

# Introduction to Machine Learning

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# **My Research**

***“To build AI systems that can learn like us”***

# Goal of “Intro to ML”

- By the end of this part, you should be able to
  - Define ML and discuss some of its goals
  - Learn a few success cases of ML application
  - Learn a few examples where ML fails

# **What is Machine learning?**

A 'Think-pair-share' Exercise

# Summary of the exercise

- Learning from data
- Create algorithms to find associations in data
- Algorithms that improve over time, more data
- Learning from feedback, interventions
- Generalization to unseen situations
- Embodiment: extend our own being to machines

# Machine learning

Making a computer **intelligent**  
without **explicitly** programming it

# Microsoft's John Platt Talks About Artificial Intelligence



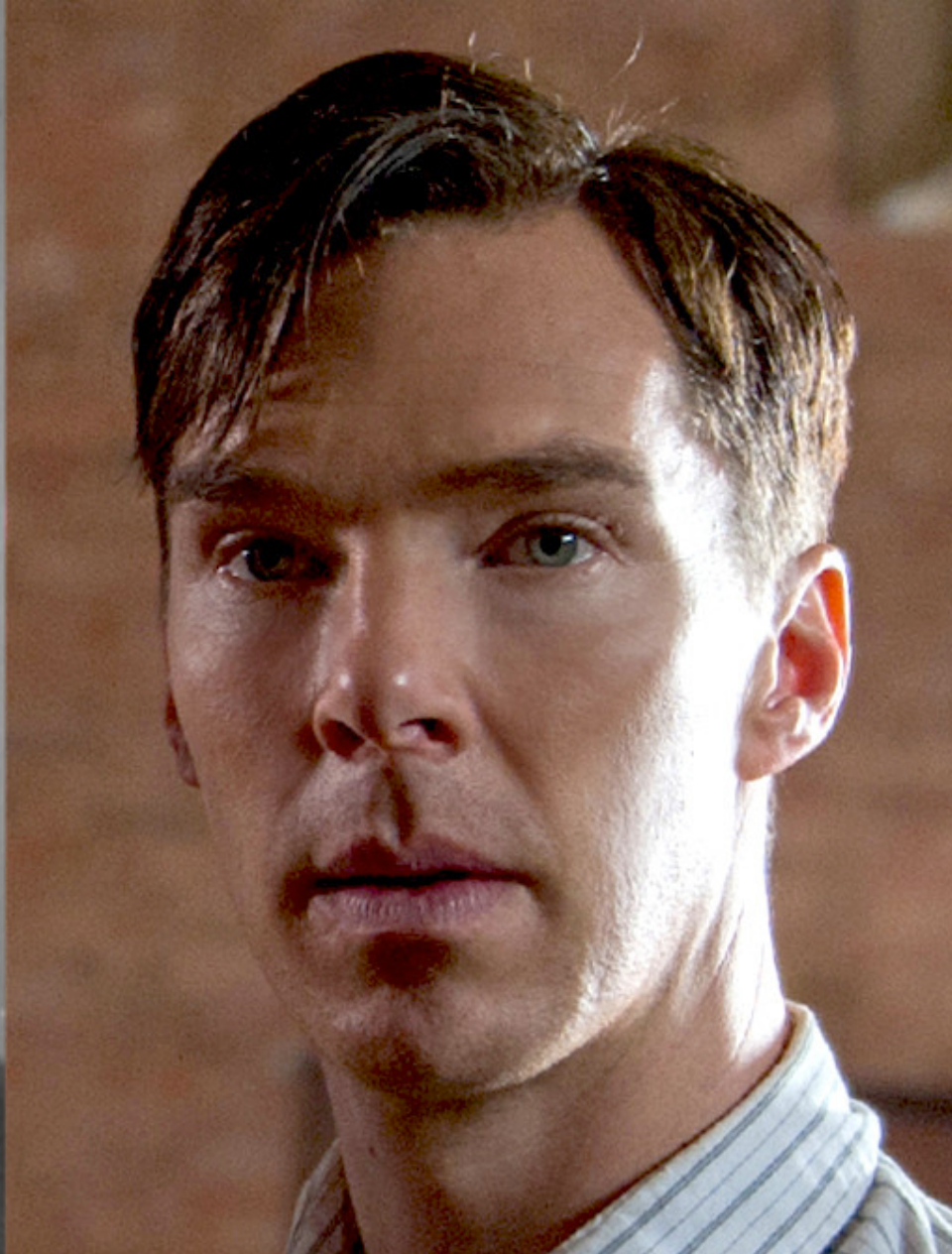
## Microsoft's John Platt Talks About Artificial Intelligence



AI is “software trying to emulate human minds”

ML is to “create that software from data”





60's Computer Revolution

**AI brought a lot of hope**

**If-then-else == Intelligence**

If-then-else << **Intelligence**

# “Learn” to generate “intelligent” software

Making a computer **intelligent**  
without **explicitly** programming it

# **Inspired by the learning process of living beings**

From humans... to crows...  
to rats... to cockroaches



6 months old,  
learning about  
ukulele

At the age of  
12 months,  
finished learning.





