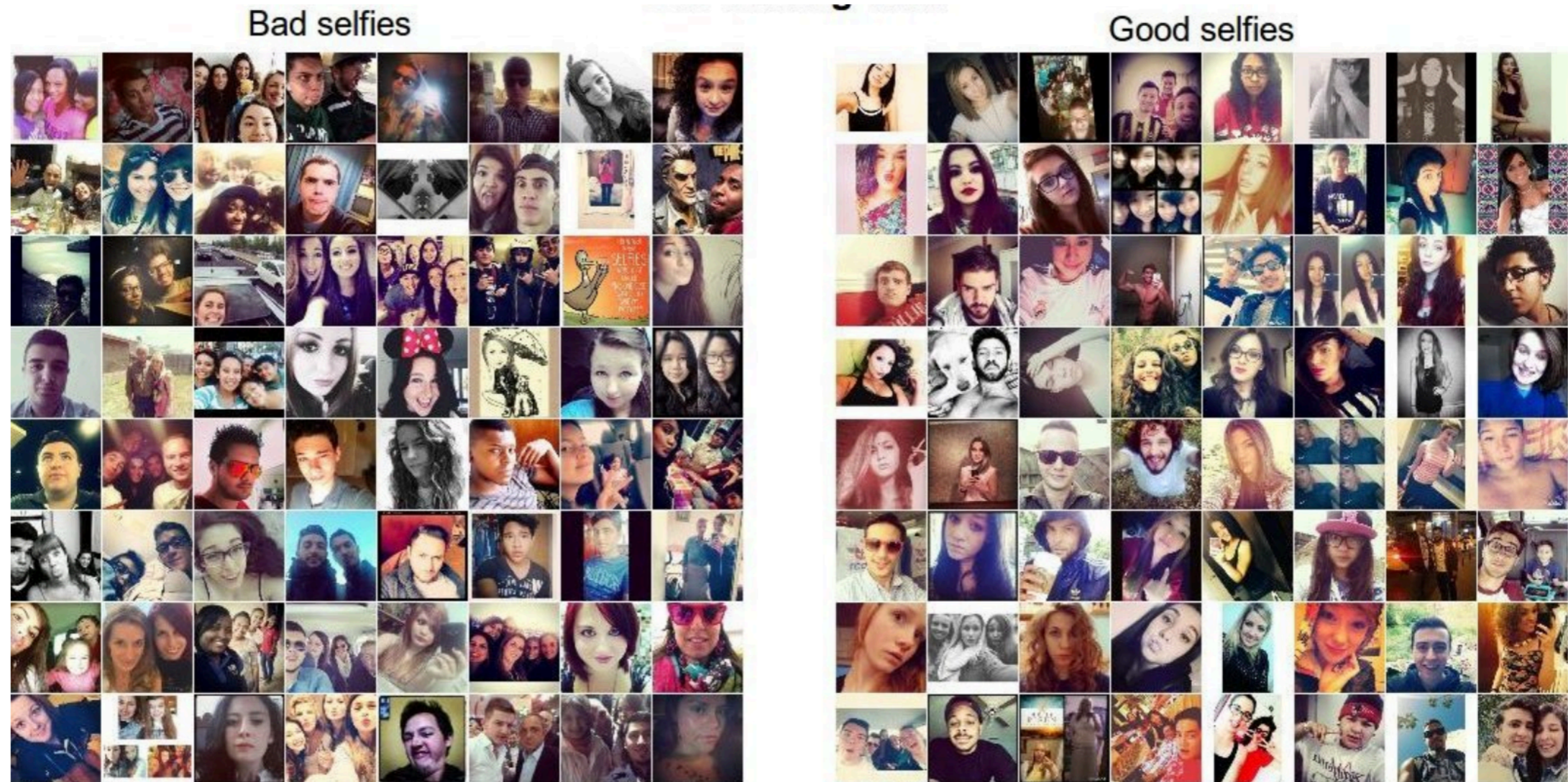
Input
Chest X-Ray Image

CheXNet
121-layer CNN

Output
Pneumonia Positive (85%)



Machine Learning Applications



Example images showing good and bad selfies in our training data. These will be given to the ConvNet as teaching material.

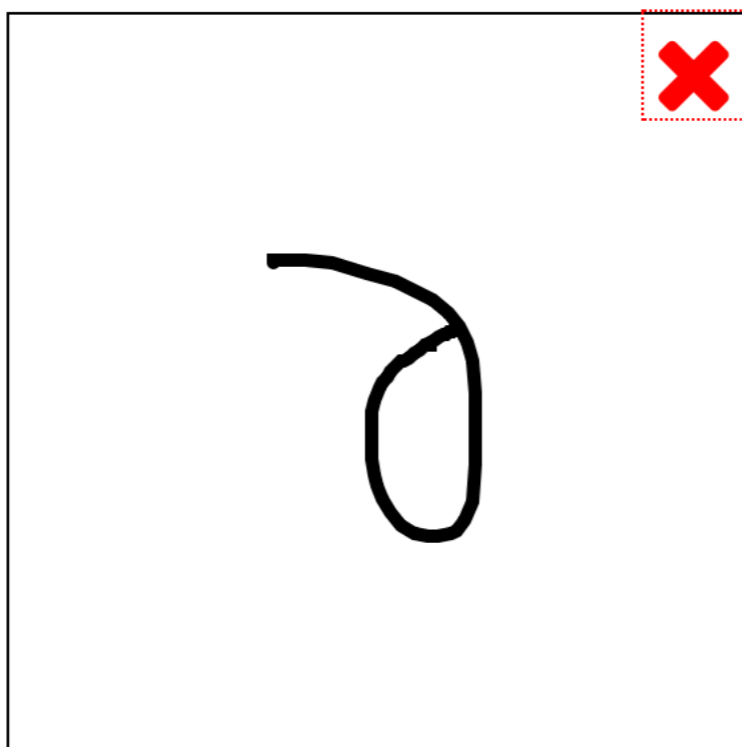
- Face should occupy about 1/3 of the image.
- Cut off your forehead

