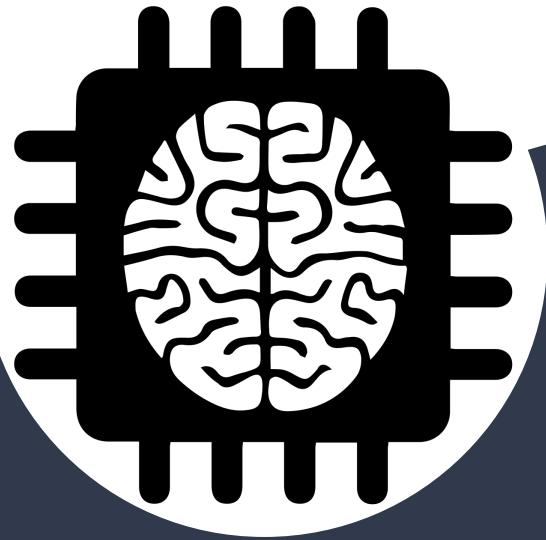


ECE ING4

MACHINE LEARNING

Jeremy Cohen



Jeremy Cohen

After my studies and in the middle of my nanodegree, I joins a big consulting startup to work on Artificial Intelligence

Starts to write blogs on self-driving cars and to hunt for a position in the field when confident enough

Graduate from my nanodegree after 10 months of hard work



Join a small consulting company called Suricats Consulting as an intern project manager in IoT



The project isn't what was planned and I am moved to an emerging AI project



Works on Computer Vision project and applies learned skills



Give AI pitches to company leaders

loan request

rendez-vous

card issue



During this internship, I realized I lack a lot of skills and start to look for another year of studies in Machine Learning.



Internet of Things Engineer diploma



I couldn't find anything, so I looked for online training and found Udacity.

In a day, I registered to the self-driving car engineer nanodegree and sets myself to reject the fear of coding and to embrace technical skills.

Jeremy Cohen

Graduate from my nanodegree after 10 months of hard work

Build a portfolio based on my projects



Leave my job as an AI Engineer in consulting to join a self-driving car startup as a Computer Vision Engineer



In the meantime, I joined the School of AI movement as a Dean and create Paris School of AI to democratize AI education



I gain tons of skills working on self-driving cars and realize I am building an amazing community in Paris



Named Head Dean of France School of AI and handles all french deans



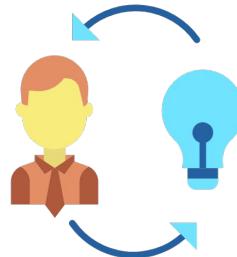
Realize I want to work on my own projects and I can't have time for both



