

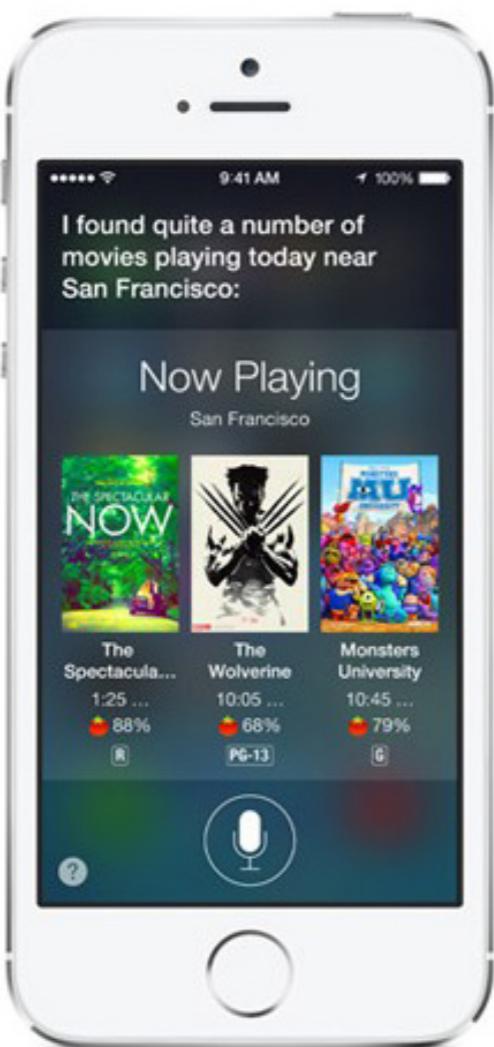
# Introduction to ML Decision Trees

Nipun Batra  
Jan 4, 2019

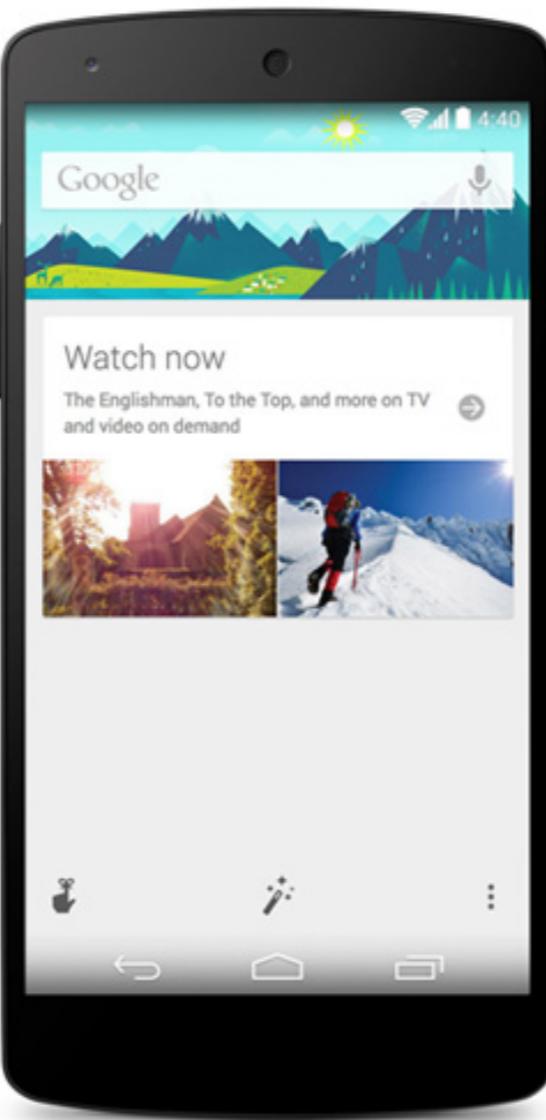
# Machine Learning Applications

---

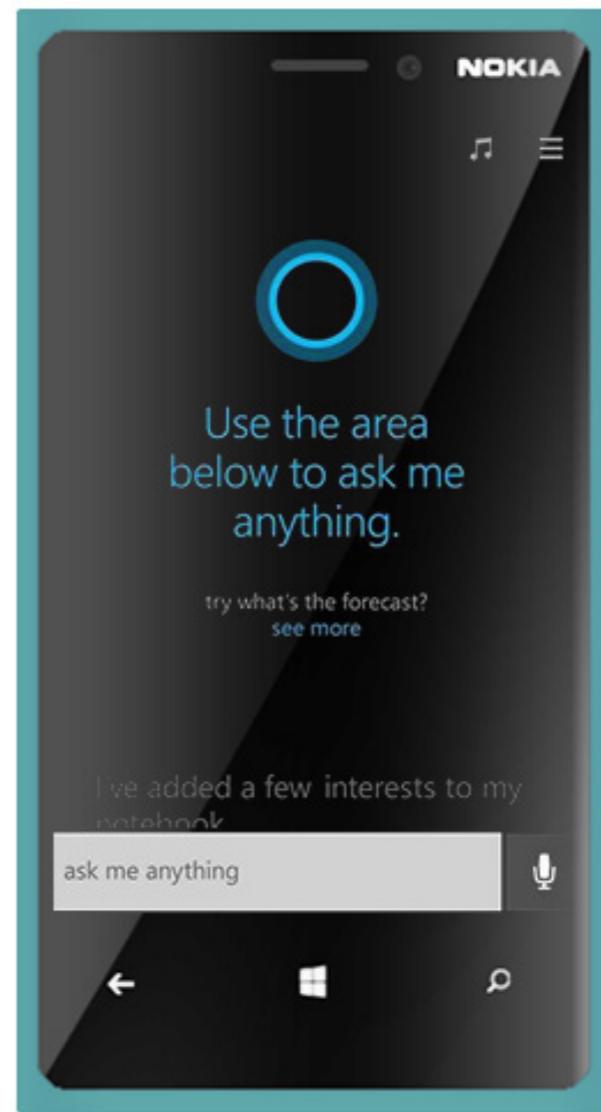