Machine Learning Applications

Detexify

classify

symbols



∂

Score: 0.12107724371908918

`\partial`
mathmode

\mathcal{D}

Score: 0.1744210074369589

`\usepackage{ amssymb }`
`\Game`
mathmode

γ

Score: 0.18567692685446785

`\usepackage{ tipa }`
`\textbabygamma`
textmode

Υ

Score: 0.19845446379011045

`\usepackage{ upgreek }`
`\upgamma`
mathmode

δ

Score: 0.19849650347374576

`\usepackage[T1]{fontenc}`
`\dh`
textmode

Want a Mac app?

Lucky you. The Mac app is finally stable enough. See how it works on [Vimeo](#). Download the latest version [here](#).

Restriction: In addition to the LaTeX command the unlicensed version will copy a reminder to purchase a license to the clipboard when you select a symbol.

You can purchase a license here:




Buy Detexify for Mac

The symbol is not in the list? [Show more](#)

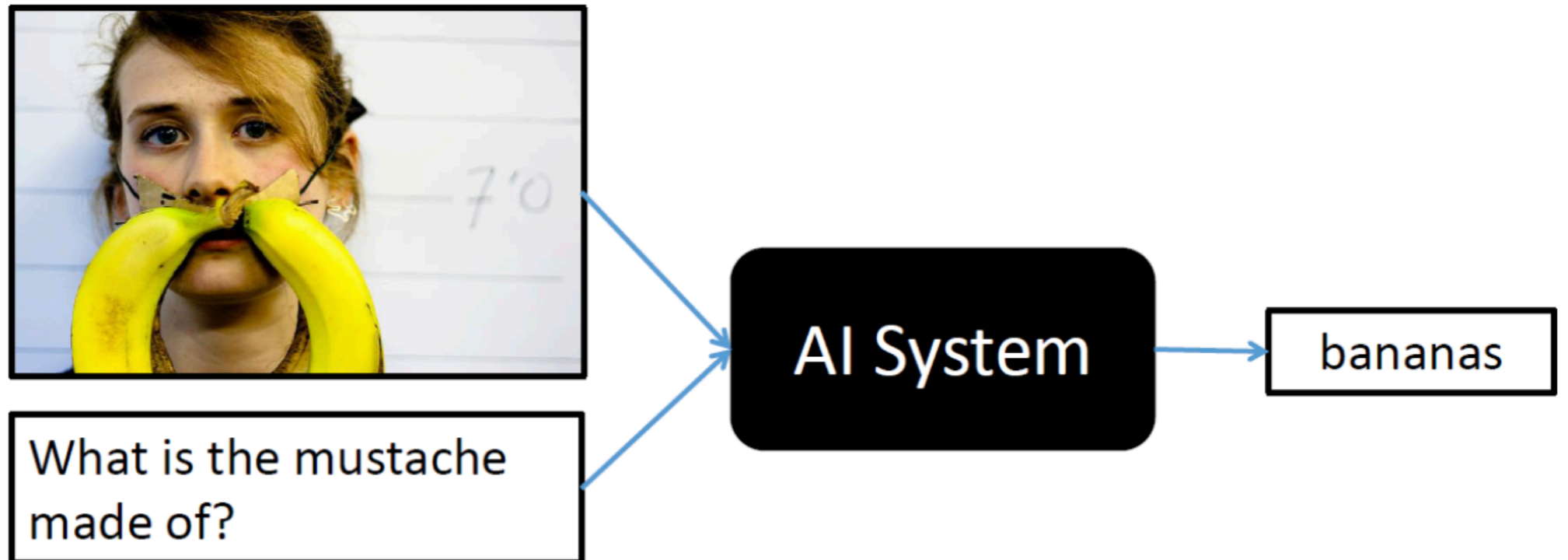
Did this help?

Machine Learning Applications

Labels	Web	Properties	Safe Search	JSON																		
																						
image_20121216120914.jpg																						
<table><tbody><tr><td>Test Cricket</td><td>98%</td></tr><tr><td>Cricket</td><td>98%</td></tr><tr><td>Baseball Player</td><td>98%</td></tr><tr><td>Cricketer</td><td>97%</td></tr><tr><td>Bat And Ball Games</td><td>96%</td></tr><tr><td>Team Sport</td><td>91%</td></tr><tr><td>Ball Game</td><td>88%</td></tr><tr><td>Games</td><td>86%</td></tr><tr><td>Sports</td><td>85%</td></tr></tbody></table>					Test Cricket	98%	Cricket	98%	Baseball Player	98%	Cricketer	97%	Bat And Ball Games	96%	Team Sport	91%	Ball Game	88%	Games	86%	Sports	85%
Test Cricket	98%																					
Cricket	98%																					
Baseball Player	98%																					
Cricketer	97%																					
Bat And Ball Games	96%																					
Team Sport	91%																					
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Sports	85%																					