Leave self-driving car engineer job to pursue entrepreneurship



Advanced Technologies



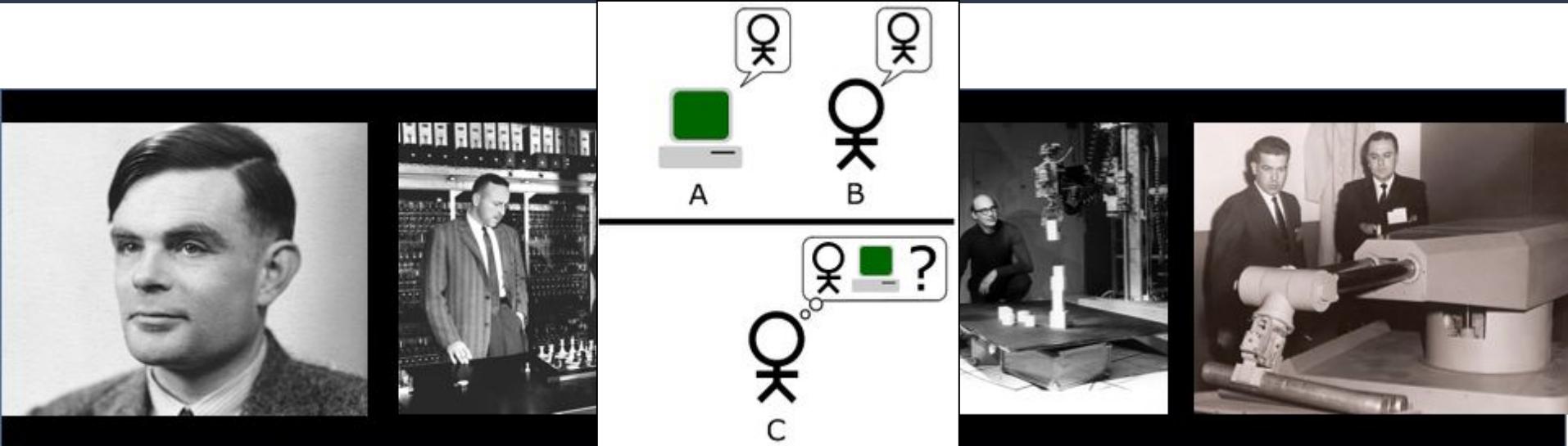
Entrepreneurship



Continuous Learning

Artificial Intelligence

50s - AI was born



1950

The Turing Test

1955

First Chess Program

1959

MIT AI LAB

1960

First factory robots

90s - AI Boom



1990

Yann LeCun co-invents
Deep Learning

1997

Chess World Champion