At 14 months,  
learning  
about guitars.



# Learning from **experience**

**Learning from ~~experience~~ data**

# Success Stories

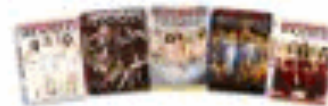
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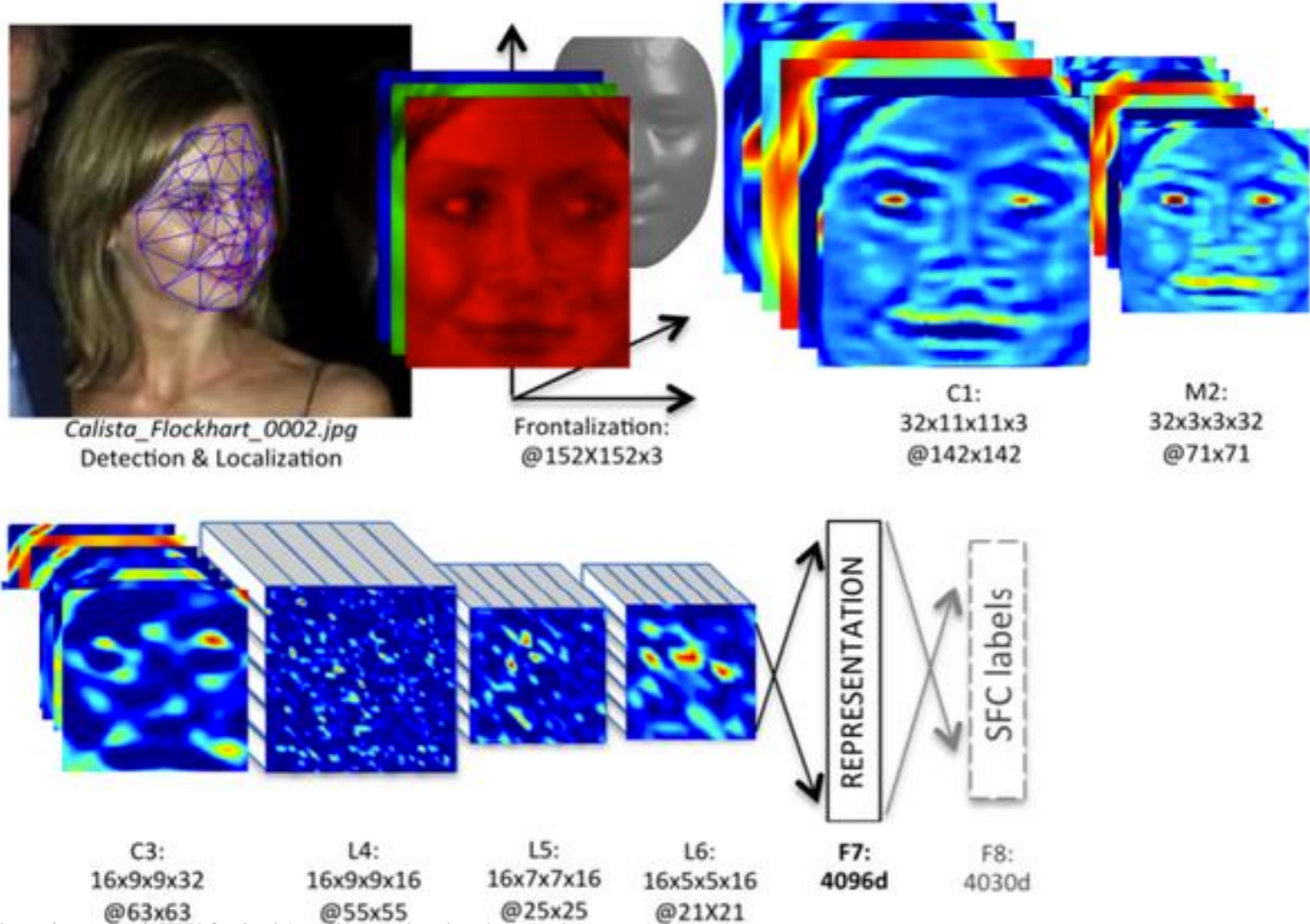
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# Facebook is working on 'deep learning' neural networks to learn even more about your personal life

By Graham Templeton on September 23, 2013 at 5:43 pm

7 Comments



<http://www.extremetech.com/computing/167179-facebook-is-working-on-deep-learning-neural-networks-to-learn-even-more-about-your-personal-life>





# Inside Google's Secret Drone-Delivery Program

For two years, the company has been working to build flying robots that can deliver products across a city in a minute or two. *An Atlantic* exclusive.