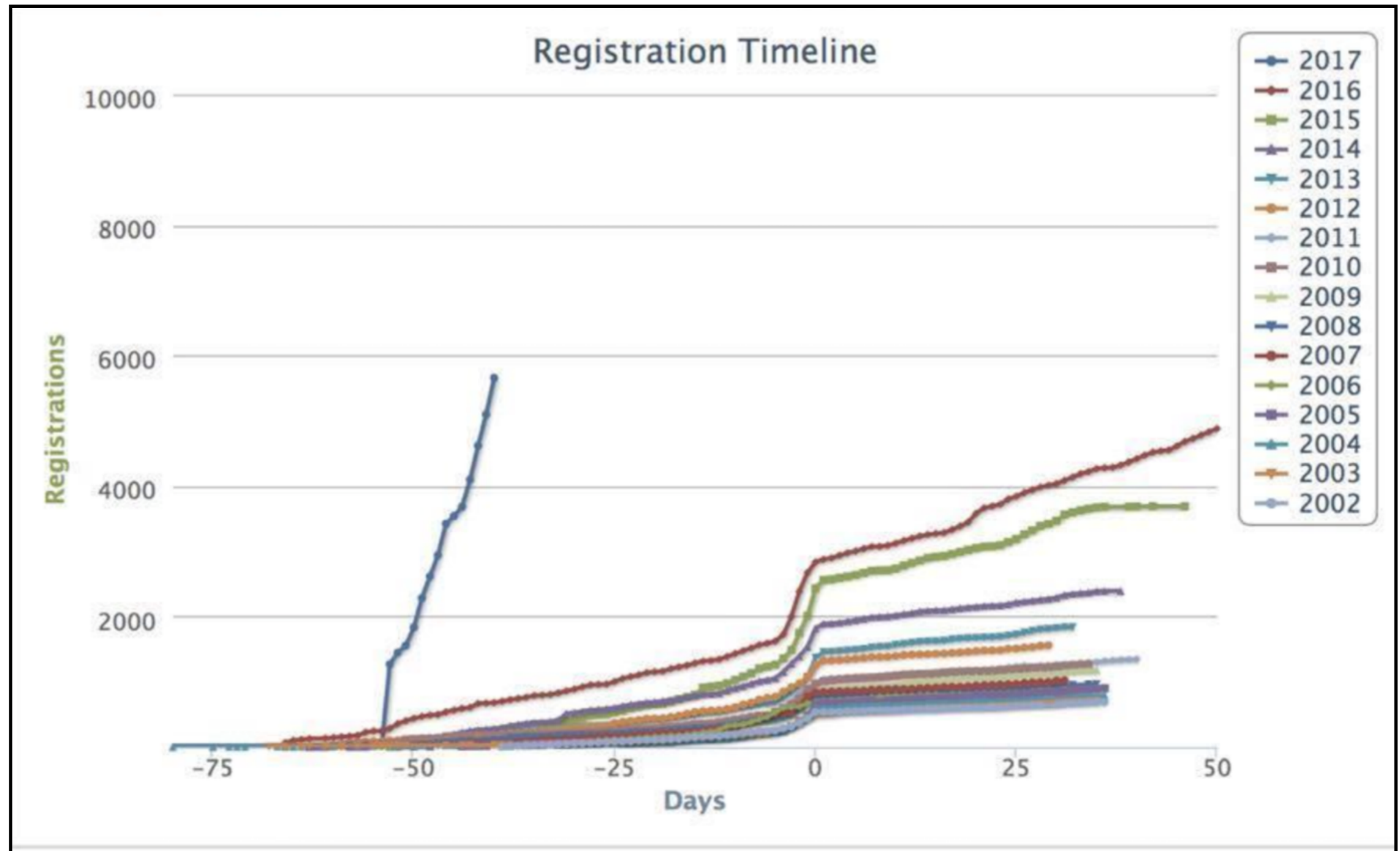
Machine Learning Applications

Visual Q and A



NeurIPS registration

$x=0$ -> early registration deadline



Machine Learning Gone Wrong

THE VERGE

TECH ▾

SCIENCE ▾

CULTURE ▾

CARS ▾

REVIEWS ▾

LONGFORM

VIDEO

MORE

🕒 STORYSTREAM

TRANSPORTATION

UBER

RIDE-SHARING



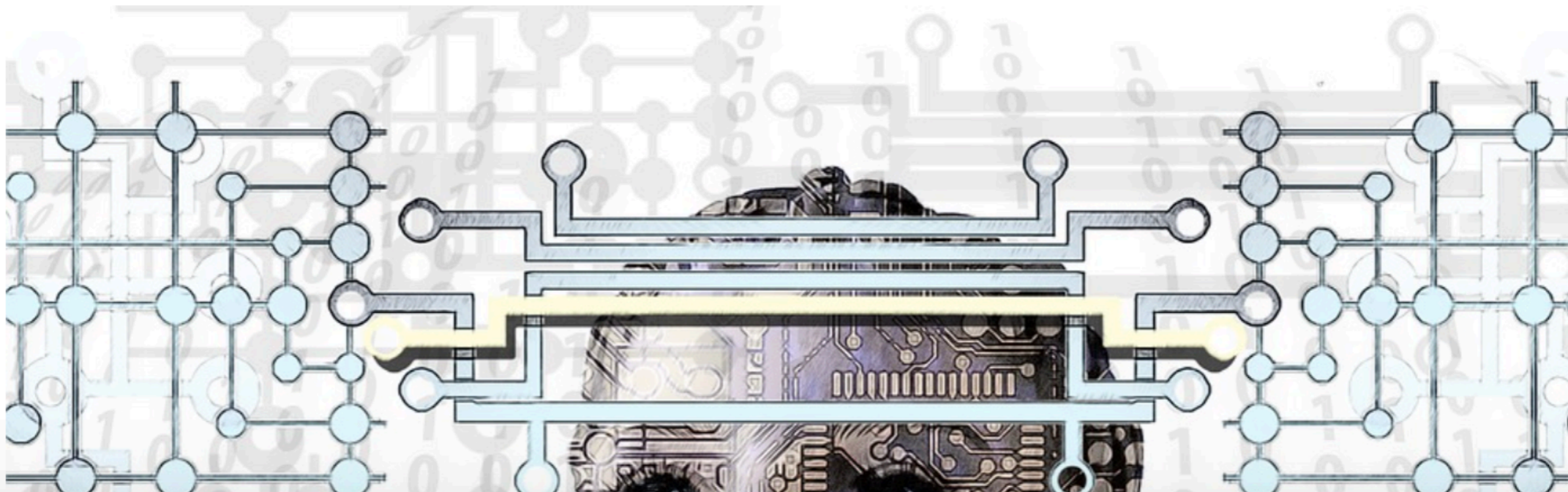
Uber's fatal self-driving crash: all the news and updates

Machine Learning Gone Wrong

Home > Cool Science > After Uber, Tesla Incidents, Can Artificial Intelligence Be Trusted?