defeated by IBM Deep
Blue program

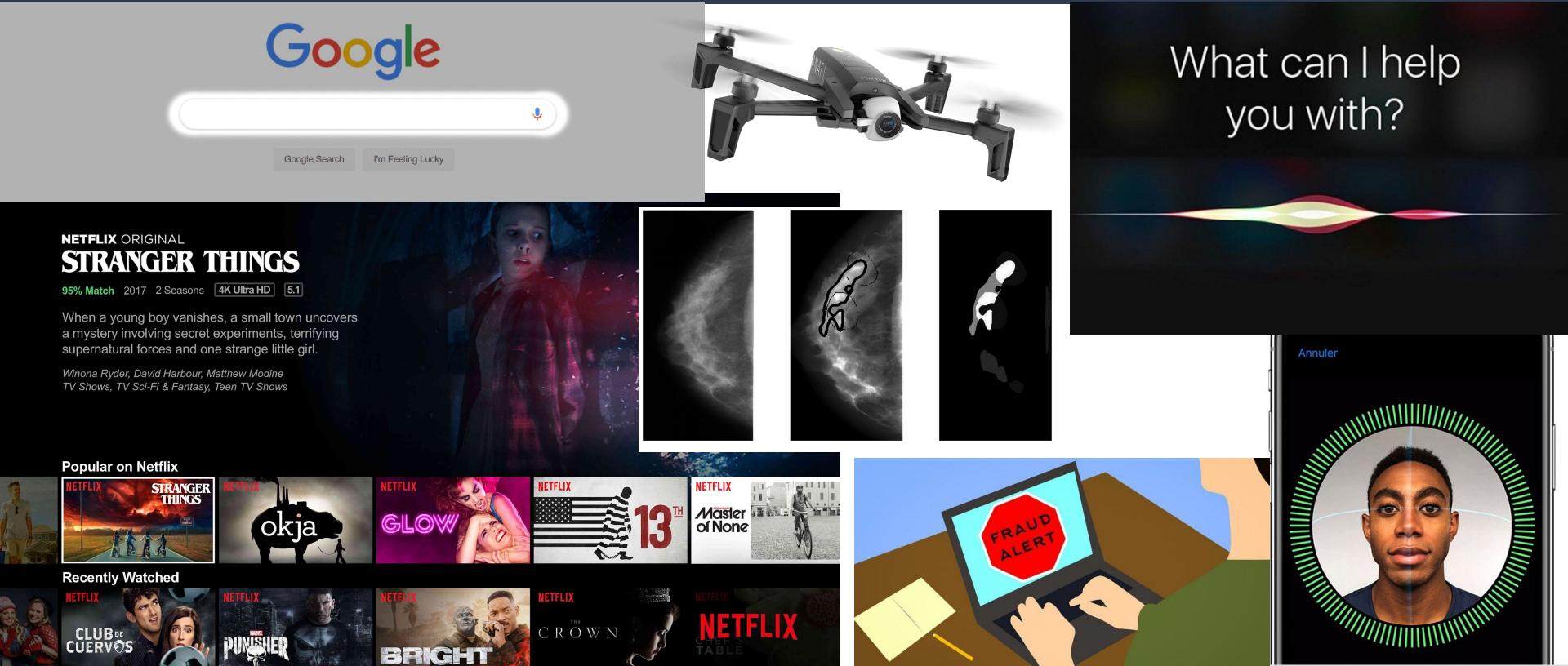
2005

DARPA Grand
Challenge - Stanley
wins

2009

Google Car program

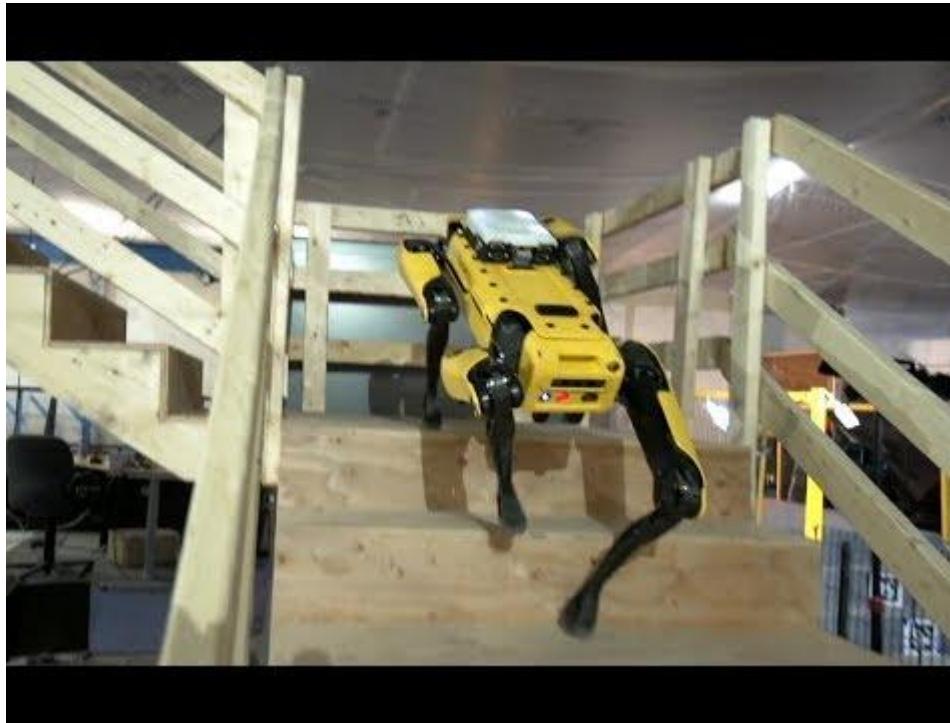
Today - AI is everywhere



Self-Driving Cars



Autonomous Robots



Flying Cars



Machine Learning is the field of study that gives computers the ability to learn without being explicitly programmed.

What does acerous mean?