Apple Siri



Google Now

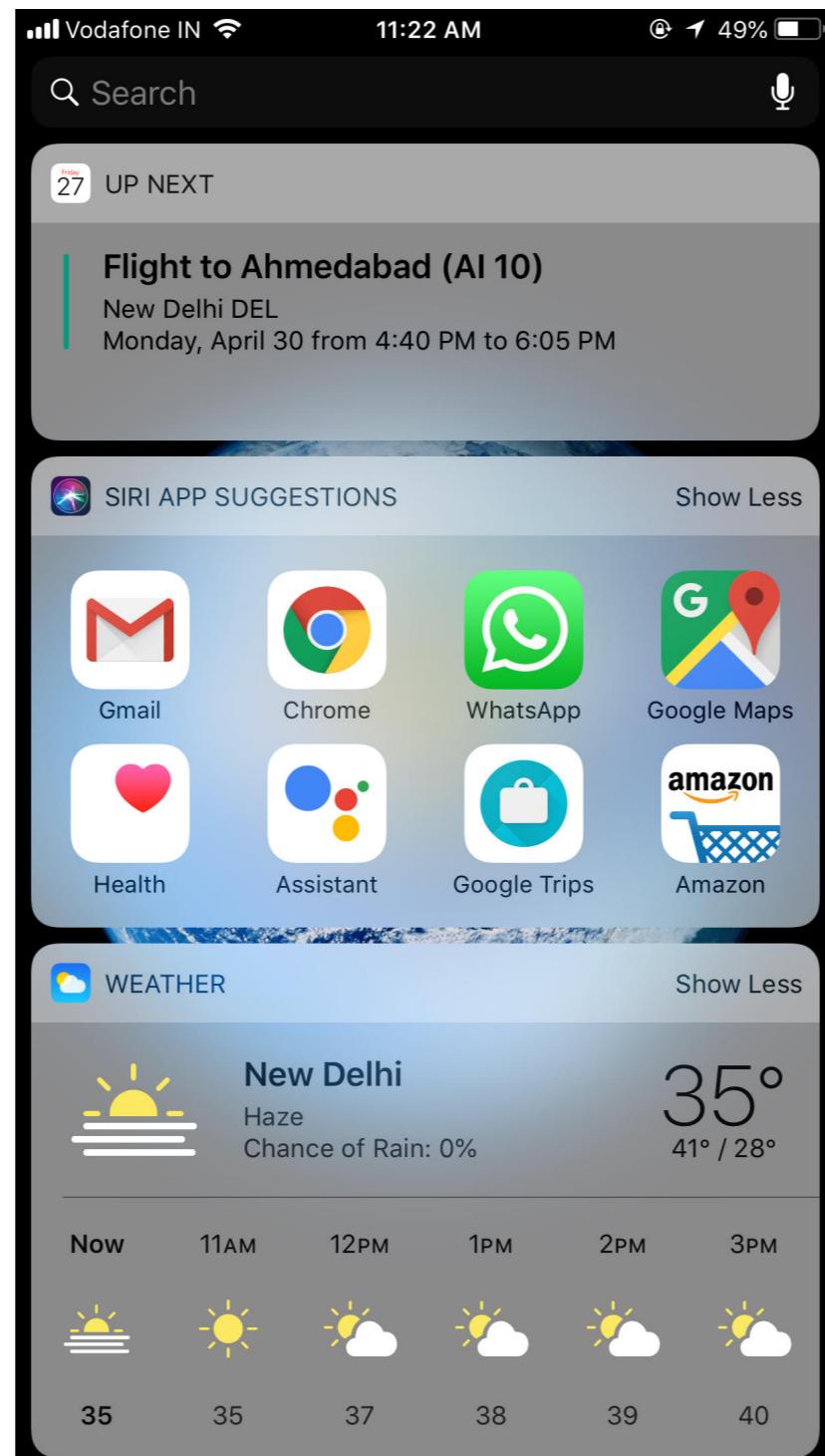


Windows Cortana



# Machine Learning Applications

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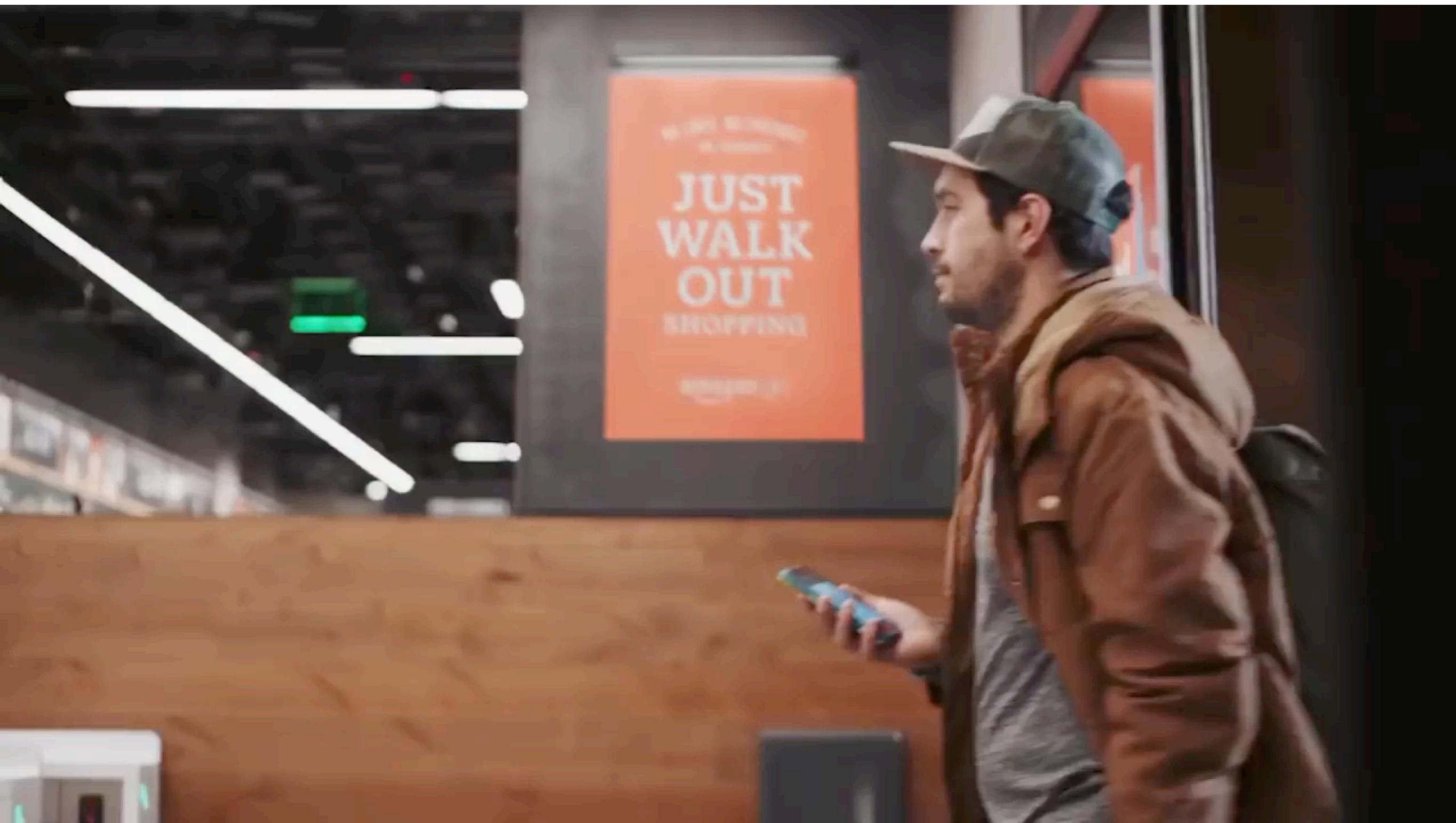
# The Long Wait ...