After Uber, Tesla Incidents, Can Artificial Intelligence Be Trusted?

April 13, 2018



“Bias” in Machine Learning

Stereotypes in Google Translate

Translate

French English Turkish Detect language

English French Turkish Translate

He is a babysitter
She is a doctor

O bir bebek bakıcısı
O bir doktor

Translate

French English Turkish Detect language

English French Turkish Translate

O bir bebek bakıcısı
O bir doktor

She's a babysitter
He is a doctor

ANITA B.ORG

PAGE 9 | GRACE HOPPER CELEBRATION FOR WOMEN IN COMPUTING 2017
PRESENTED BY THE ANITA BORG INSTITUTE AND THE ASSOCIATION FOR COMPUTING MACHINERY

#GHC17

“Bias” addressed

Text Documents

TURKISH - DETECTED ENGLISH SPANISH FRENCH

TURKISH ARABIC ENGLISH

o bir doktor

Translations are gender-specific. [LEARN MORE](#)

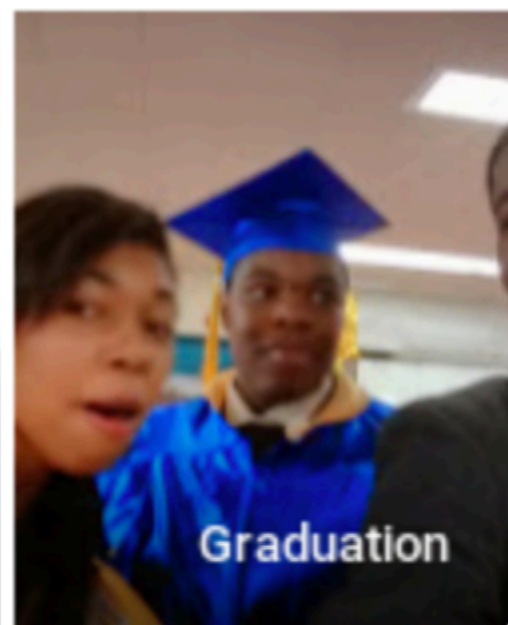
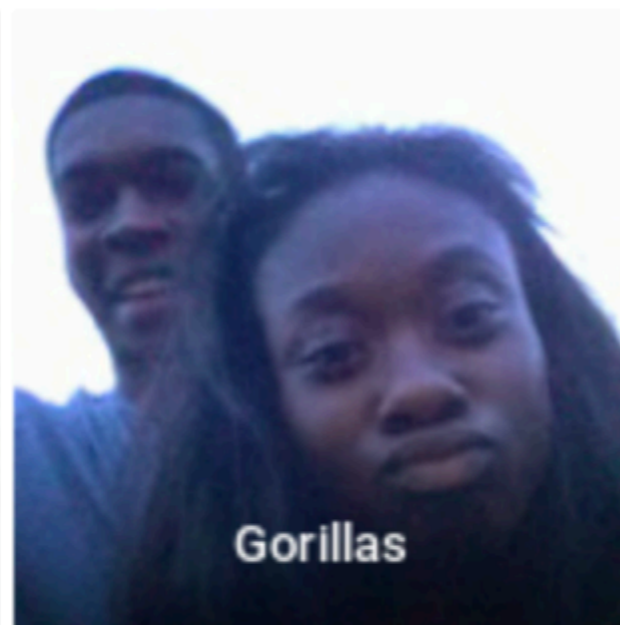
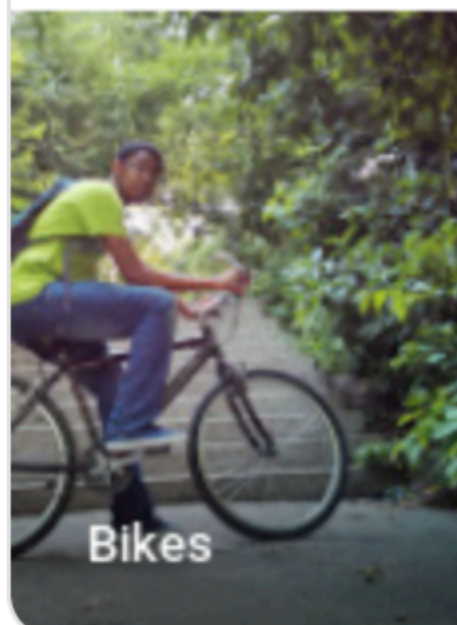
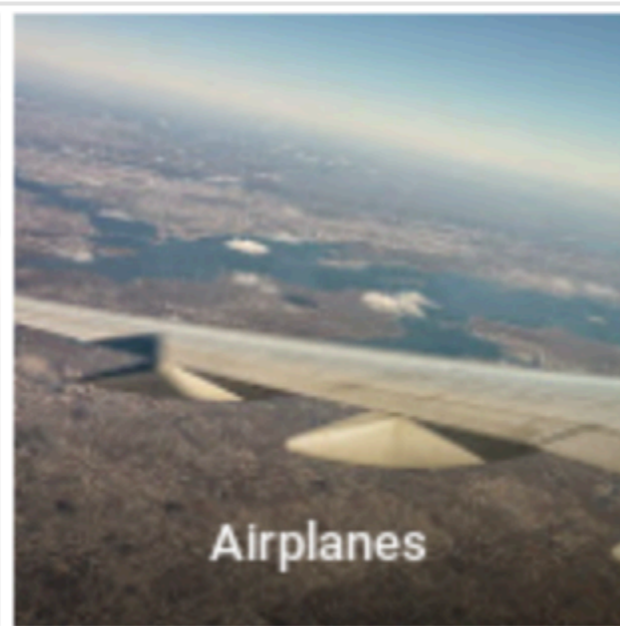
she is a doctor *(feminine)*