ACEROUS

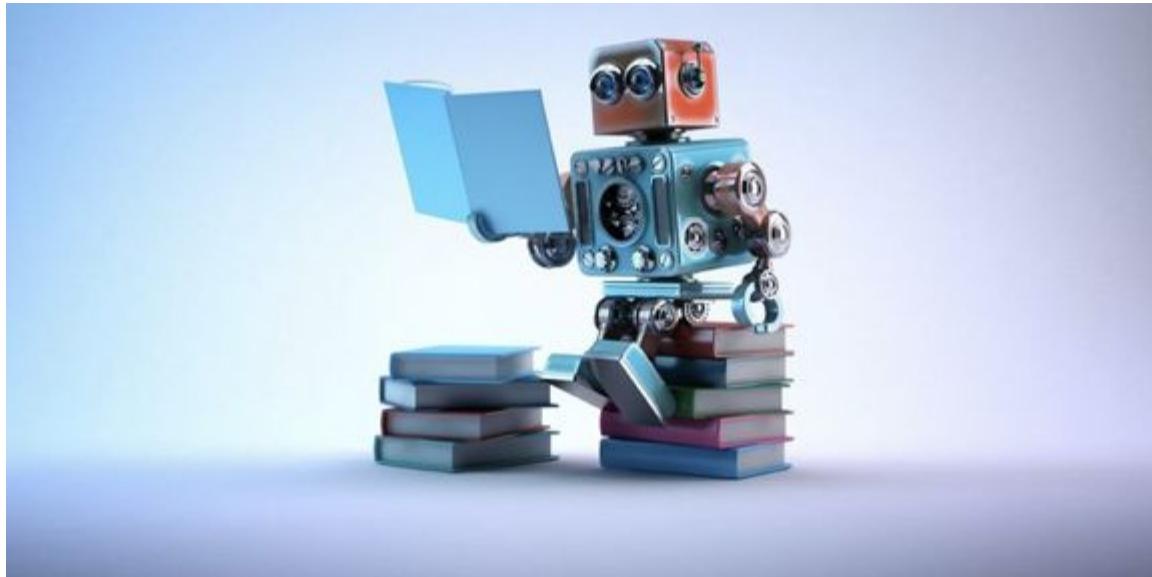


HORSE ?

NOT ACEROUS



This was Machine Learning



What if?

ACEROUS



HORSE ?

