

# Lecture 1: Introduction to ML

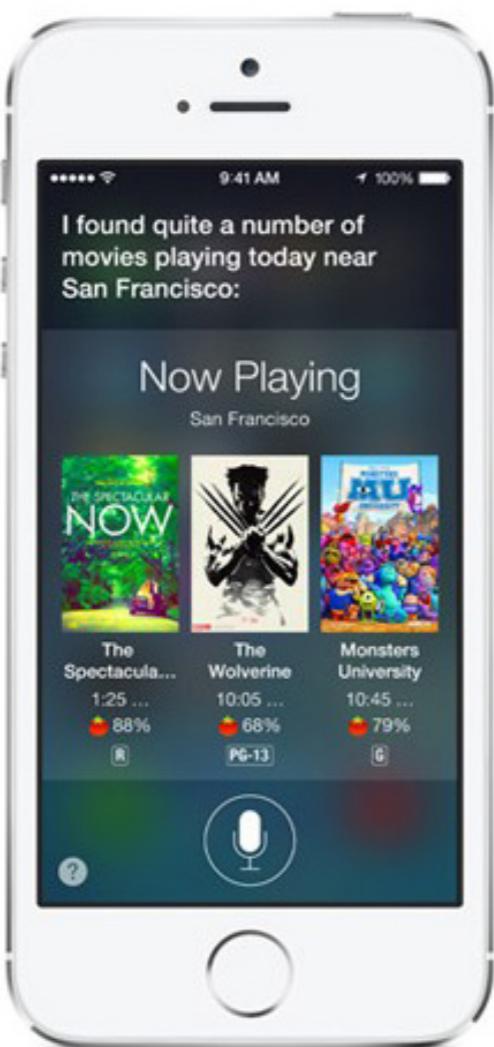
## Course: ES 654

Nipun Batra  
Jan 6, 2020

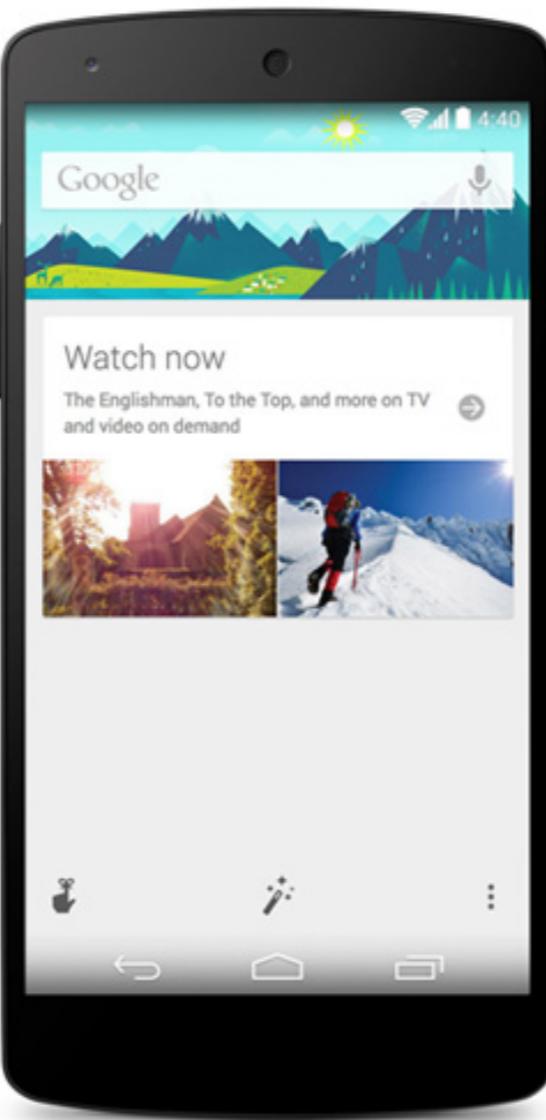
# Machine Learning Applications

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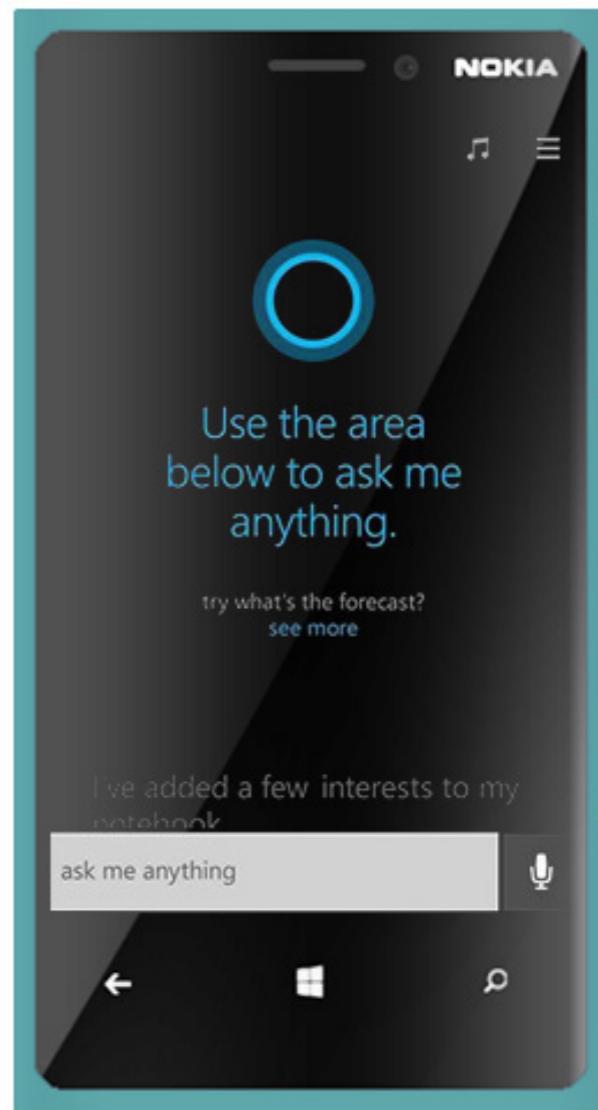
Apple Siri