---



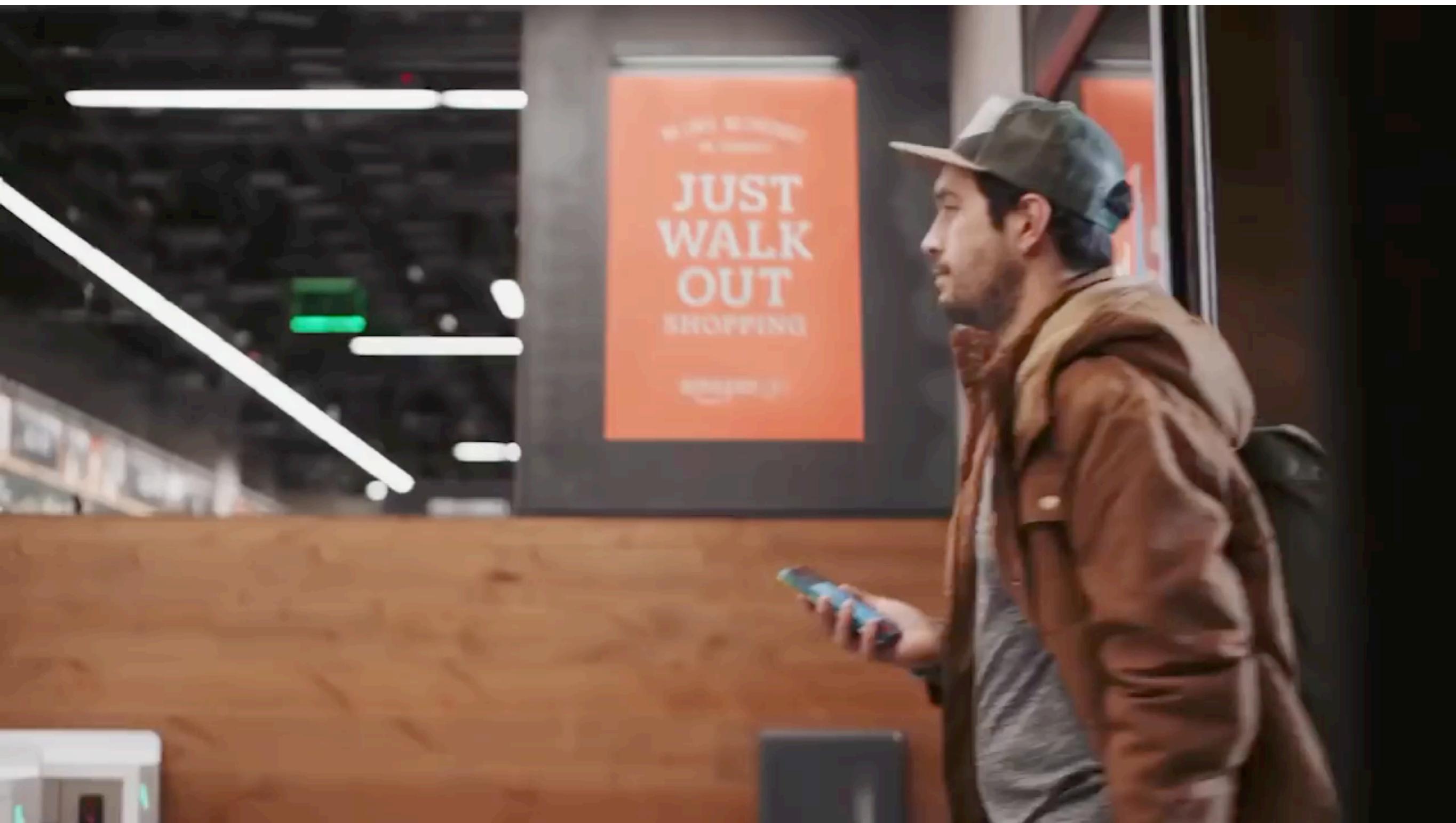
# Machine Learning Applications

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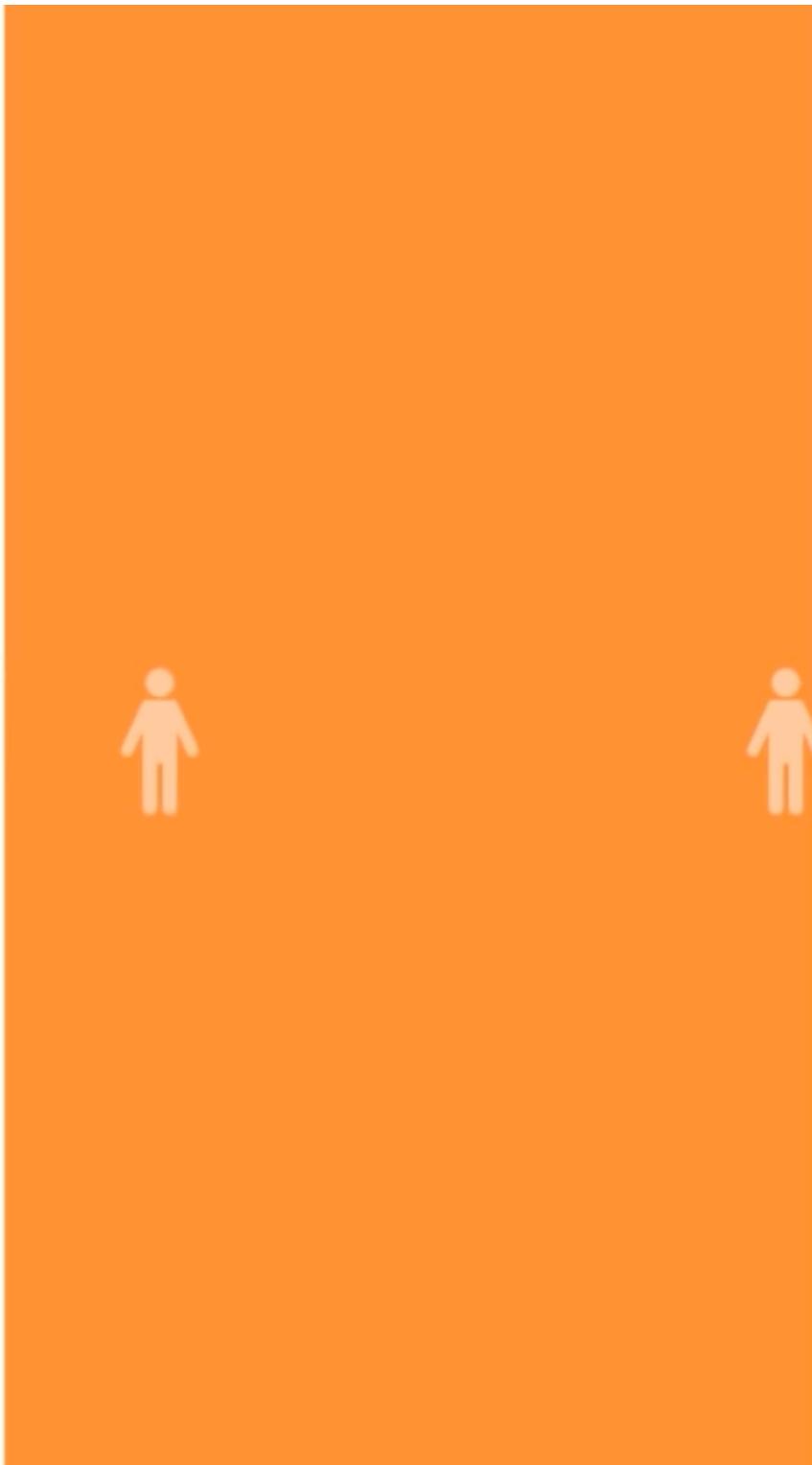
# Machine Learning Applications

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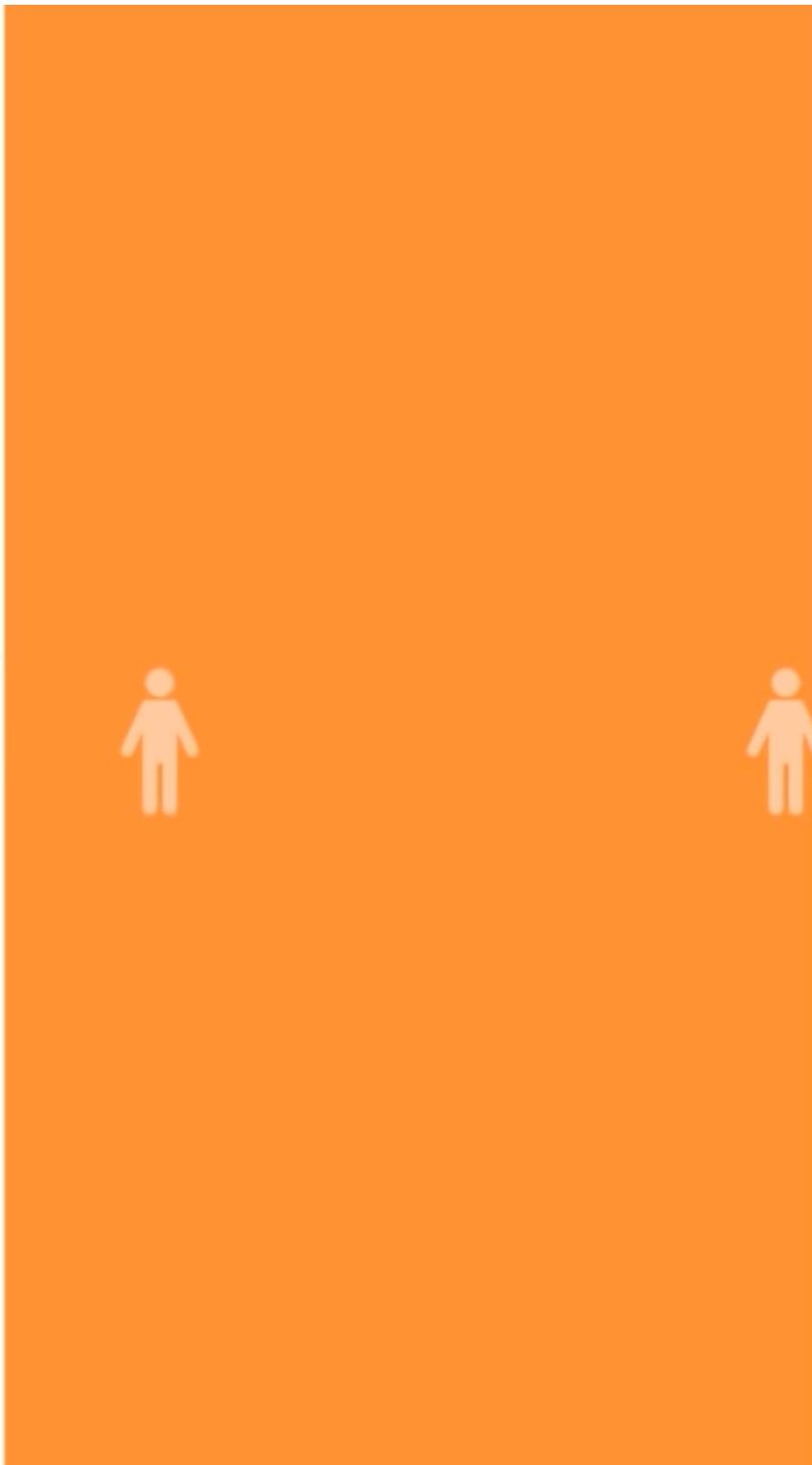
# Machine Learning Applications

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# Machine Learning Applications

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# Never Liked To Call People!