NOT ACEROUS



DATA IS EVERYTHING

Supervised Learning

DOGS



CATS



Unsupervised Learning



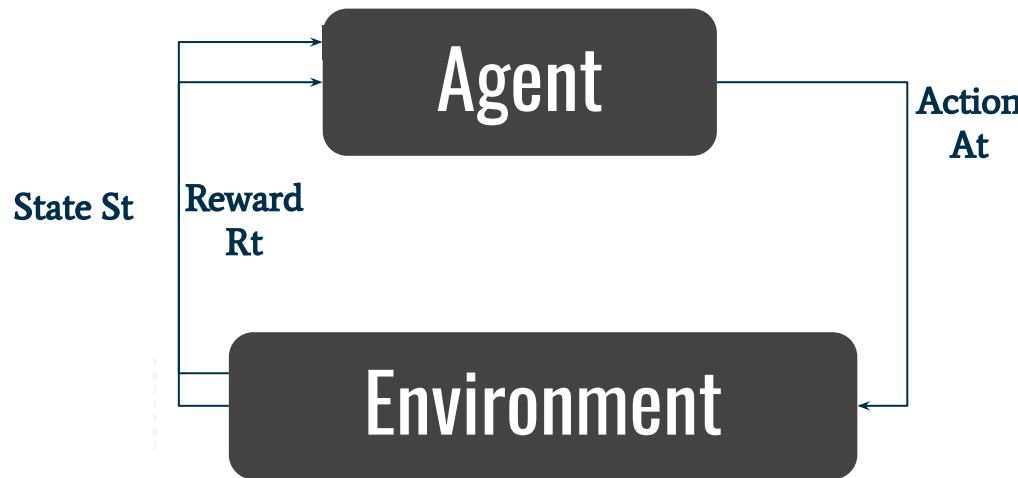
CLASS A



CLASS B

**MOST PROBLEMS ARE SUPERVISED
MOST DATA IS UNLABELLED**

Reinforcement Learning

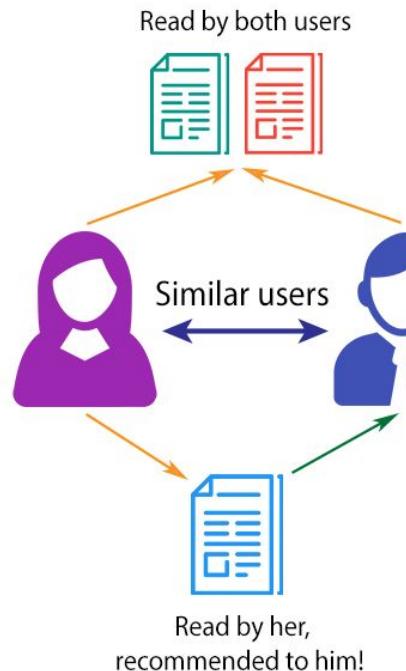


Reinforcement Learning

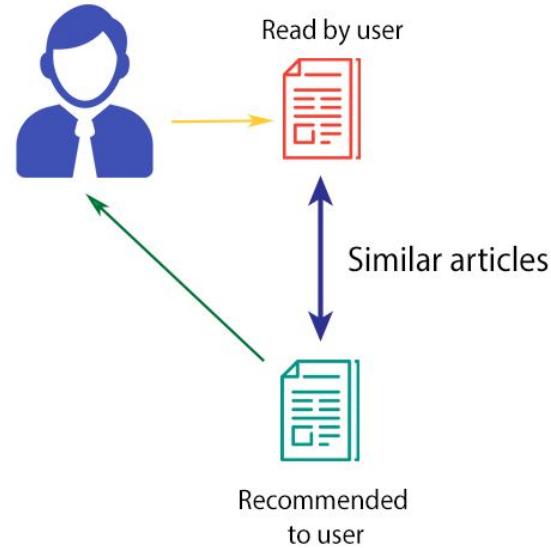