Google Now

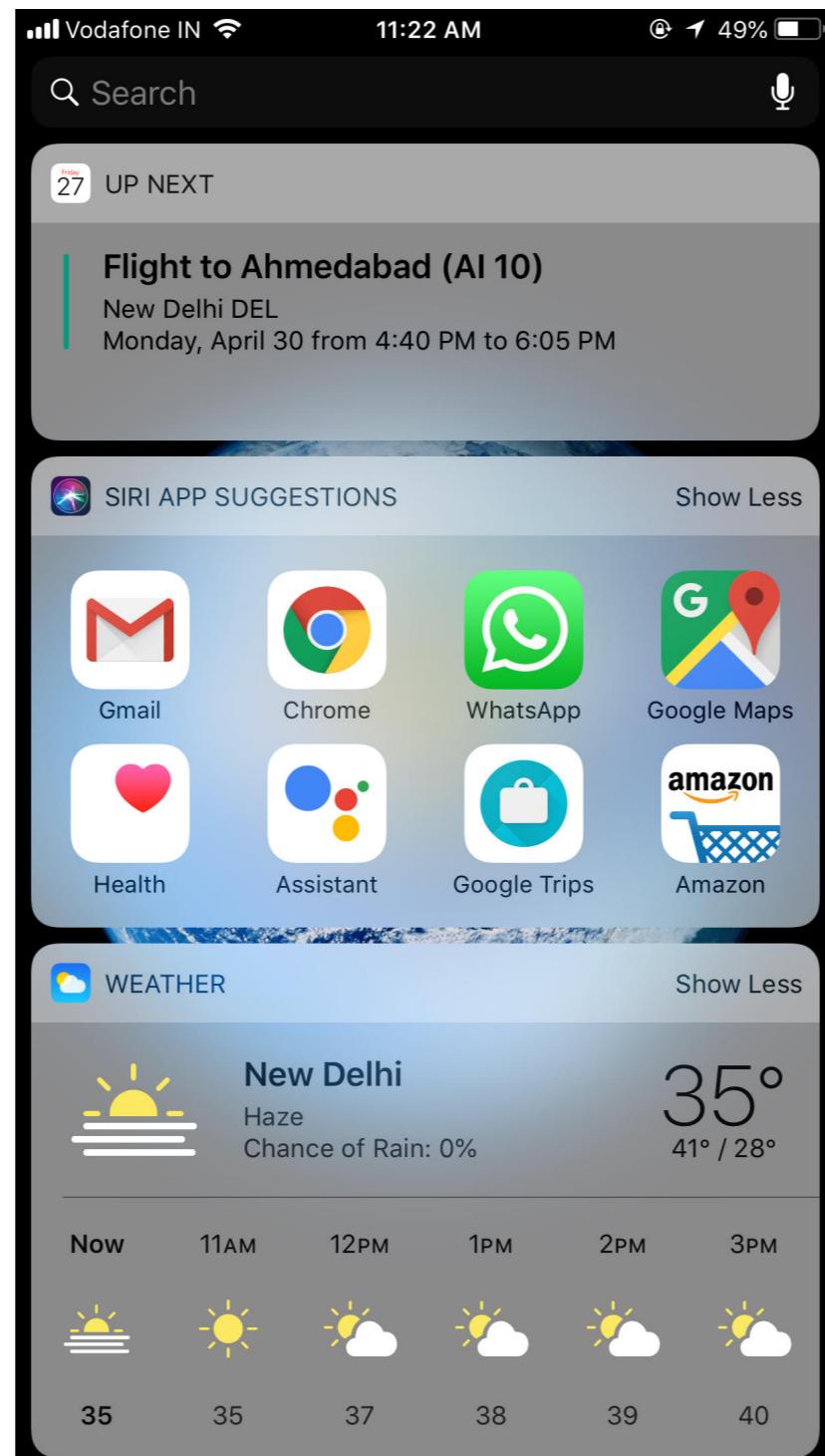


Windows Cortana



# Machine Learning Applications

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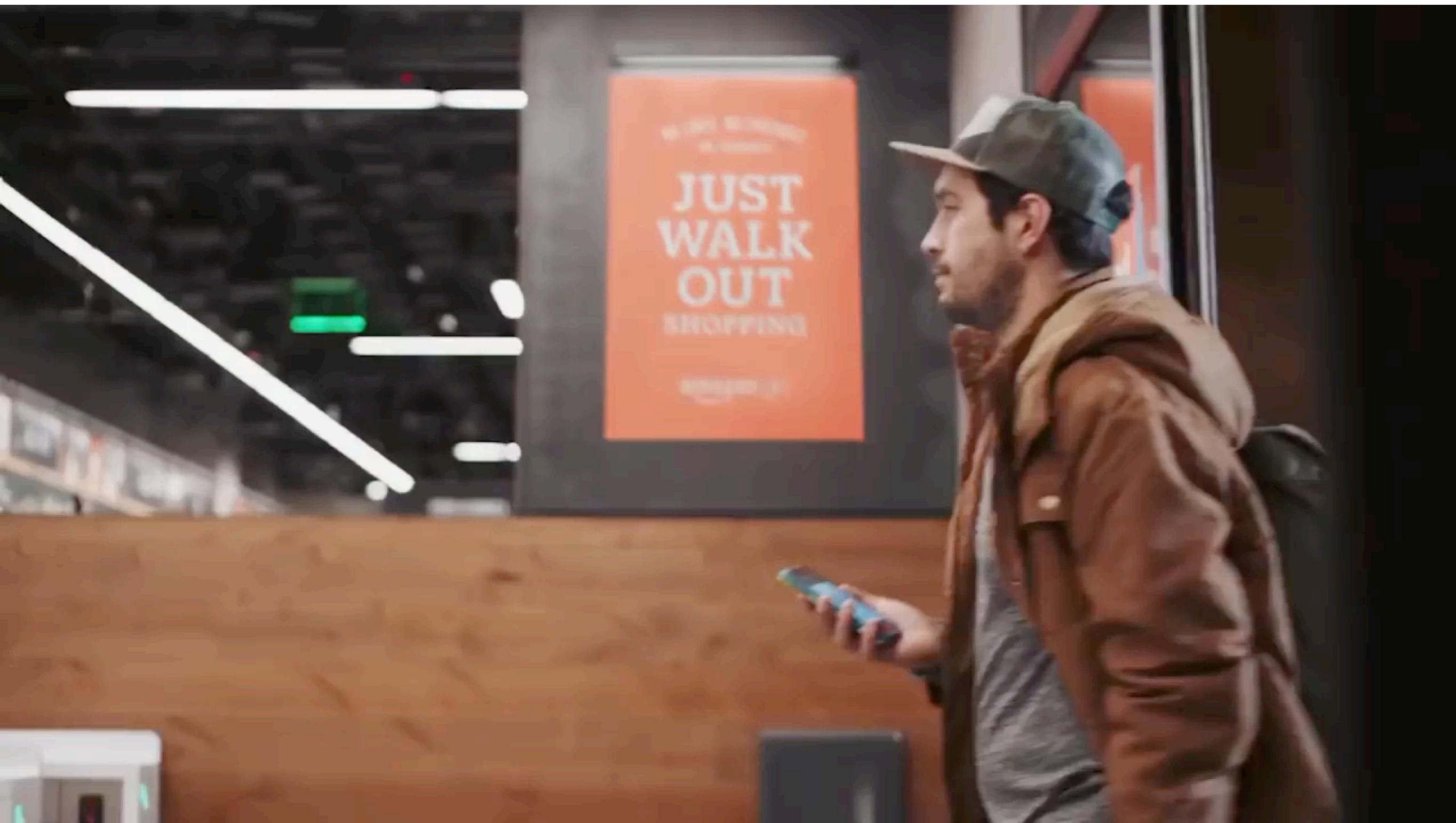
# The Long Wait ...

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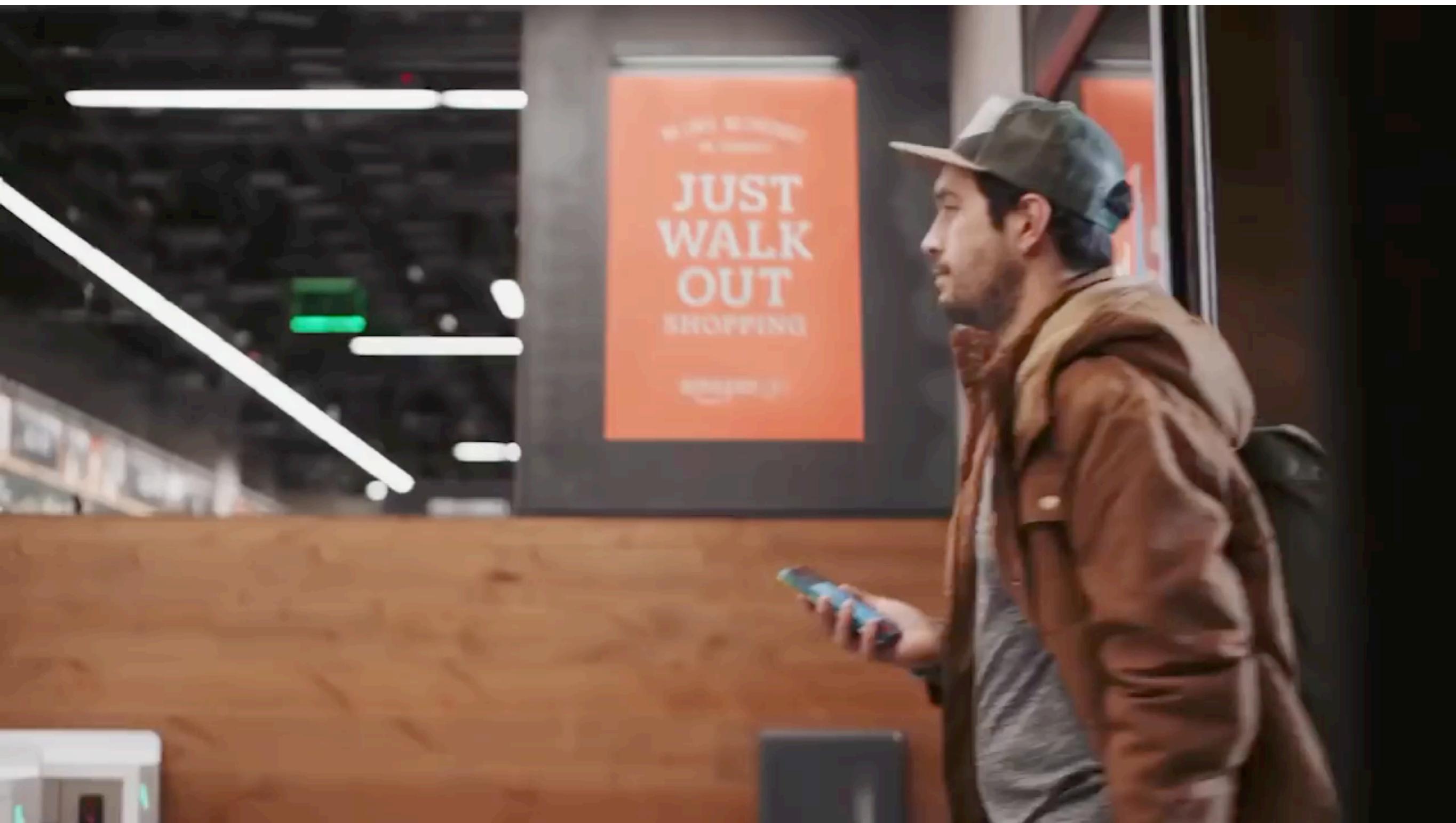
# Machine Learning Applications

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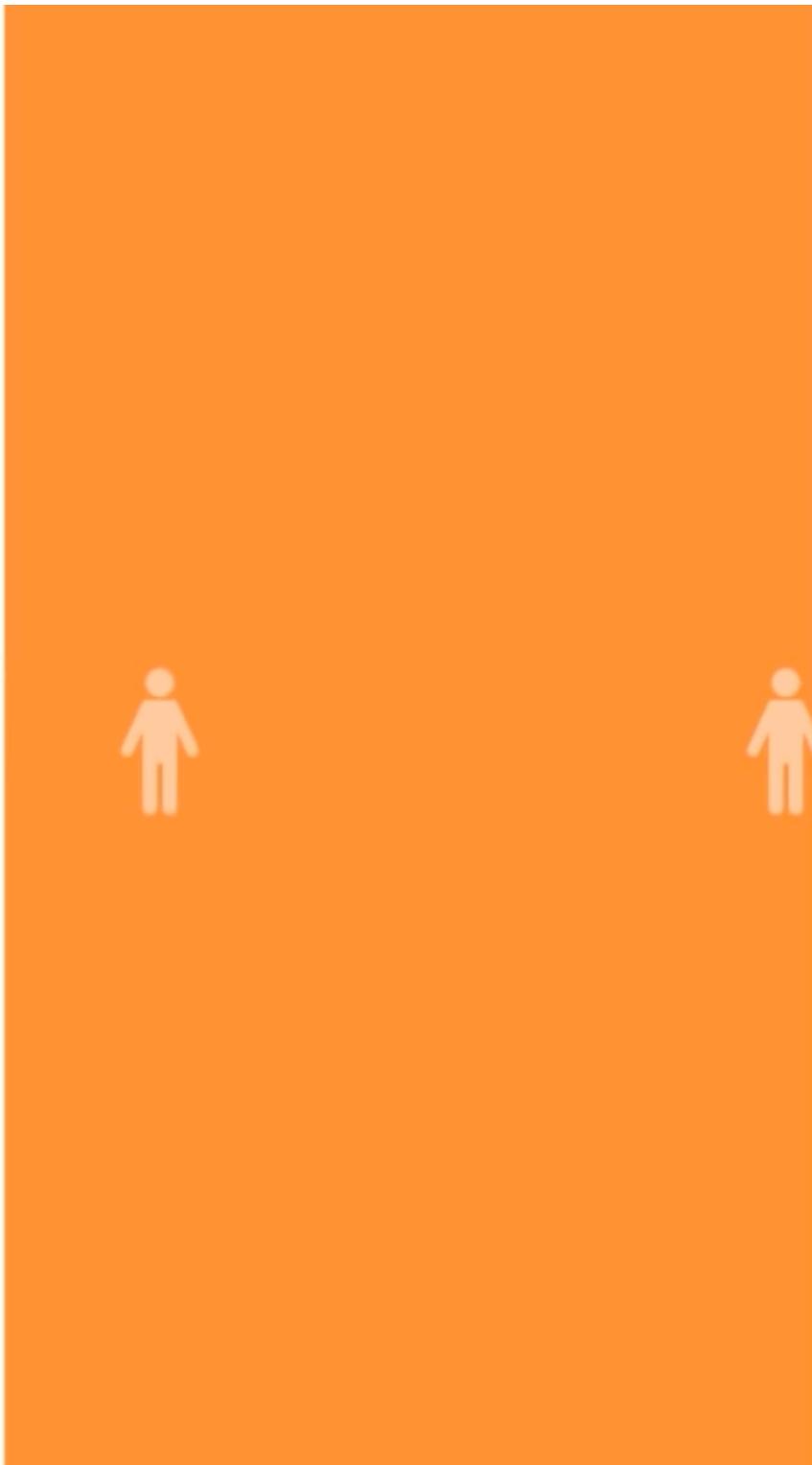
# Machine Learning Applications