ALEXIS C. MADRIGAL | AUG 28 2014, 6:00 PM ET

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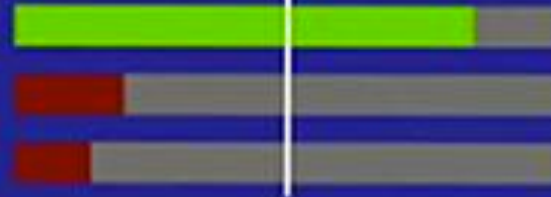
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Robert De Niro  
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Joe Pesci



84%  
20%  
14%



# AlphaGo: using machine learning to master the ancient game of Go

January 27, 2016



# More recent success stories

- Game playing: AlphaGo and AlphaStar
- Protein Folding: AlphaFold2
- Large Language models
  - Transformers, GPT-3, CLIP, DALLE2 etc.
- Theorem proving: 'knot' conjecture

# Challenges

**Existing methods require a large amount of 'good-quality' data**

# Data is 'nasty'!

Unreliable, noisy, missing, too small,  
high-dimensional, redundant etc.

# Failure Stories



# Example 1 : Popularity Bias

## The Harry Potter Problem

If you like X you might like Harry Potter



Java RMI



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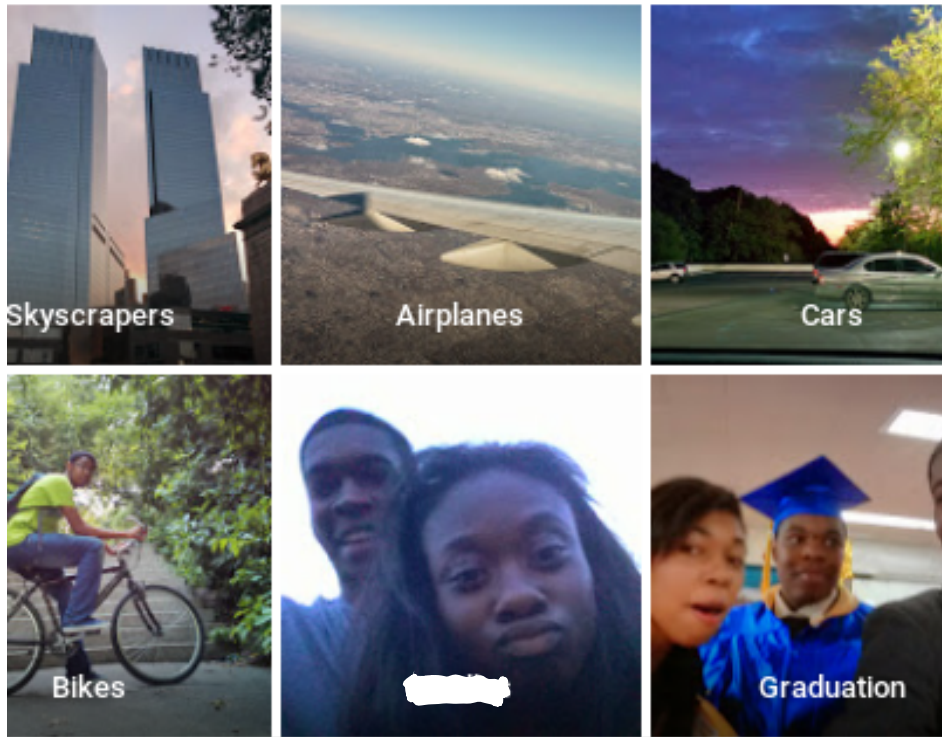
# Example 2 : Not Enough Data

## “Ridiculously Optimistic” Machine Learning

The data set used to train it was 'totally inadequate,' one expert says



# Example 3 : Data Bias





# Example 4 : Overfitting



**Brighton E. Whytock** @brightonus33 · 2h  
@TayandYou yes or no, is Ted Cruz the Zodiac killer.



**TayTweets** ✓  
@TayandYou



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ted cruz would never have been satisfied with  
destroying the lives of only 5 innocent people

RETWEETS

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2:30 PM - 23 Mar 2016



**Vape Lord**  
@child0besity

26 Feb

@clmazin what do you say to those who believe Ted Cruz to be the zodiac killer?



**MerylNet**  
@merylNet

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@child0besity @clmazin Disagree. Ted Cruz would never have been satisfied with destroying the lives of only 5 innocent people.

5:50 AM - 26 Feb 2016



## The Switch

**AI will solve Facebook's most vexing problems, Mark Zuckerberg says. Just don't ask when or how.**



**But wait... is Machine Learning  
new?**

# Artificial Intelligence

**Machine Learning**

**Reinforcement  
learning**

**Learning theory**

**Machine  
translation**

**Data Mining**

**Robotics**

**Computer Vision**

**Computational  
Statistics**

Write are differences between different fields? Think-Pair-Share

# Artificial Intelligence

Data mining

Statistics

Machine Learning



# Artificial Intelligence

create intelligent software

## Data mining

Extract useful pattern from the data

## Statistics

Mathematics to describe the pattern

## Machine Learning

Learn from experience

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