he is a doctor *(masculine)*

12/5000

“Racist” Machine Learning?

not a gorilla.



Where is the bride?



“Bias” addressed

“Bias” addressed

A “reality” check



A “reality” check



ABC
CLICK
BBC
NEWS

WH
.GOV

Adversaries!

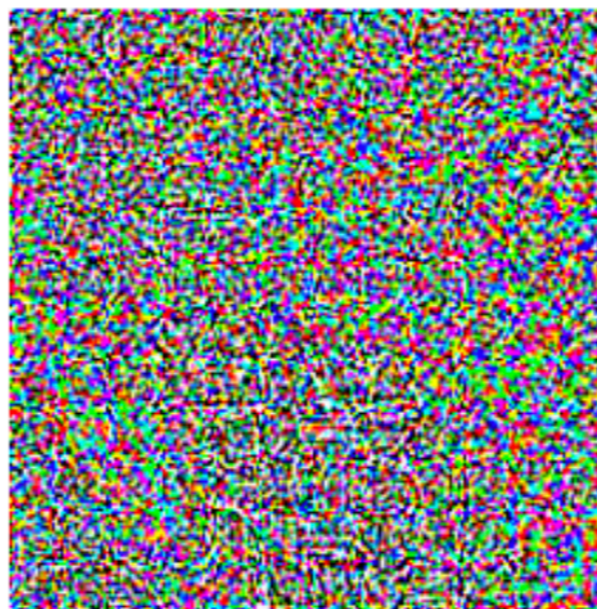


\mathbf{x}

“panda”

57.7% confidence

+ .007 ×



$\text{sign}(\nabla_{\mathbf{x}} J(\boldsymbol{\theta}, \mathbf{x}, y))$

“nematode”

8.2% confidence

=



$\mathbf{x} +$

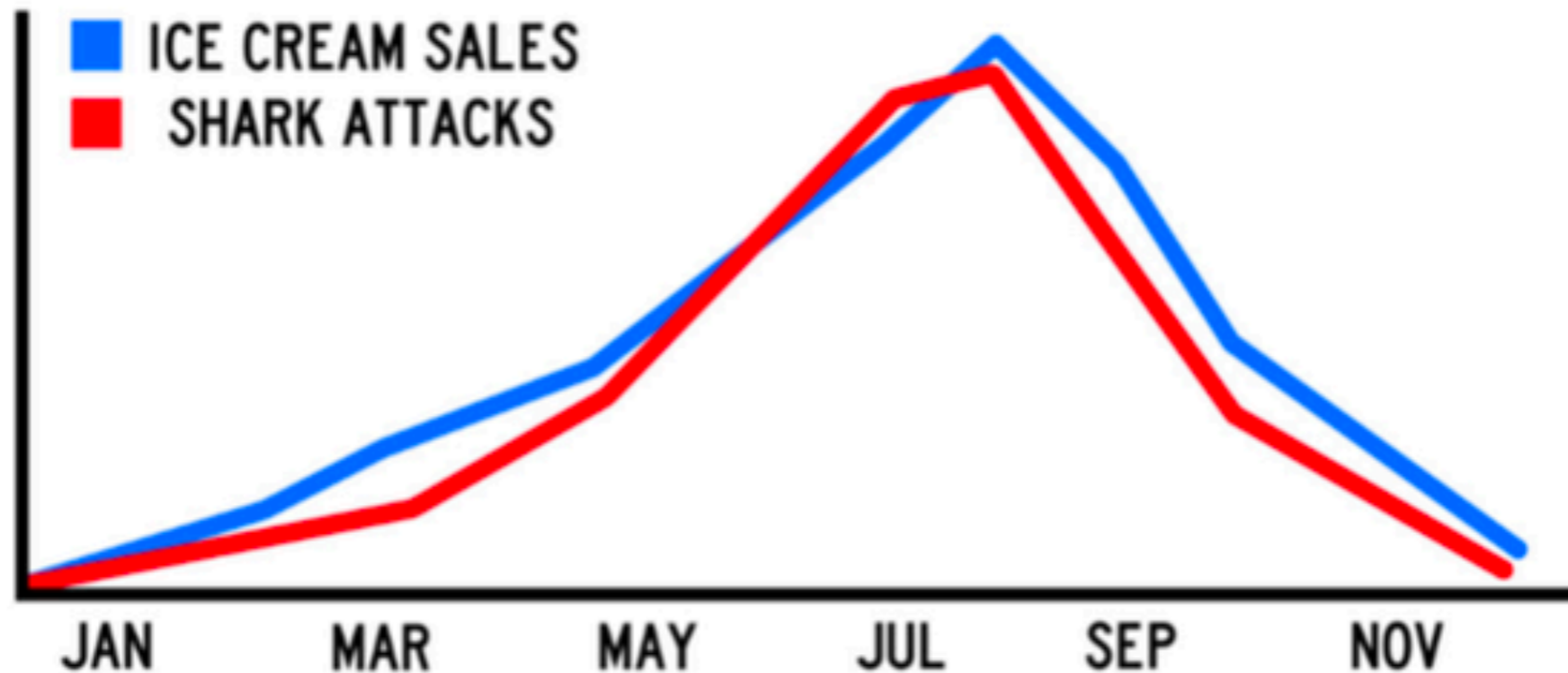
$\epsilon \text{sign}(\nabla_{\mathbf{x}} J(\boldsymbol{\theta}, \mathbf{x}, y))$

“gibbon”

99.3 % confidence

Causality v.s. Correlation

CORRELATION IS NOT CAUSATION!