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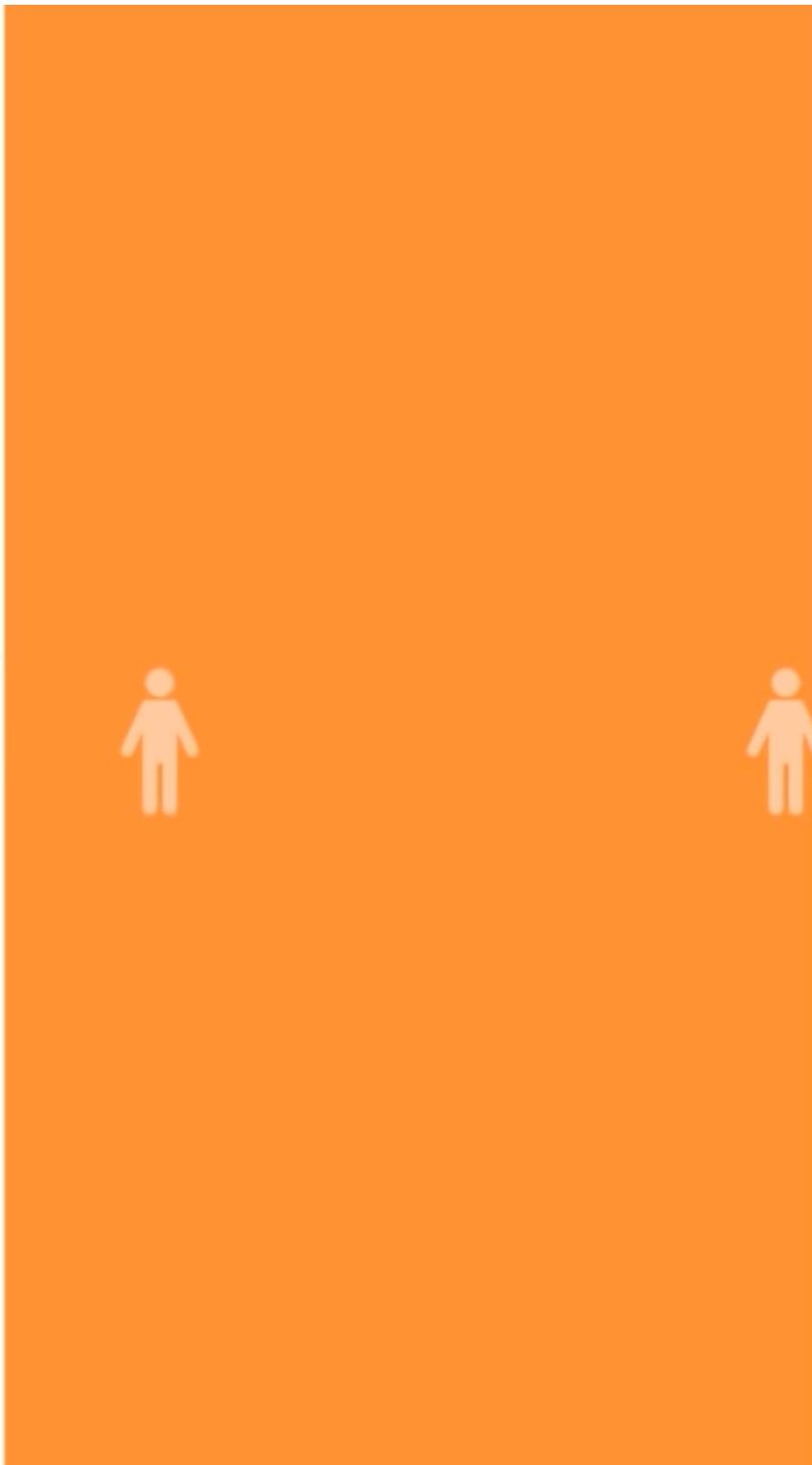
# Machine Learning Applications

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# Machine Learning Applications

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# Never Liked To Call People!

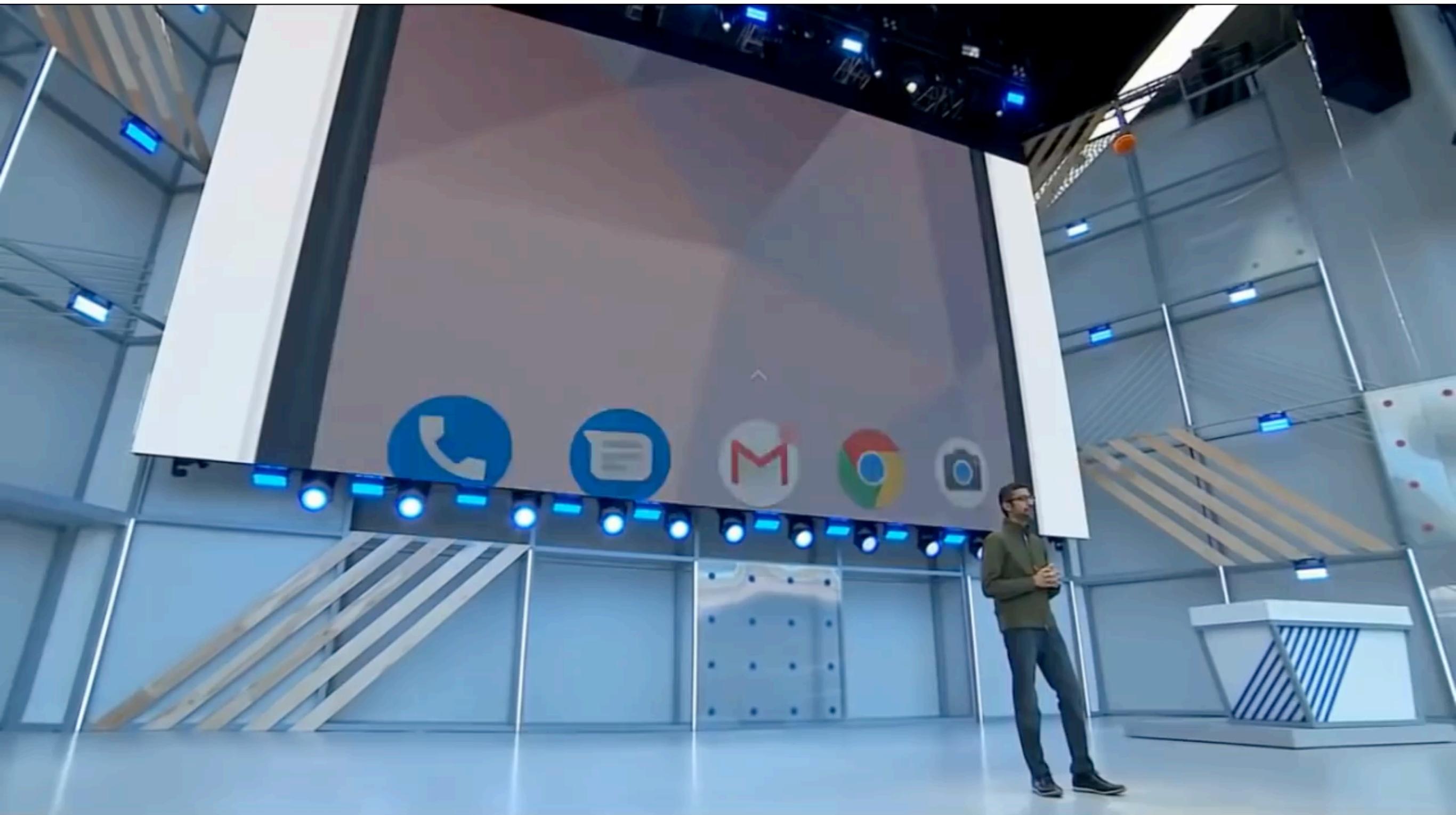
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**I might be able to fit  
you in on Monday...**