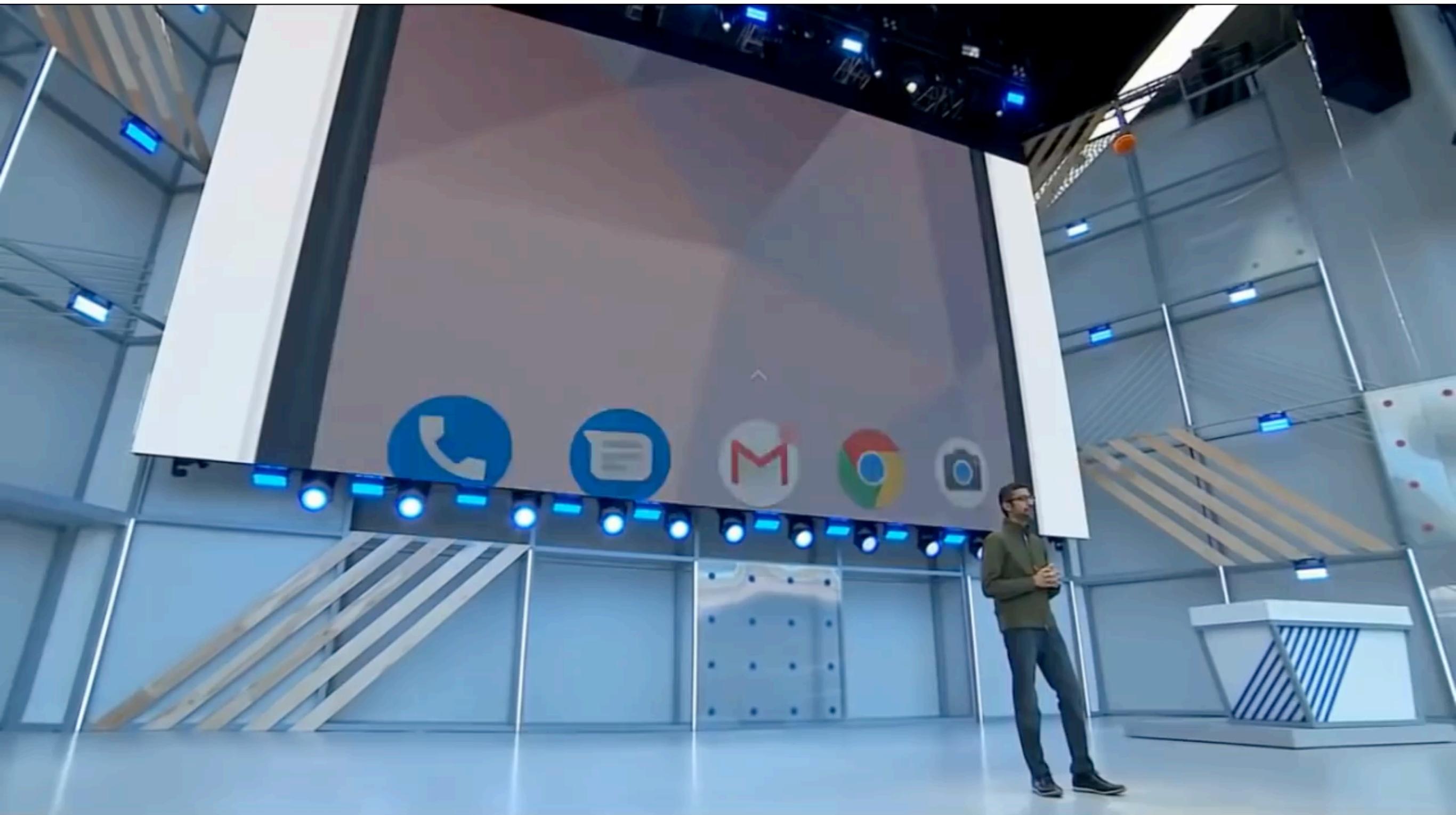
---



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

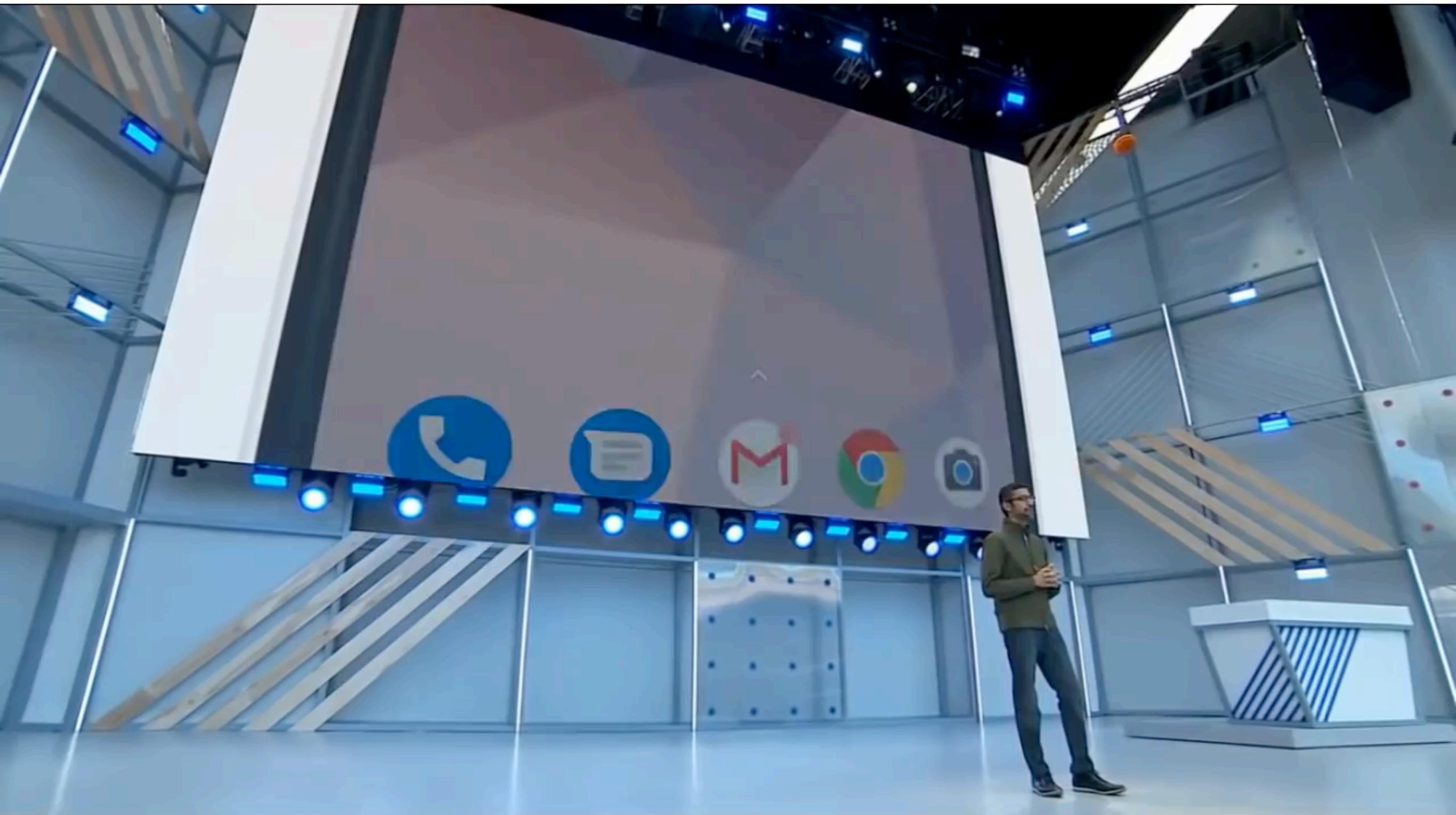
# Google Duplex!

---



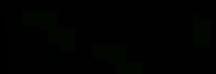
# Google Duplex!

---



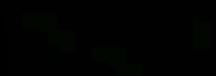
# Saving The Planet - One Watt A time

---



# Saving The Planet - One Watt A time

---



# Self Driving Car

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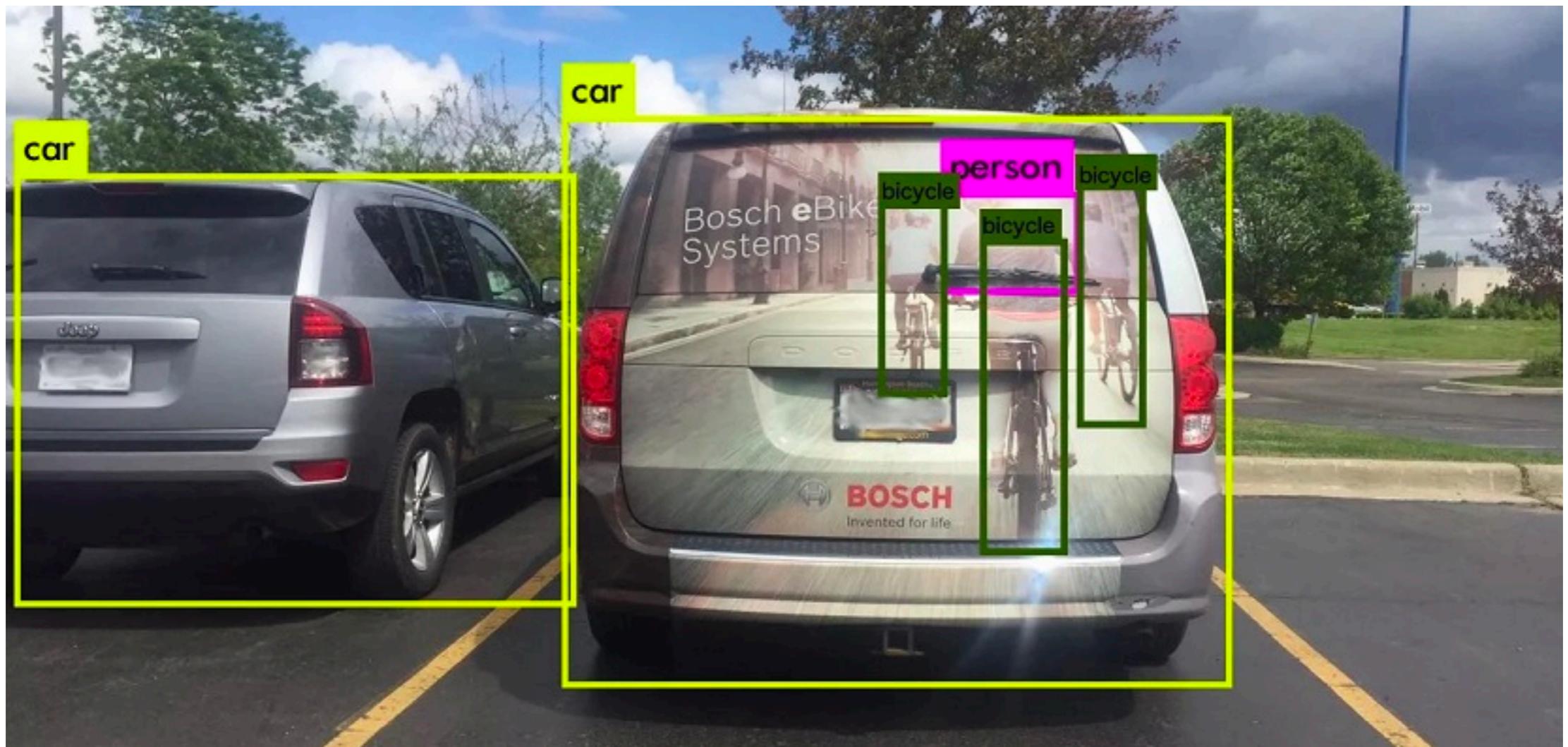
# Self Driving Car