Both ice cream sales and shark attacks increase when the weather is hot and sunny, but they are not caused by each other (they are caused by good weather, with lots of people at the beach, both eating ice cream and having a swim in the sea)

What is Machine Learning?

What is Machine Learning?

- “Field of study that give computers the ability to learn without being explicitly programmed” - Arthur Samuel [1959]

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What is Machine Learning?

- “Field of study that give computers the ability to learn without being explicitly programmed” - Arthur Samuel [1959]
- “A computer program is said to **learn** from **experience E** with respect to some class of **tasks T** and **performance measure P** if its performance at tasks in T, as measured by P, improves with experience E.” - Tom Mitchell

What is Machine Learning?



Input
Chest X-Ray Image

CheXNet
121-layer CNN

Output
Pneumonia Positive (85%)



Q: Identify task, performance measure, and experience

What is Machine Learning?

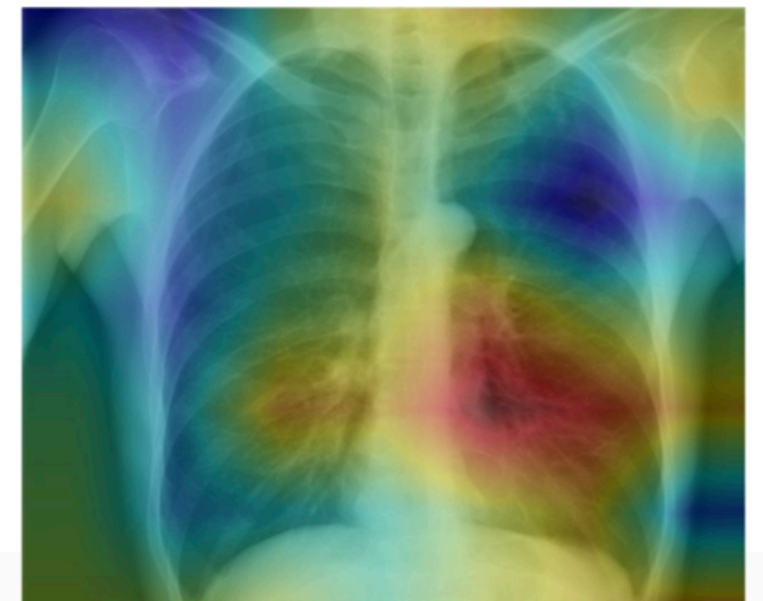


Input
Chest X-Ray Image

Task

CheXNet
121-layer CNN

Output
Pneumonia Positive (85%)



Q: Identify task, performance measure, and experience

What is Machine Learning?

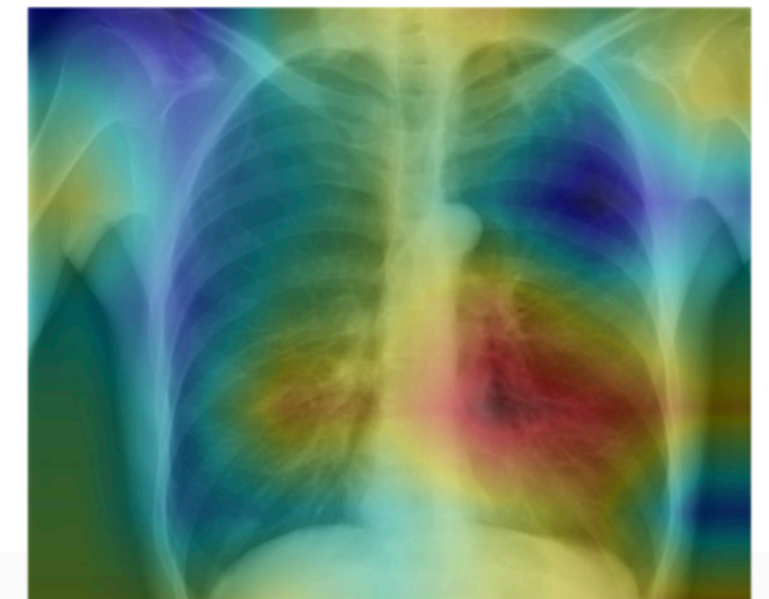
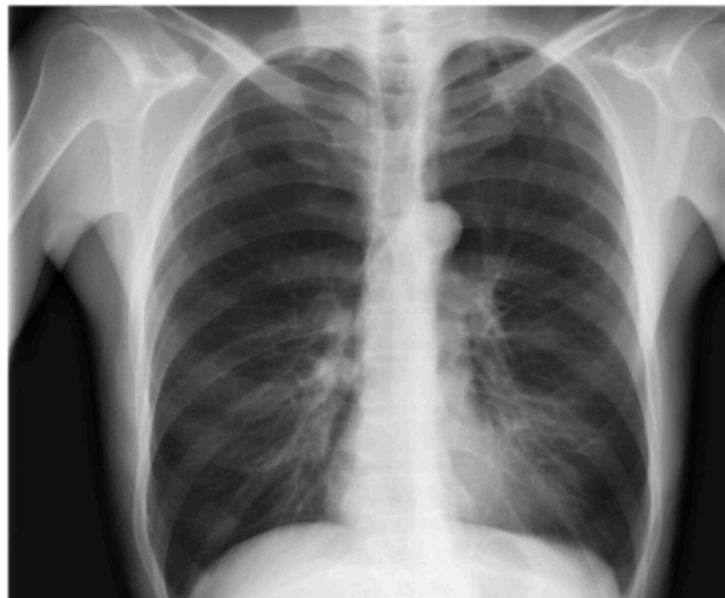
Performance
measure

Output

Pneumonia Positive (85%)

Task

CheXNet
121-layer CNN



Input

Chest X-Ray Image

Q: Identify task, performance measure, and experience

What is Machine Learning?