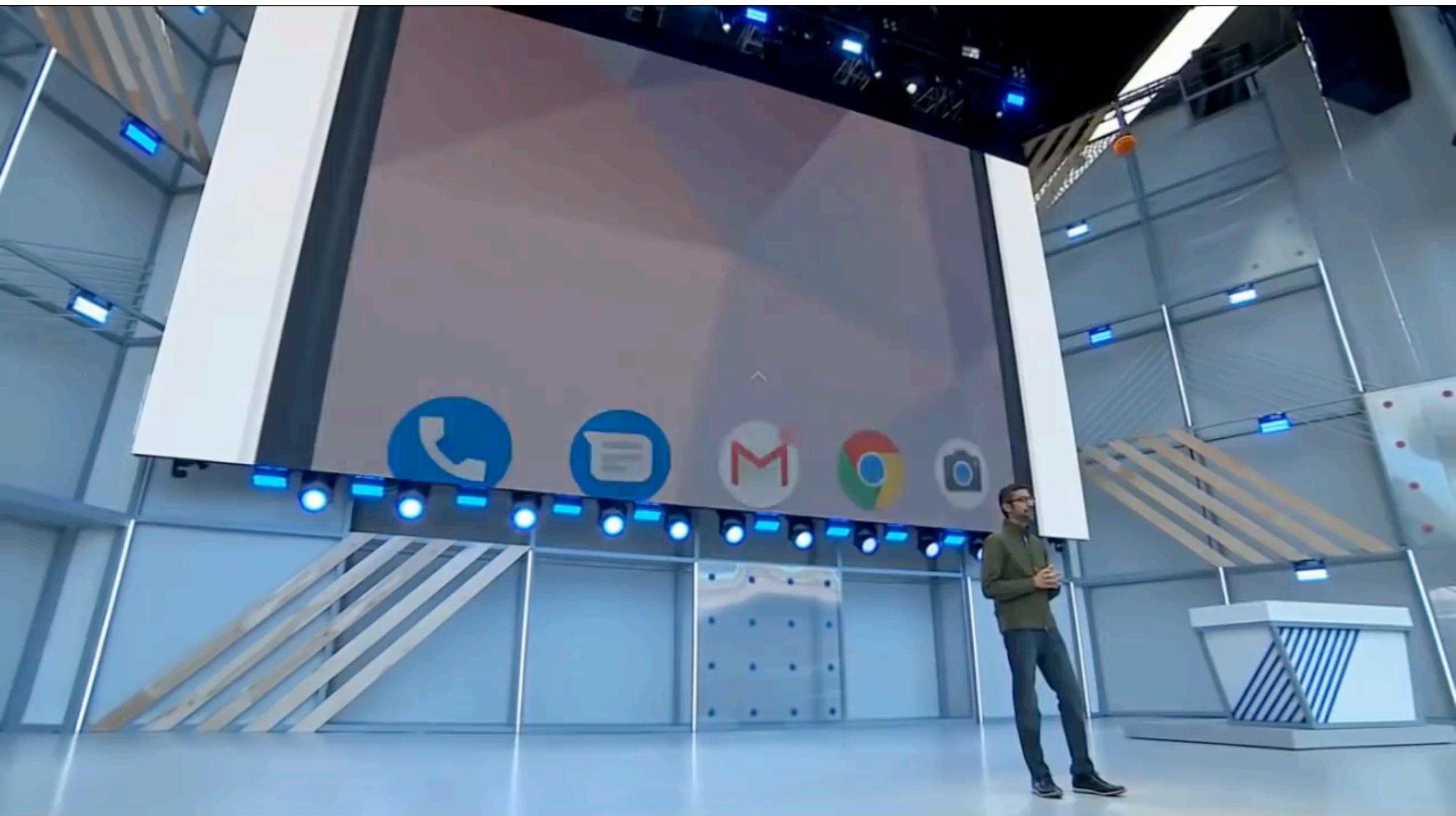
# Google Duplex!

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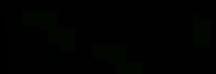
# Google Duplex!

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# Saving The Planet - One Watt A time

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# Saving The Planet - One Watt A time

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# Self Driving Car

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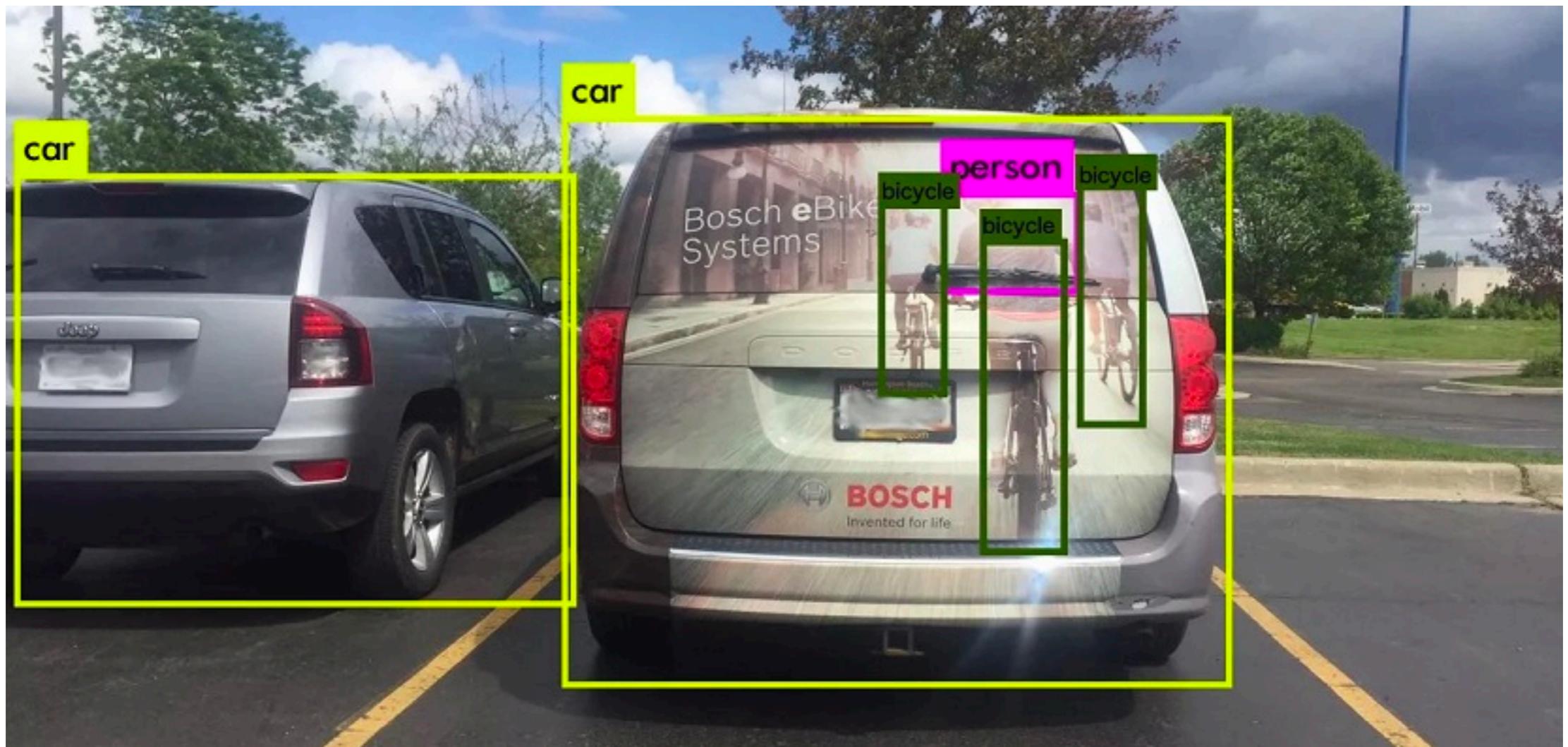
# Self Driving Car

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# Self Driving Car

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Courtesy: Cognata

# ML for Farm

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# ML for Farm

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# ML for Healthcare

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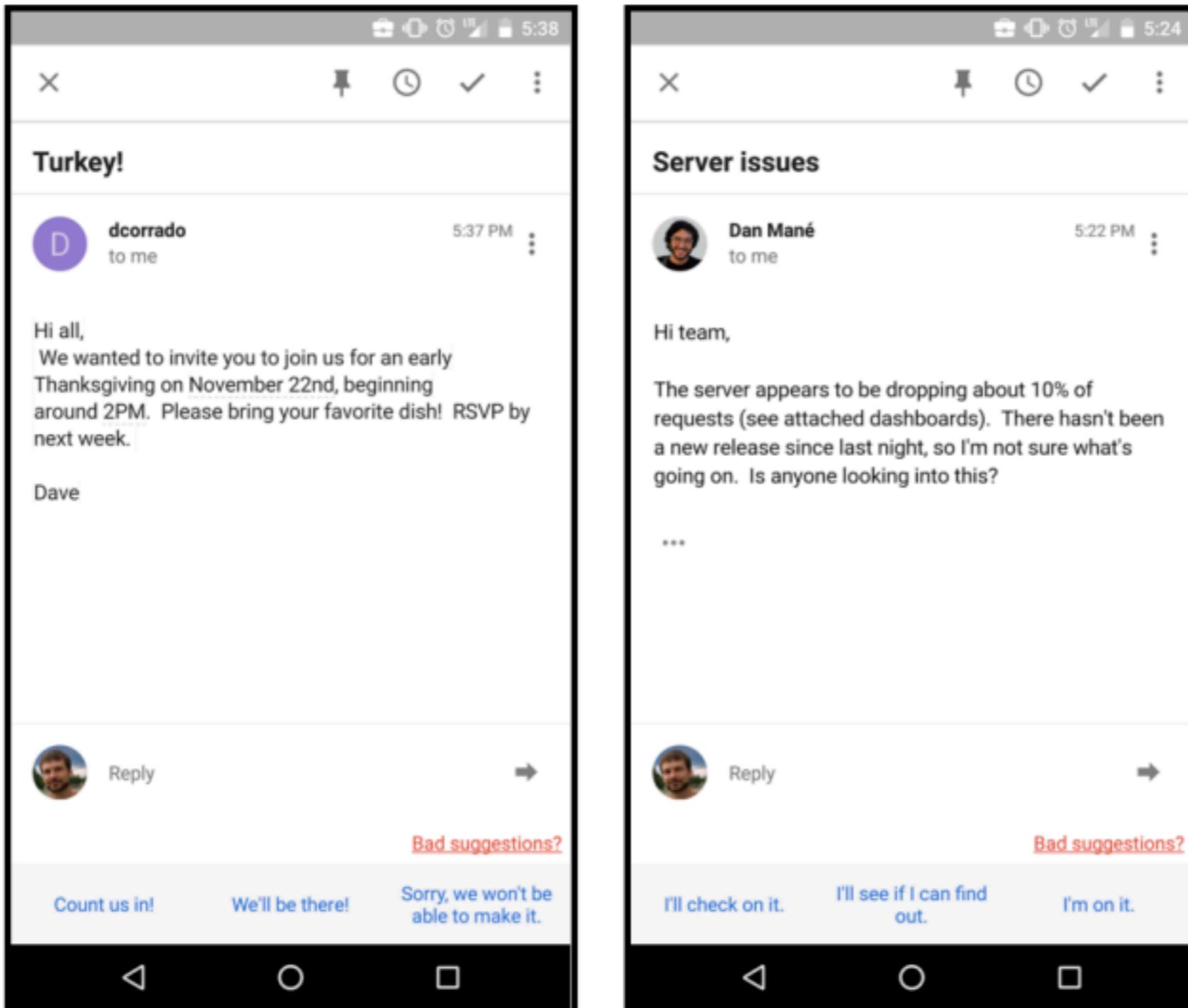
# ML for Healthcare