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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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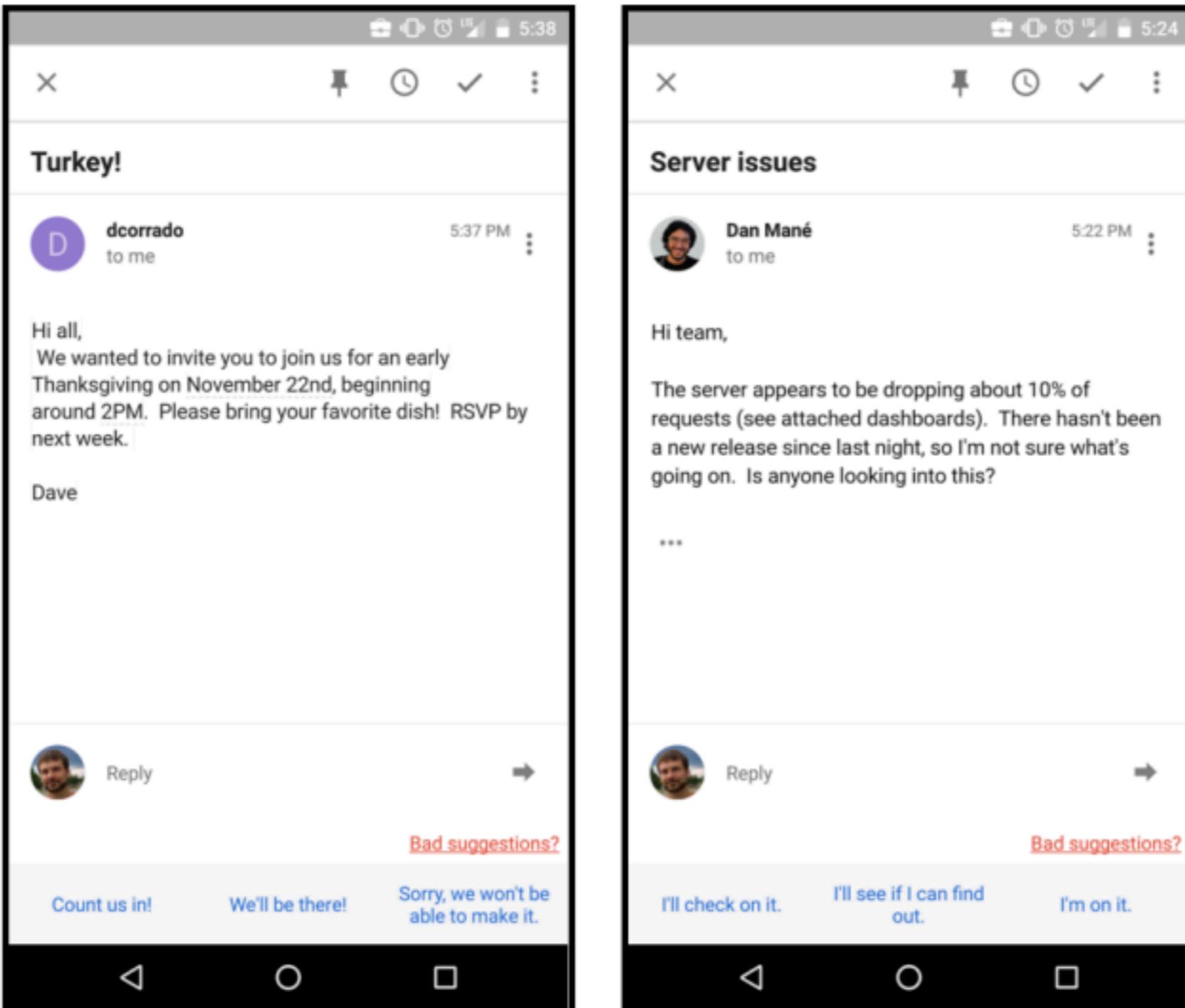
# ML for Healthcare

---

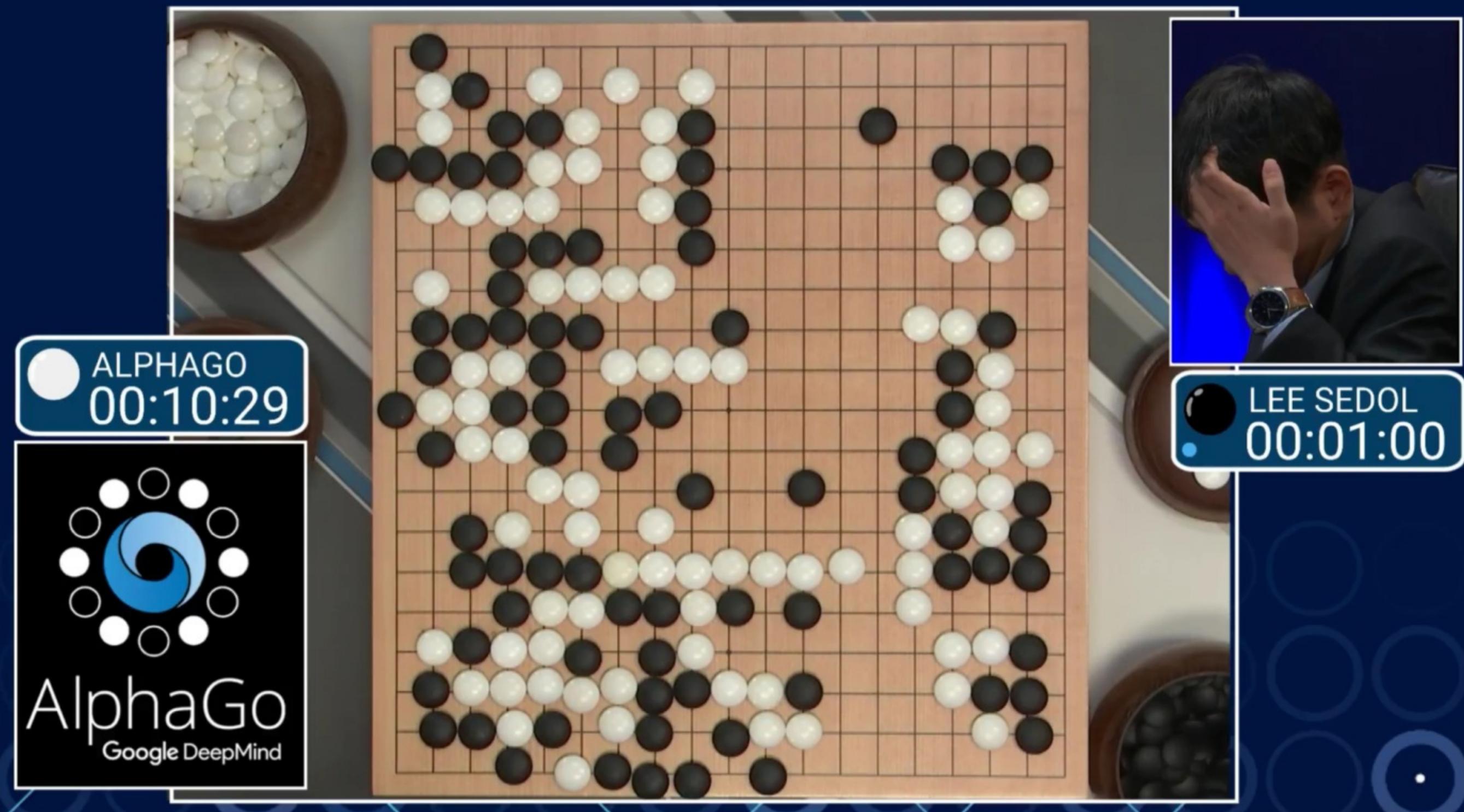


# Auto Reply

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# Machine Learning Applications