Experience

1000s of <image, disease> pairs

Performance
measure

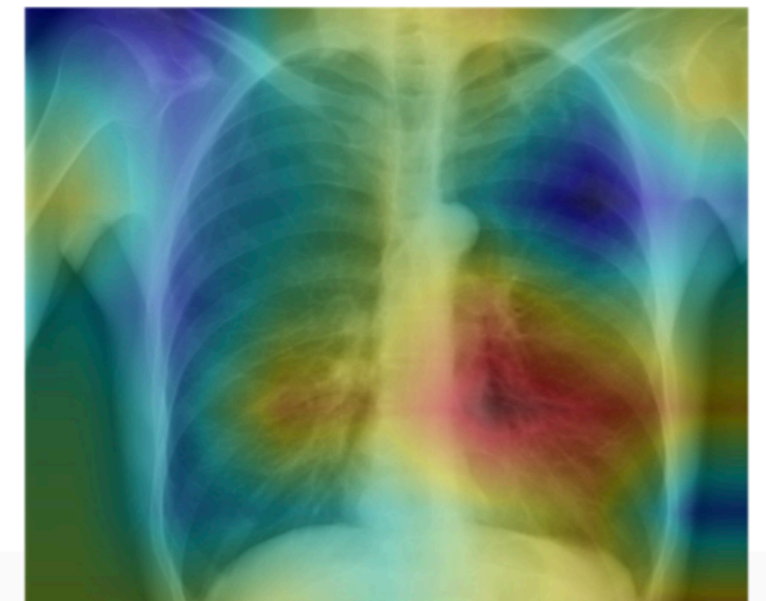
Output

Pneumonia Positive (85%)



Task

CheXNet
121-layer CNN



Input

Chest X-Ray Image

Q: Identify task, performance measure, and experience

What is Machine Learning?

Experience

1000s of <image, disease> pairs

Performance
measure

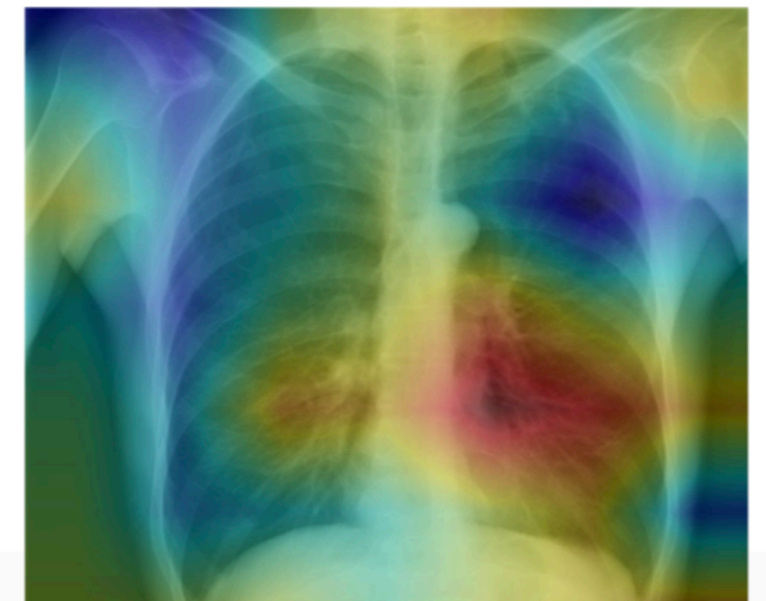
Output

Pneumonia Positive (85%)



Task

CheXNet
121-layer CNN



Input

Chest X-Ray Image

What is Machine Learning?

Experience

1000s of <image, disease> pairs



Input

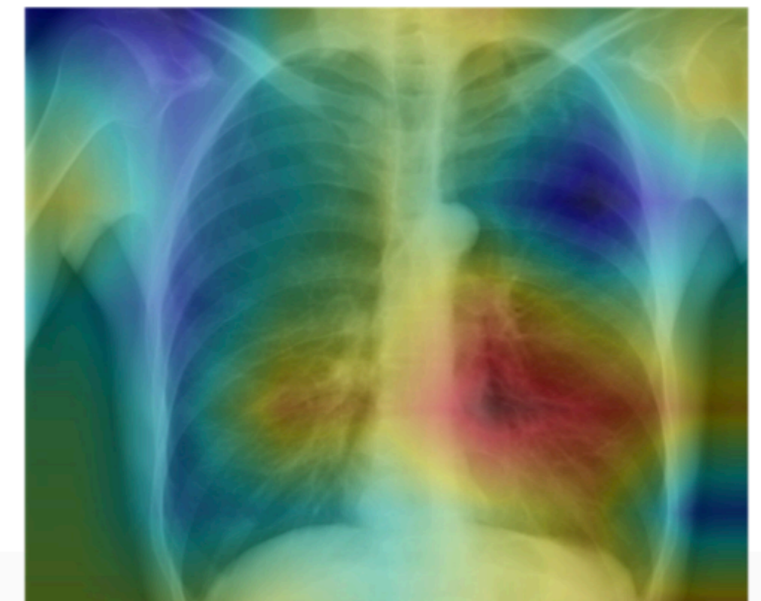
Chest X-Ray Image

Task

CheXNet
121-layer CNN

Output

Pneumonia Positive (85%)



What is Machine Learning?