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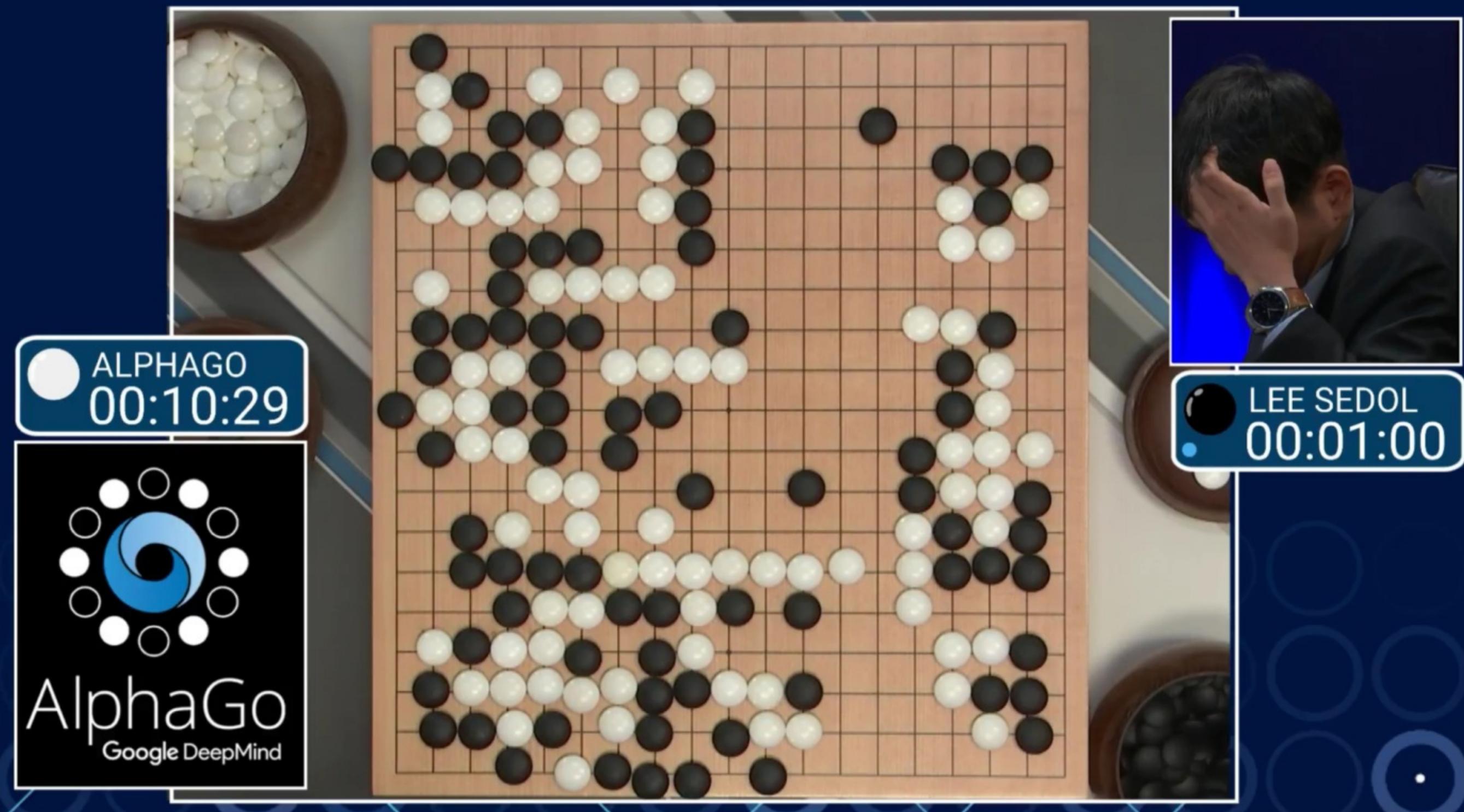


# Auto Reply

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# Machine Learning Applications



# Machine Learning Applications

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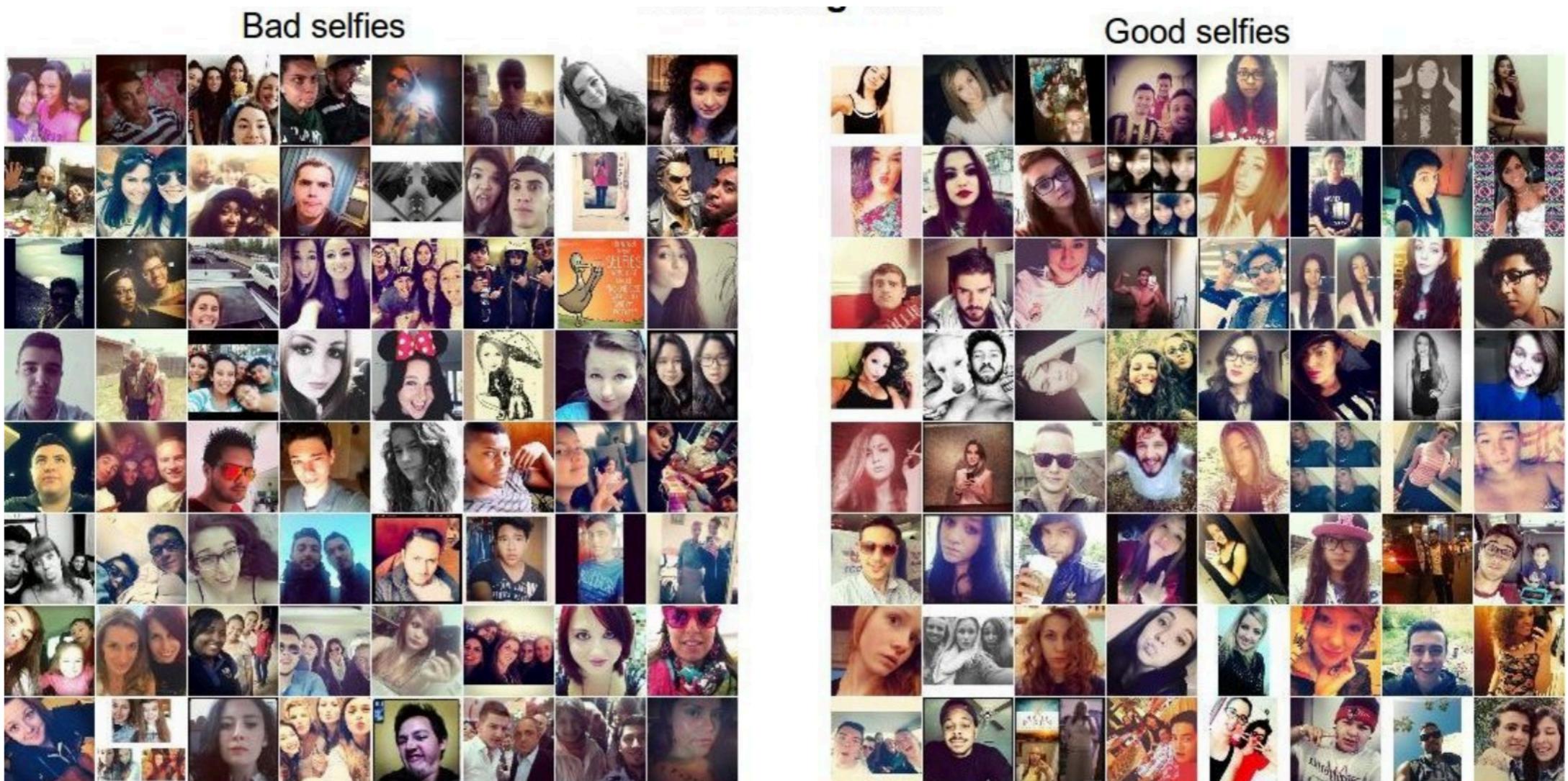
**Input**  
Chest X-Ray Image

**CheXNet**  
121-layer CNN

**Output**  
Pneumonia Positive (85%)



# Machine Learning Applications

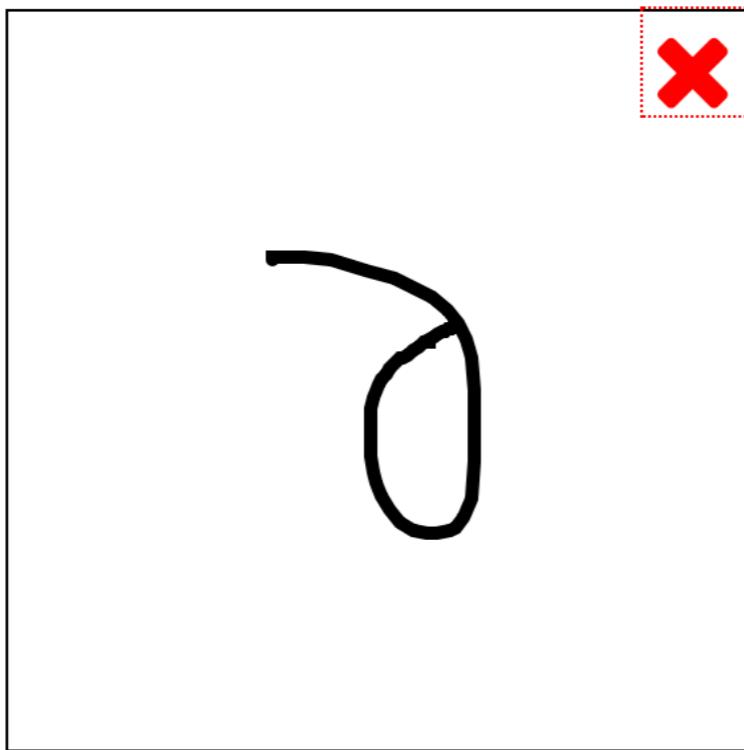


Example images showing good and bad selfies in our training data. These will be given to the ConvNet as teaching material.