# Machine Learning Applications

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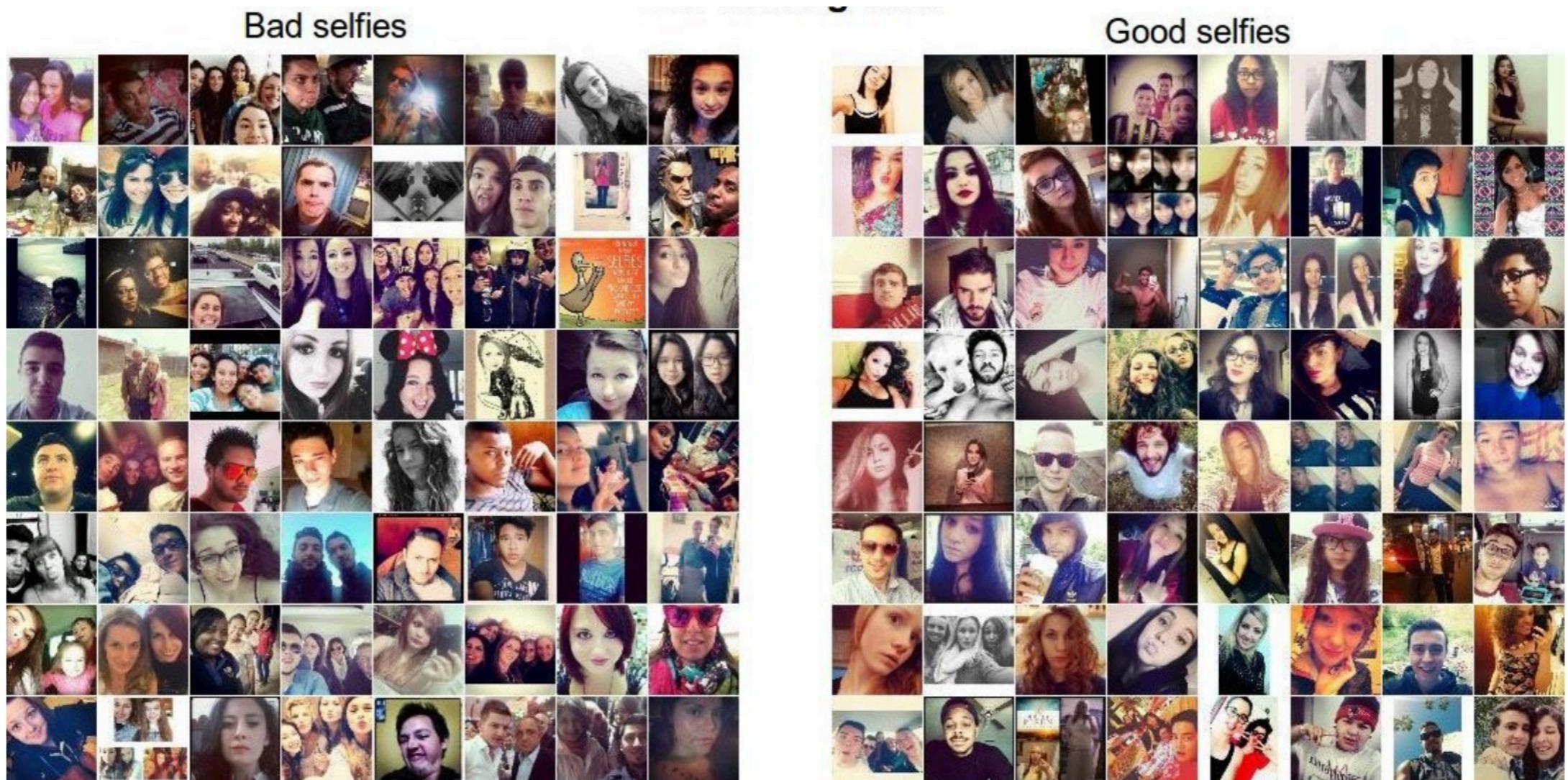
**Input**  
Chest X-Ray Image

**CheXNet**  
121-layer CNN

**Output**  
Pneumonia Positive (85%)



# Machine Learning Applications

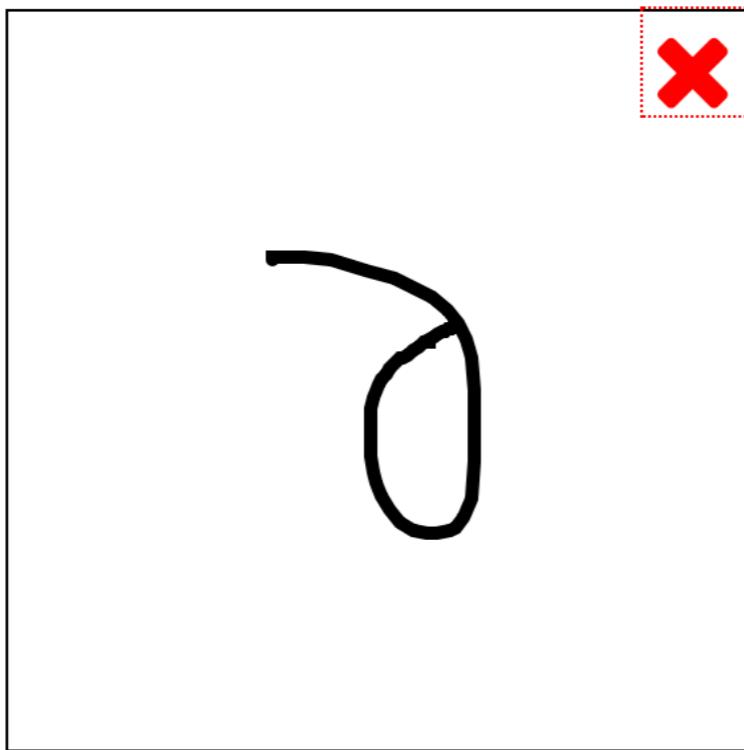


Example images showing good and bad selfies in our training data. These will be given to the ConvNet as teaching material.

- 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

$\partial$

`\partial`  
mathmode

Score: 0.1744210074369589

$\exists$

`\usepackage{ amssymb }`  
`\exists`  
mathmode

Score: 0.18567692685446785

$\gamma$

`\usepackage{ tipa }`  
`\textbabylgamma`  
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%