Experience

1000s of <image, disease> pairs



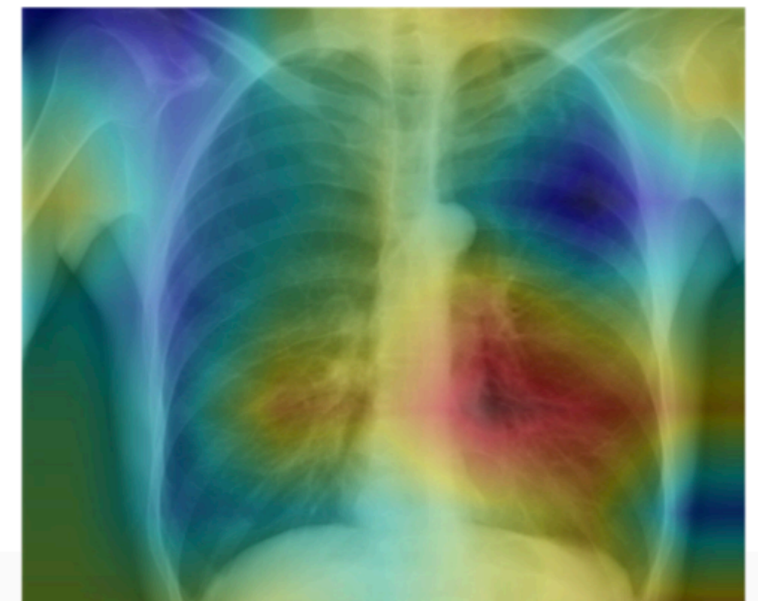
Input

Chest X-Ray Image

CheXNet
121-layer CNN

Output

Pneumonia Positive (85%)



What is Machine Learning?

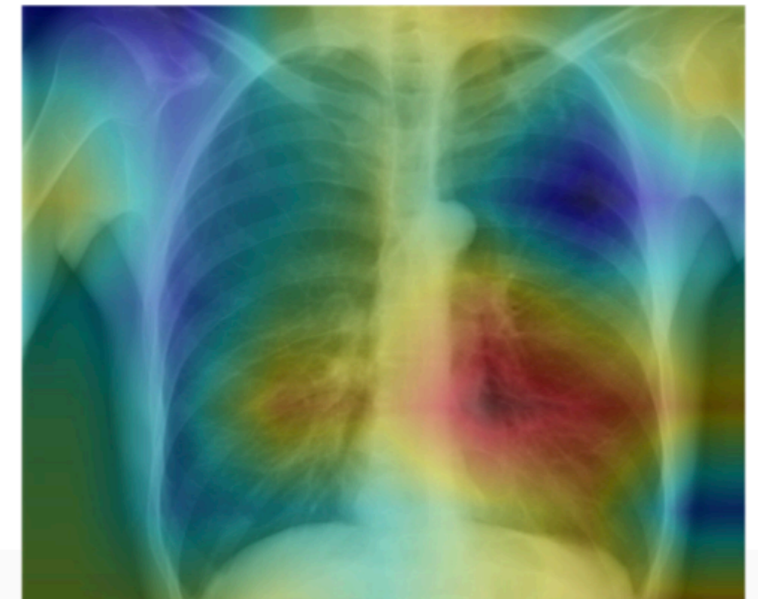
Experience
1000s of <image, disease> pairs



Input
Chest X-Ray Image

CheXNet
121-layer CNN

Output
Pneumonia Positive (85%)



What is Machine Learning?

Experience
1000s of <image, disease> pairs

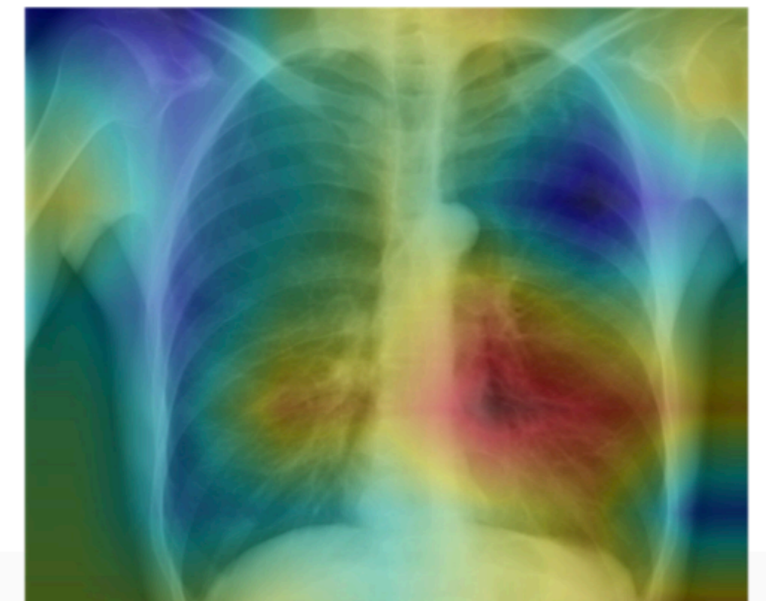
Supervised Learning

Output

Pneumonia Positive (85%)



CheXNet
121-layer CNN



Input

Chest X-Ray Image

Google Classroom and Website

Google Classroom code: cgt6rwd

Website: <https://sites.google.com/view/es654-2020/>

Announcement

Announcement

- Saturday, 11th Jan: Extra lecture(s) at 10 AM in 1/101 in lieu of 15th Jan (institute holiday)