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

# Machine Learning Applications

## Detexify

[classify](#)[symbols](#)

### 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](#)

Score: 0.12107724371908918  
 $\partial$   
mathmode

Score: 0.1744210074369589  
 $\exists$   
\usepackage{ amssymb }  
\Game  
mathmode

Score: 0.18567692685446785  
\usepackage{ tipa }  
\textbabygamma  
textmode

Score: 0.19845446379011045  
 $\gamma$   
\usepackage{ upgreek }  
\upgamma  
mathmode

Score: 0.19849650347374576  
 $\eth$   
\usepackage[T1]{fontenc}  
\dh  
textmode

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

Did this help?

# Machine Learning Applications

Labels

Web

Properties

Safe Search

JSON



image\_20121216120914.jpg

Test Cricket

98%

Cricket

98%

Baseball Player

98%

Cricketer

97%

Bat And Ball Games

96%

Team Sport

91%

Ball Game

88%

Games

86%

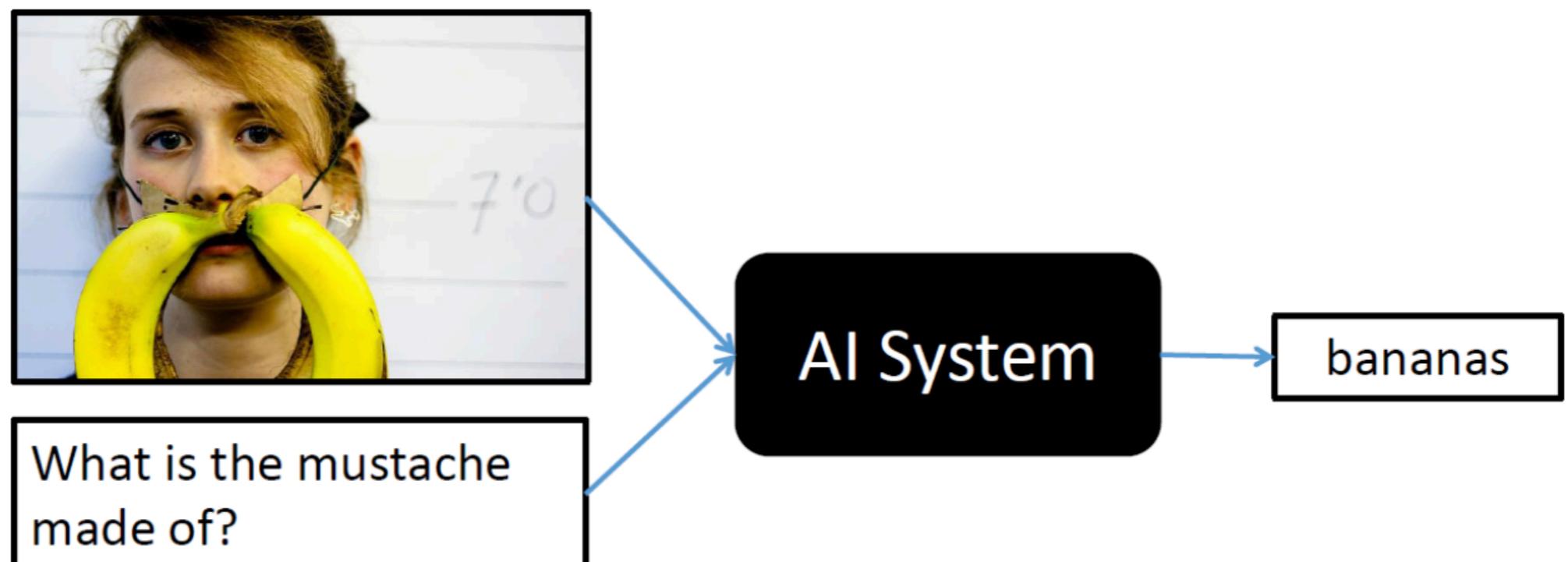
Sports

85%

# Machine Learning Applications

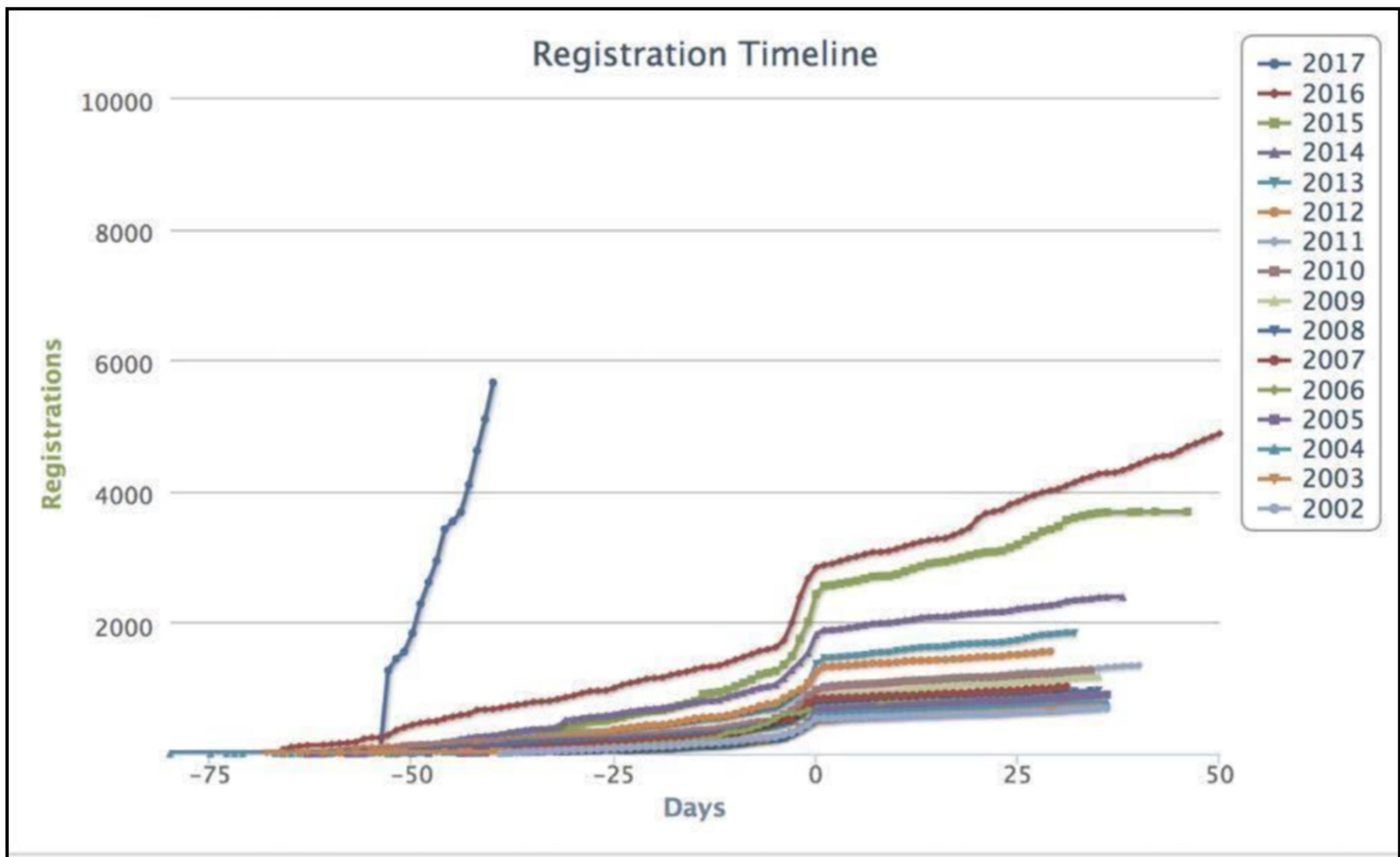
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## Visual Q and A