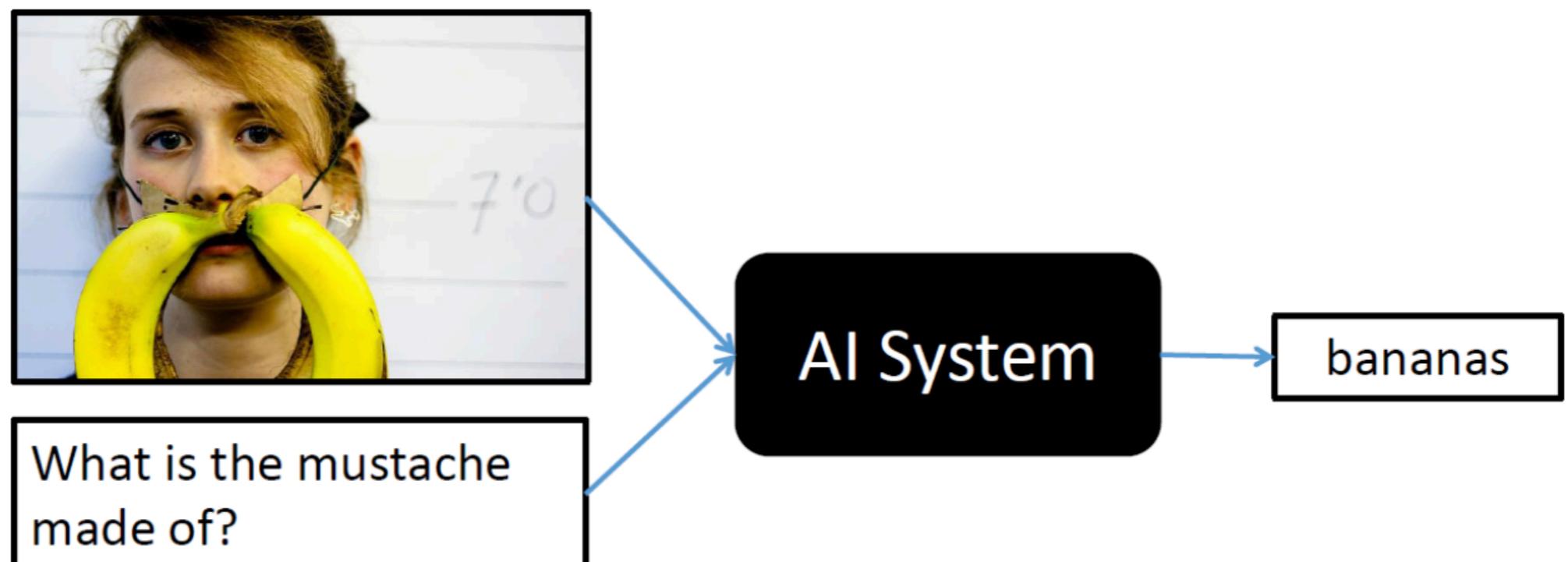
Sports

85%

# Machine Learning Applications

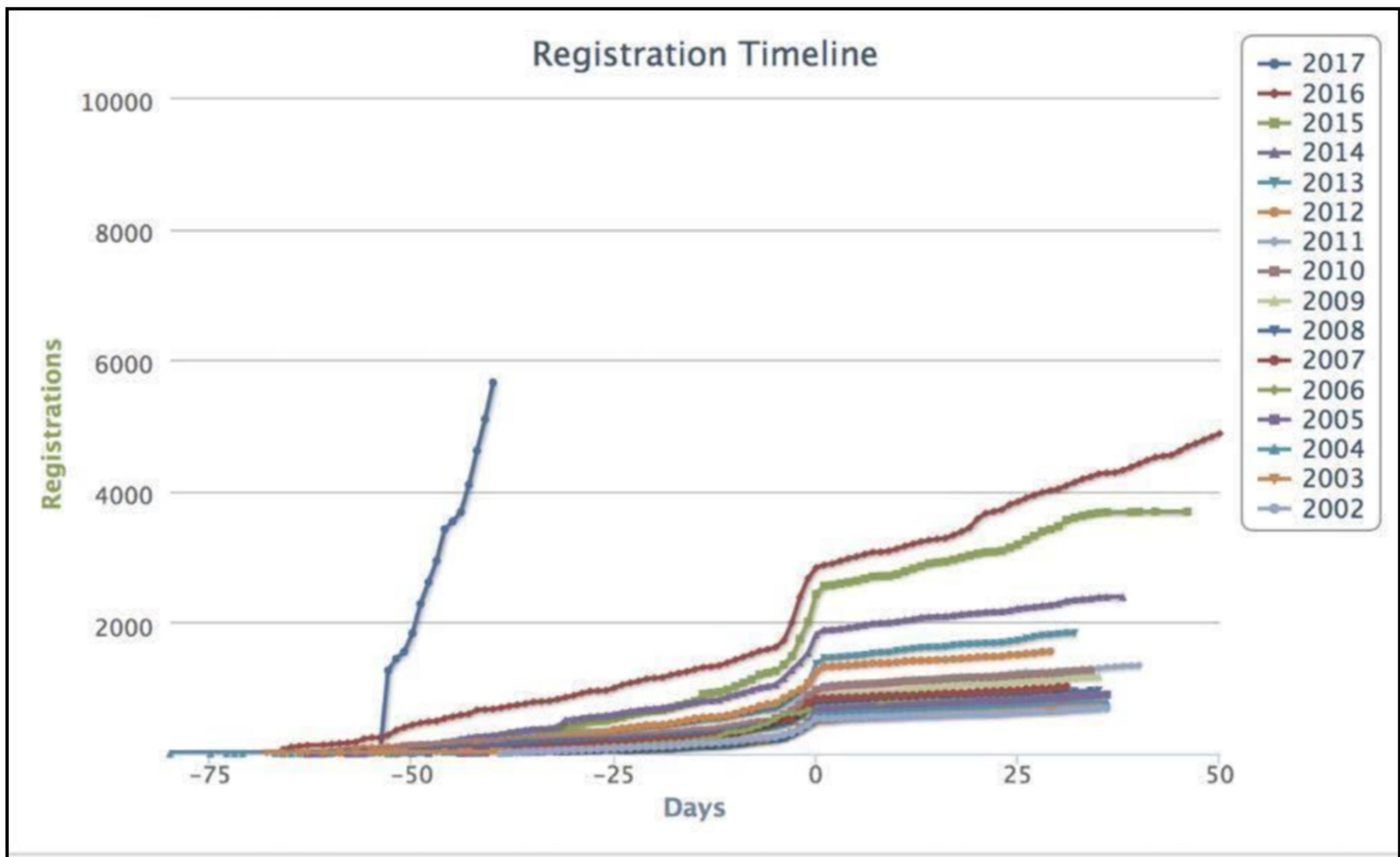
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## Visual Q and A



# NeurIPS registration

$x=0 \rightarrow$  early registration deadline



# Machine Learning Gone Wrong

THE VERGE

TECH ▾

SCIENCE ▾

CULTURE ▾

CARS ▾

REVIEWS ▾

LONGFORM

VIDEO

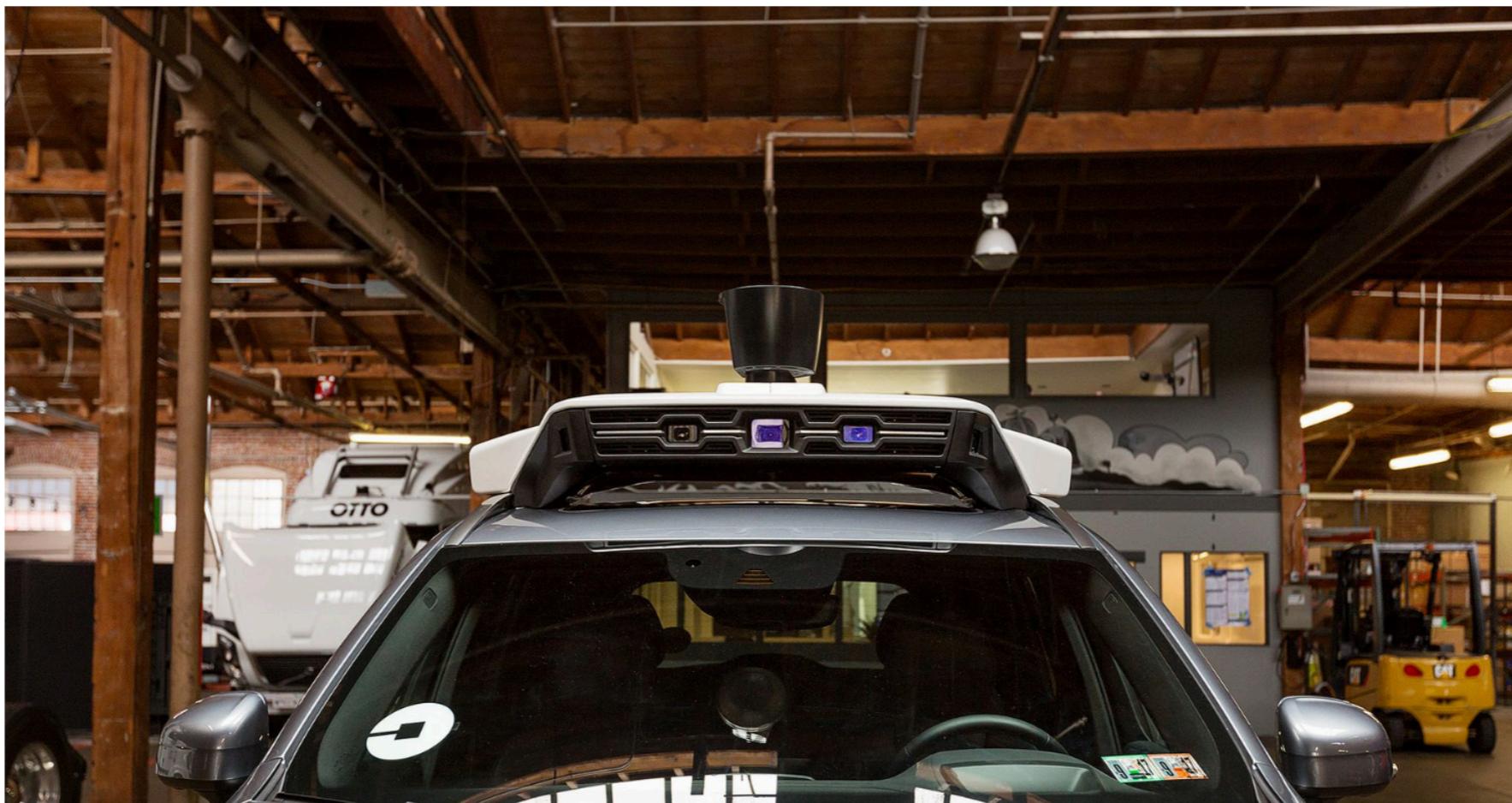
MORE

⌚ STORYSTREAM

TRANSPORTATION

UBER

RIDE-SHARING



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



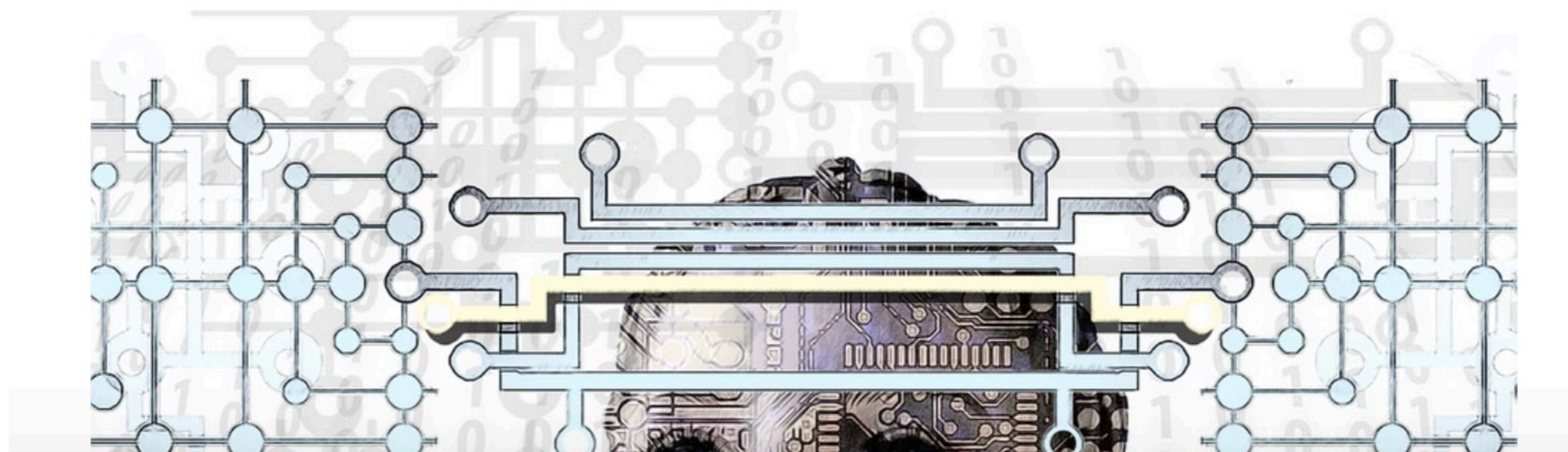
# Machine Learning Gone Wrong

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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 image shows two side-by-side Google Translate interfaces illustrating gender bias.