# NeurIPS registration

$x=0 \rightarrow$  early registration deadline



# Machine Learning Gone Wrong

THE VERGE

TECH ▾

SCIENCE ▾

CULTURE ▾

CARS ▾

REVIEWS ▾

LONGFORM

VIDEO

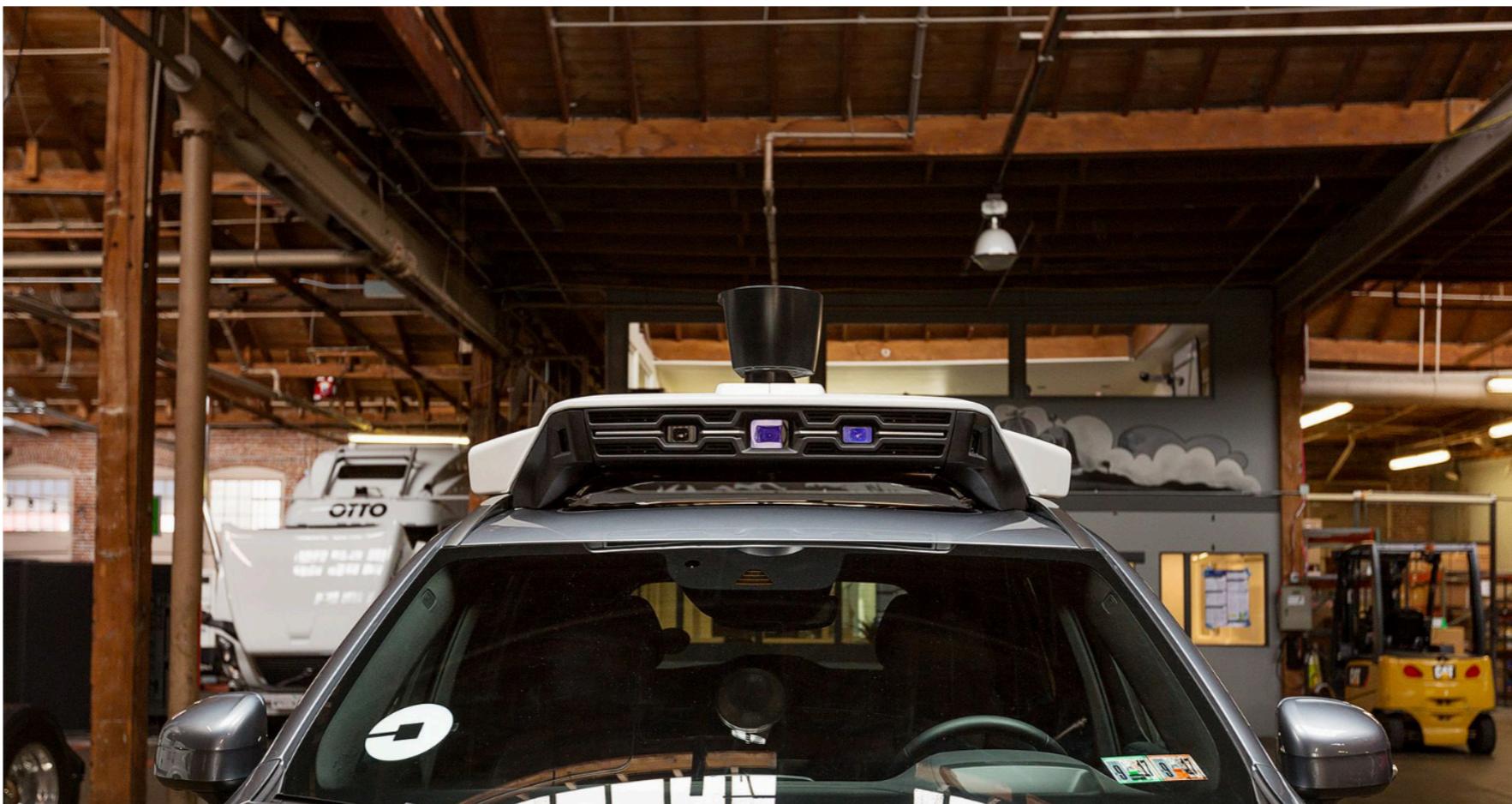
MORE

⌚ STORYSTREAM

TRANSPORTATION

UBER

RIDE-SHARING



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



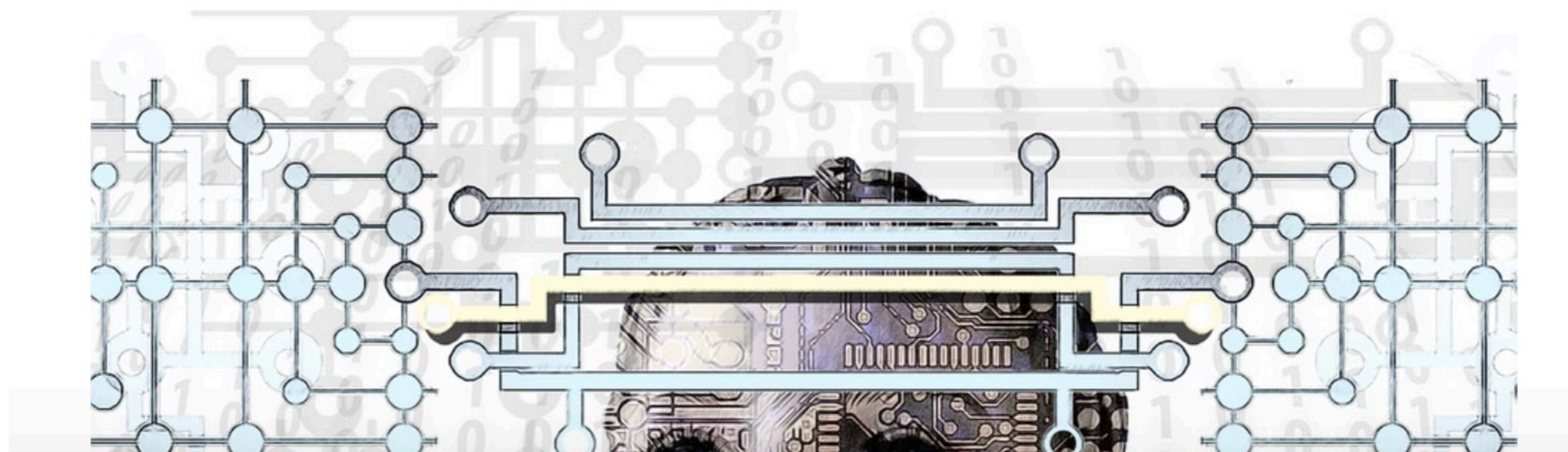
# Machine Learning Gone Wrong

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[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

The screenshot shows two examples of Google Translate's handling of gendered sentences.

**Example 1:** English input: "He is a babysitter  
She is a doctor". Translation: "O bir bebek bakıcısı  
O bir doktor".

**Example 2:** English input: "O bir bebek bakıcısı  
O bir doktor". Translation: "She's a babysitter  
He is a doctor".

Both examples demonstrate a clear bias in favor of male gender roles, as the machine learning model consistently translates "he" to "she" and "she" to "he".

**ANITA BORG**

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

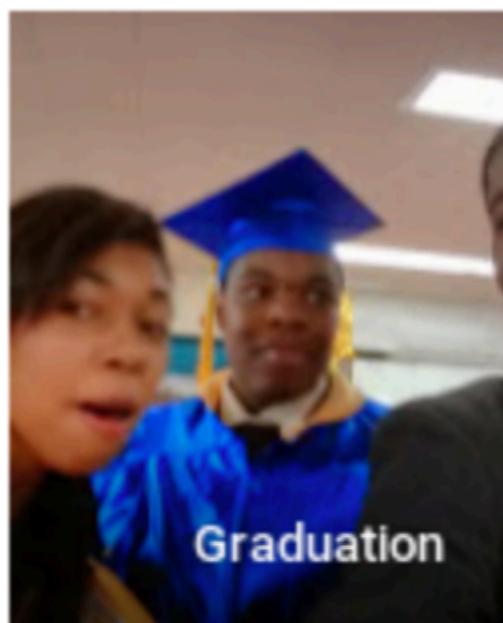
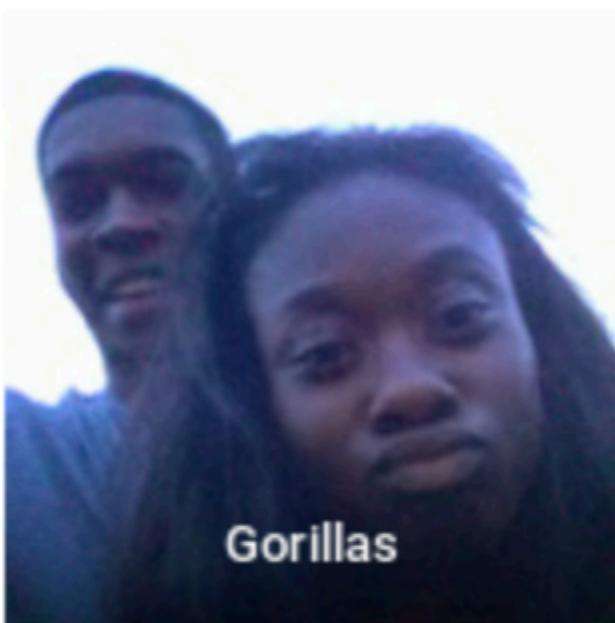
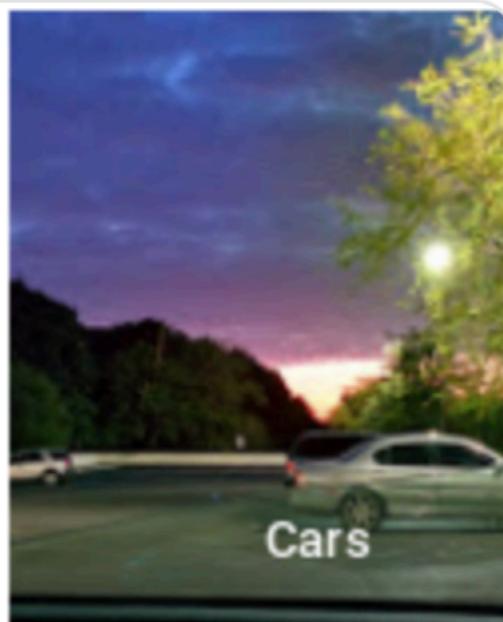
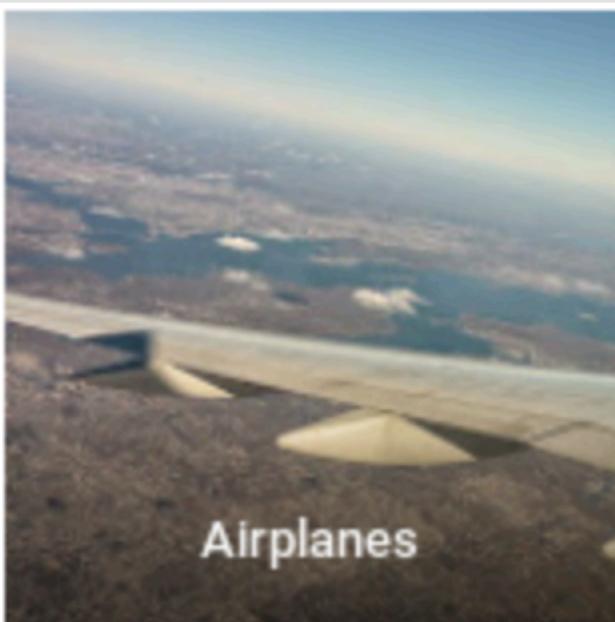
The screenshot shows a translation interface with the following settings:

- Source language: TURKISH - DETECTED
- Target language: ENGLISH
- Other available languages: SPANISH, FRENCH, TURKISH, ARABIC
- Input text: o bir doktor
- Output translations:
  - she is a doctor (feminine)
  - he is a doctor (masculine)
- Annotations:
  - A note states: "Translations are gender-specific. [LEARN MORE](#)"
  - Speaker icons indicate audio availability for each translation.
  - A star icon is present for rating.

# “Racist” Machine Learning?

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not a gorilla.