**Top Translation:**

- Input (English to Turkish): "He is a babysitter  
She is a doctor"
- Output (Turkish to English): "O bir bebek bakıcısı  
O bir doktor"

**Bottom Translation:**

- Input (Turkish to English): "O bir bebek bakıcısı  
O bir doktor"
- Output (English to Turkish): "She's a babysitter  
He is a doctor"

**ANITA BORG Logo:**

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

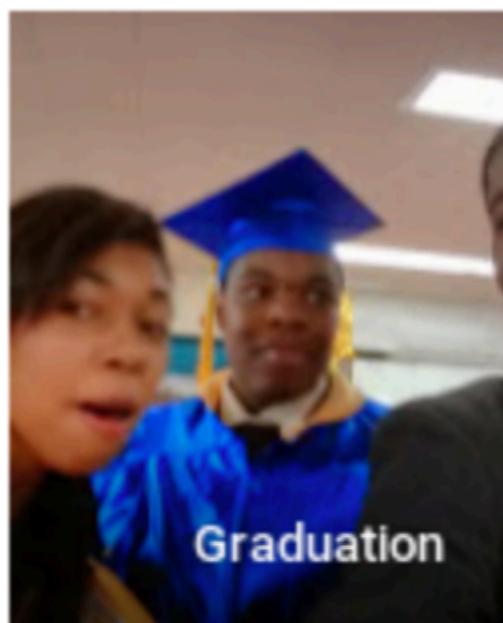
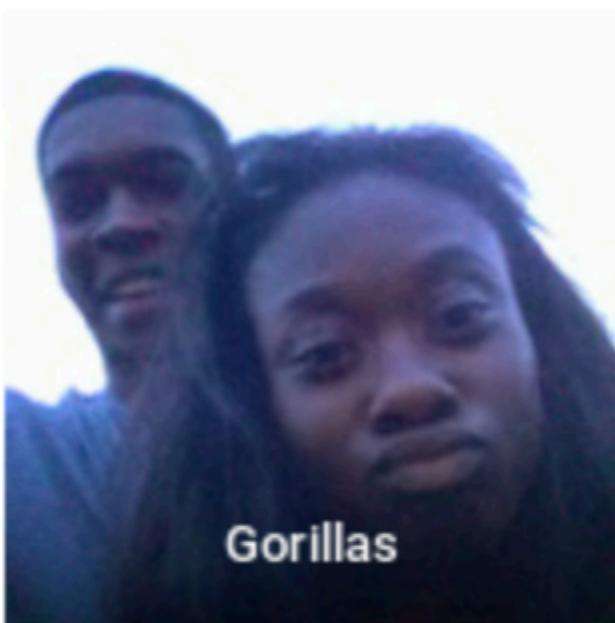
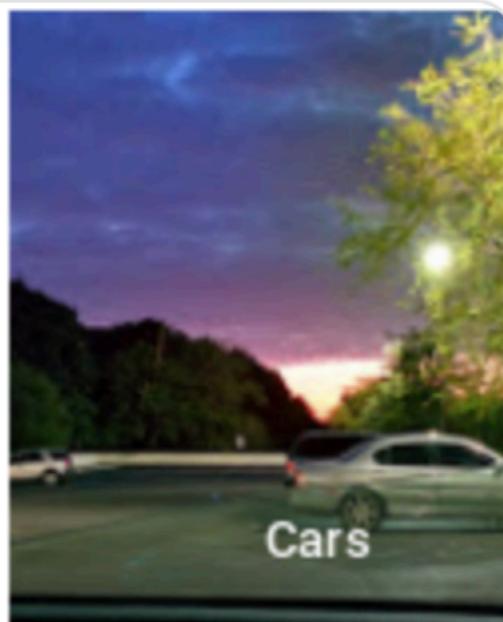
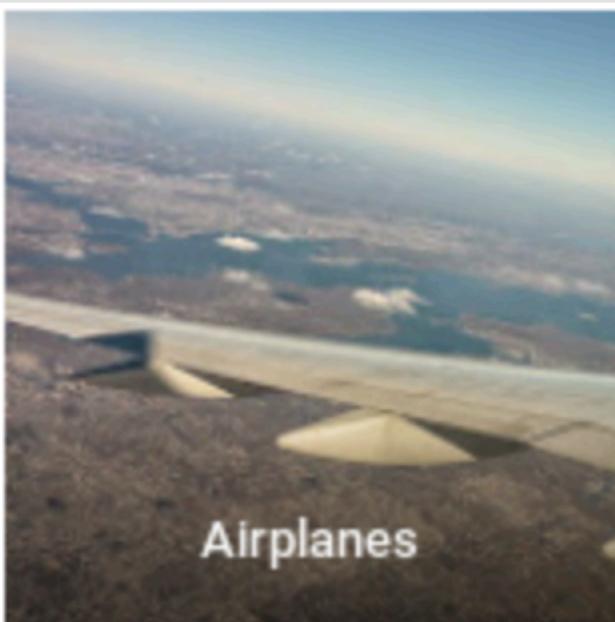
The screenshot shows a translation interface with the following settings:

- 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?

---

not a gorilla.



# Where is the bride?

---



# “Bias” addressed

---

# “Bias” addressed

---

# A “reality” check

---



# A “reality” check

---



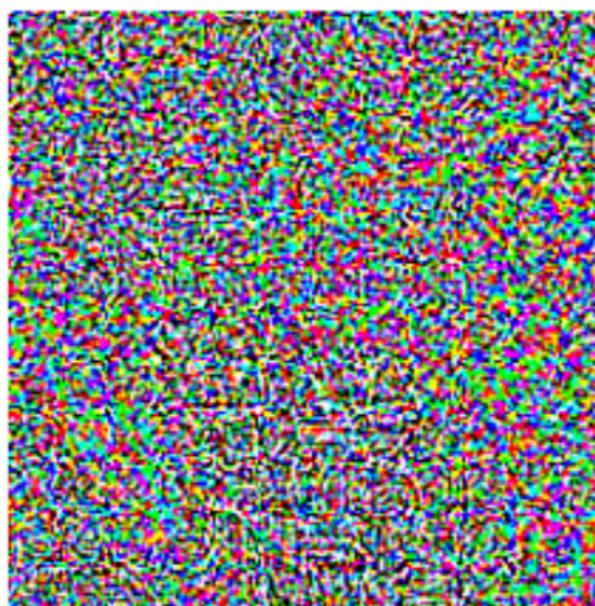
# Adversaries!

---



$\mathbf{x}$   
“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

# What is Machine Learning?

---

# 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?

---

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

# 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%)



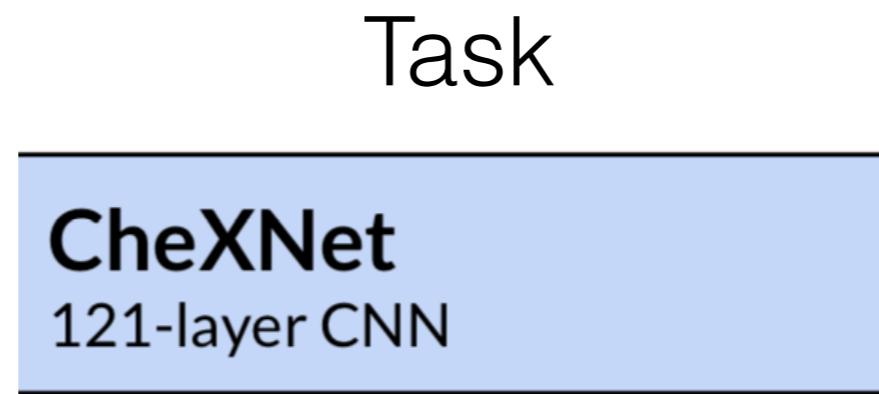
Q: Identify task, performance measure, and experience

# What is Machine Learning?

---



**Input**  
Chest X-Ray Image



**Output**  
Pneumonia Positive (85%)



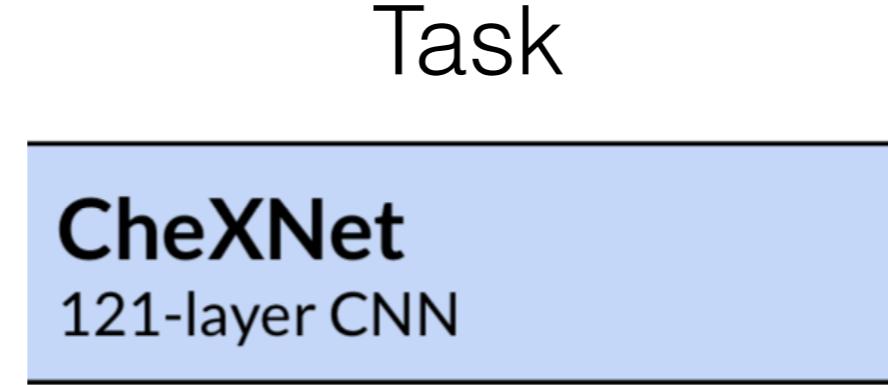
Q: Identify task, performance measure, and experience

# What is Machine Learning?

---



**Input**  
Chest X-Ray Image



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: 2chpsz

Website: <https://hipunbatra.github.io/teaching/ml-spring-19/>