# Where is the bride?

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# “Bias” addressed

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# “Bias” addressed

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# A “reality” check

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# A “reality” check

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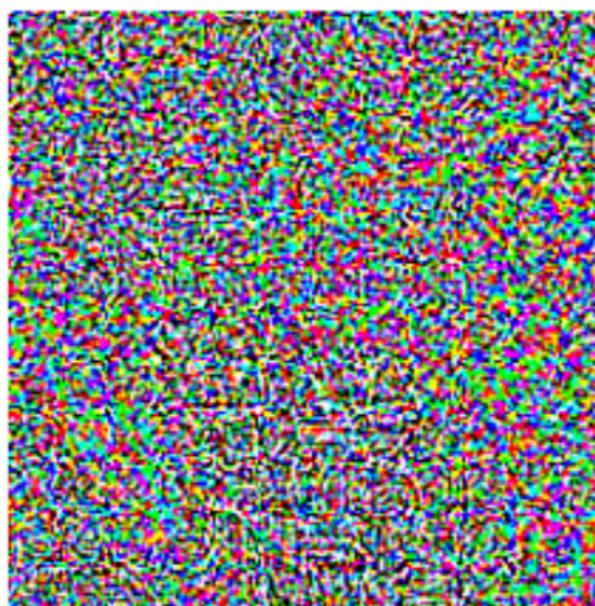
# Adversaries!

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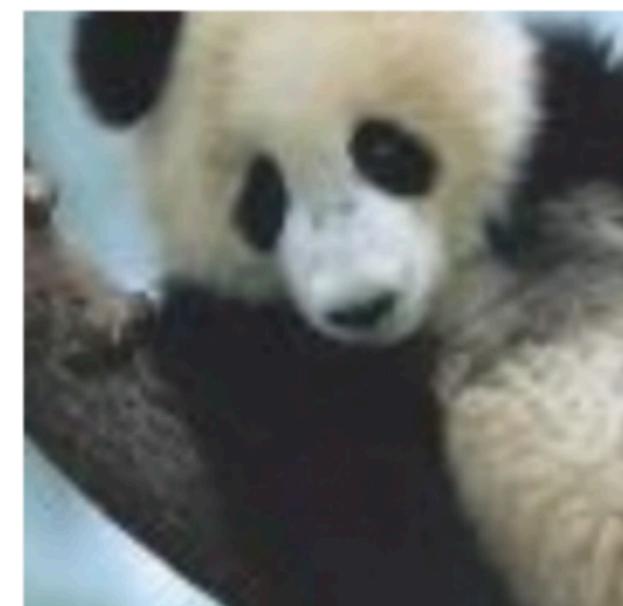
$\mathbf{x}$   
“panda”  
57.7% confidence

+ .007 ×



$\text{sign}(\nabla_{\mathbf{x}} J(\boldsymbol{\theta}, \mathbf{x}, y))$   
“nematode”  
8.2% confidence

=

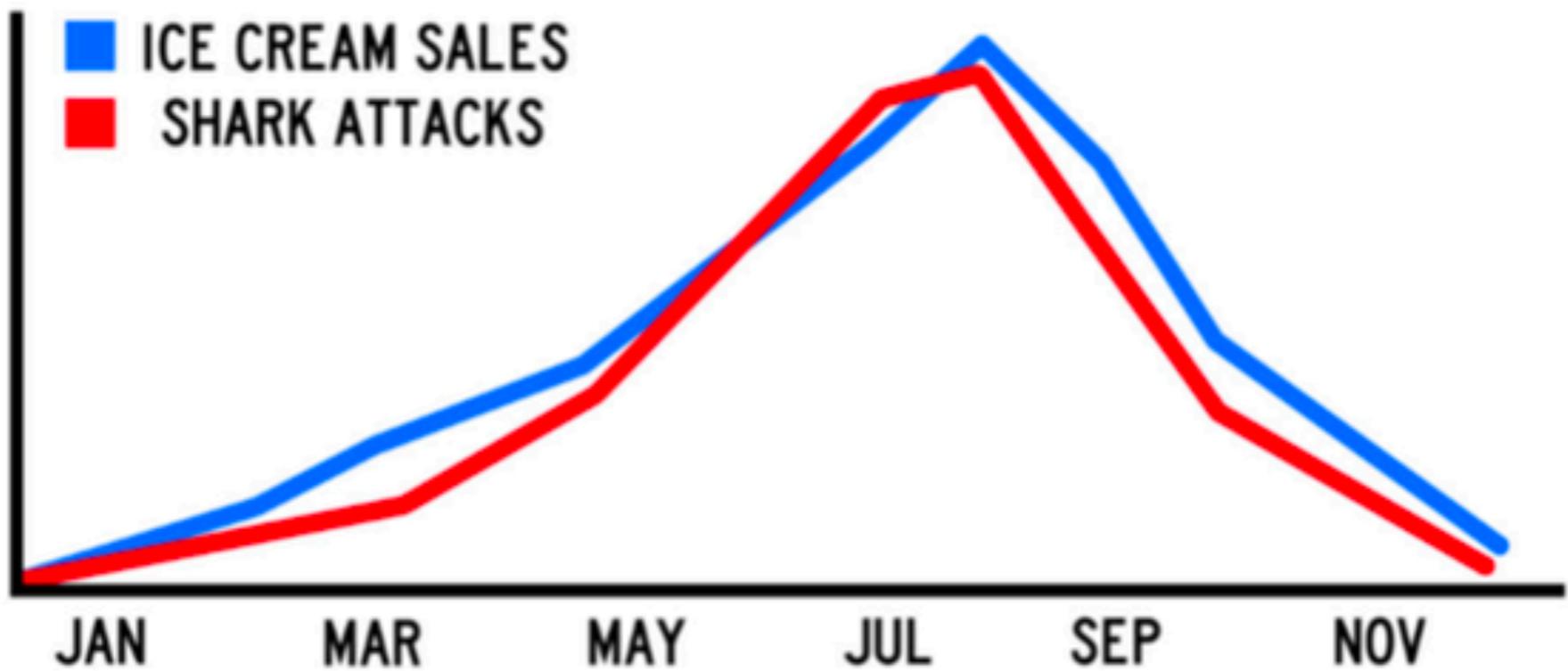


$\mathbf{x} +$   
 $\epsilon \text{sign}(\nabla_{\mathbf{x}} J(\boldsymbol{\theta}, \mathbf{x}, y))$   
“gibbon”  
99.3 % confidence

# Causality v.s. Correlation

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**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?

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# What is Machine Learning?

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

# What is Machine Learning?

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

# What is Machine Learning?

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- “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?

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**Input**  
Chest X-Ray Image

**CheXNet**  
121-layer CNN

**Output**  
Pneumonia Positive (85%)



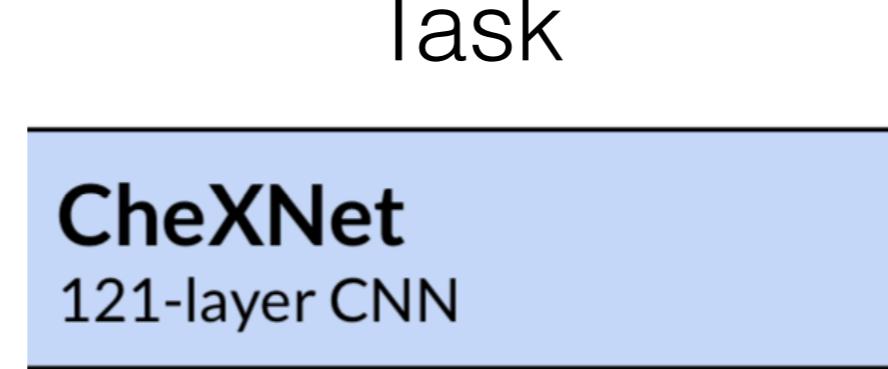
Q: Identify task, performance measure, and experience

# What is Machine Learning?

---



**Input**  
Chest X-Ray Image



**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

Performance  
measure  
**Output**  
Pneumonia Positive (85%)



Q: Identify task, performance measure, and experience

# What is Machine Learning?

---

Experience  
1000s of <image, disease> pairs



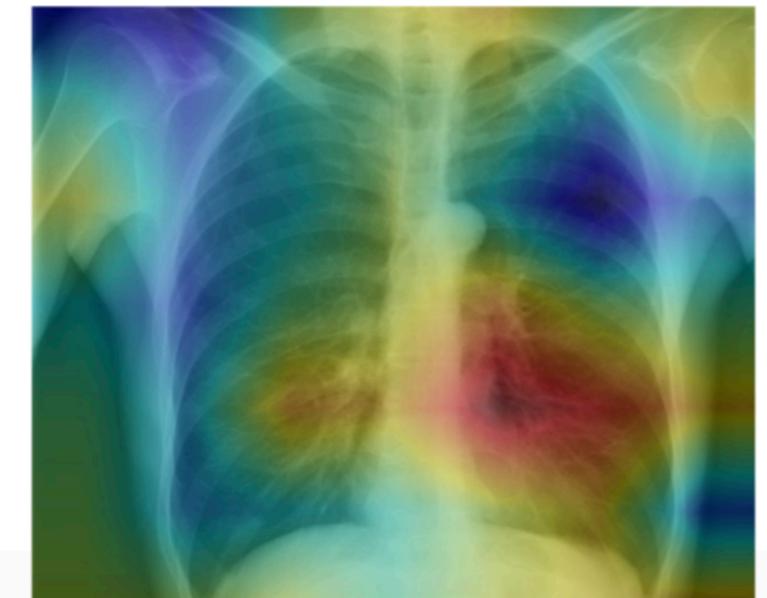
**Input**  
Chest X-Ray Image

Task

**CheXNet**  
121-layer CNN

Performance  
measure

**Output**  
Pneumonia Positive (85%)



Q: Identify task, performance measure, and experience

# What is Machine Learning?

---

Experience  
1000s of <image, disease> pairs



**Input**  
Chest X-Ray Image

Task

**CheXNet**  
121-layer CNN

Performance  
measure

**Output**

Pneumonia Positive (85%)



# 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



**Input**  
Chest X-Ray Image

Supervised Learning  
**Output**  
Pneumonia Positive (85%)



**CheXNet**  
121-layer CNN

# Google Classroom and Website

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Google Classroom code: cgt6rwd

Website: [https://sites.google.com/  
view/es654-2020/](https://sites.google.com/view/es654-2020/)

# Announcement

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# Announcement

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