Recommender Systems

COLLABORATIVE FILTERING

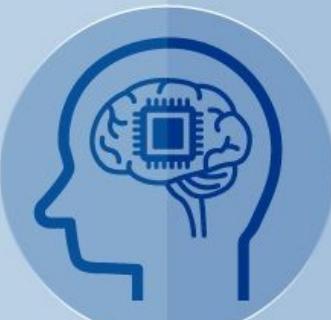


CONTENT-BASED FILTERING



Artificial Intelligence vs Machine Learning

Artificial
Intelligence



Engineering of
making Intelligent
Machines and Programs

Machine
Learning



Ability to learn
without being explicitly
programmed

Deep
Learning



Learning based on
Deep Neural
Network

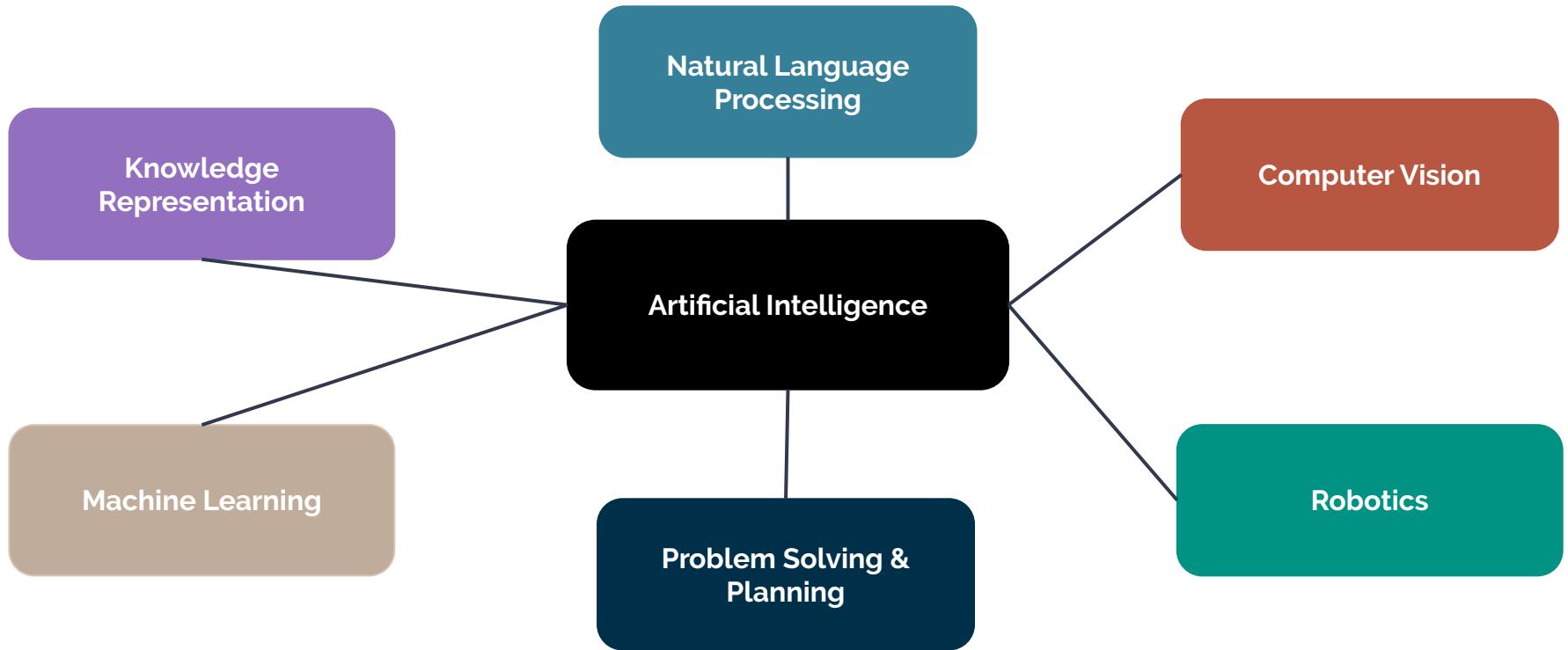
Artificial Intelligence

Machine Learning

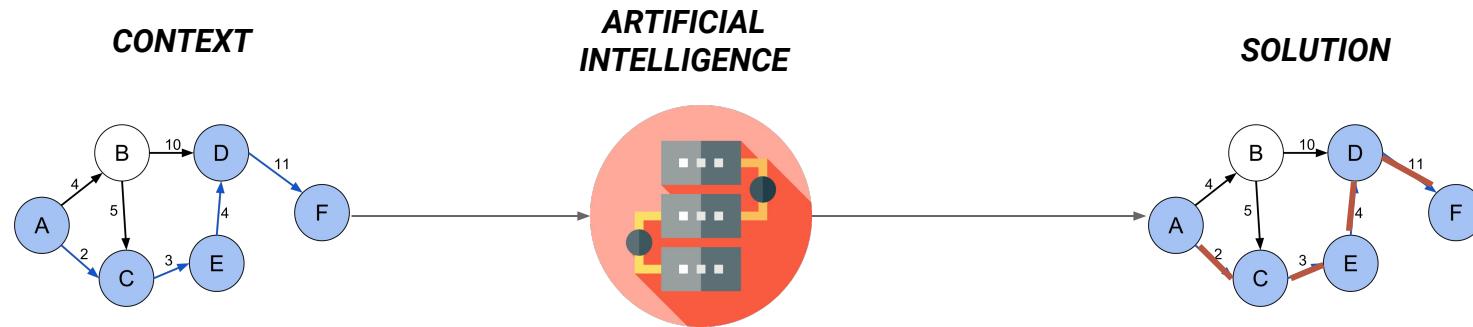
Deep
Learning

1950's 1960's 1970's 1980's 1990's 2000's 2006's 2010's 2012's 2017's

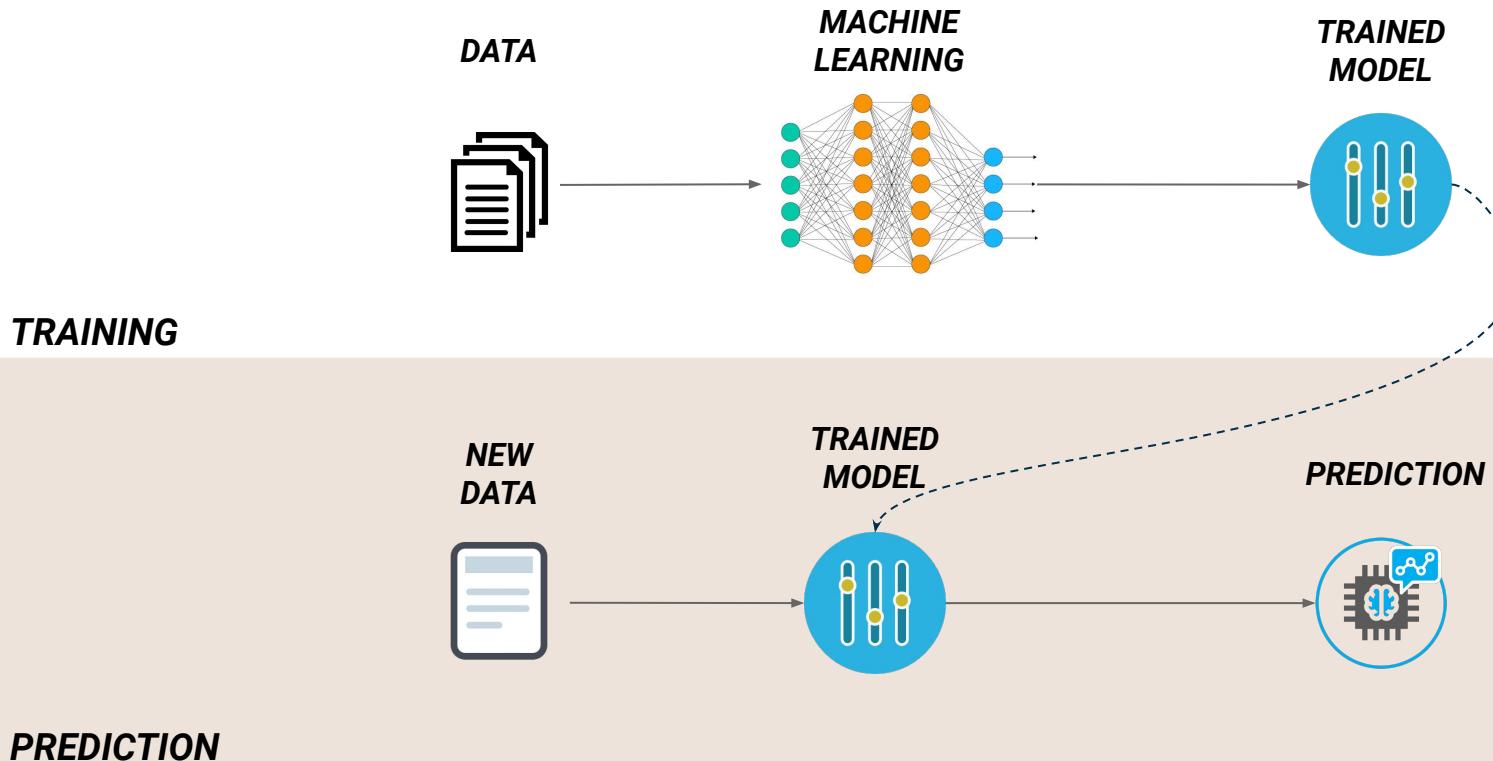
Artificial Intelligence vs Machine Learning



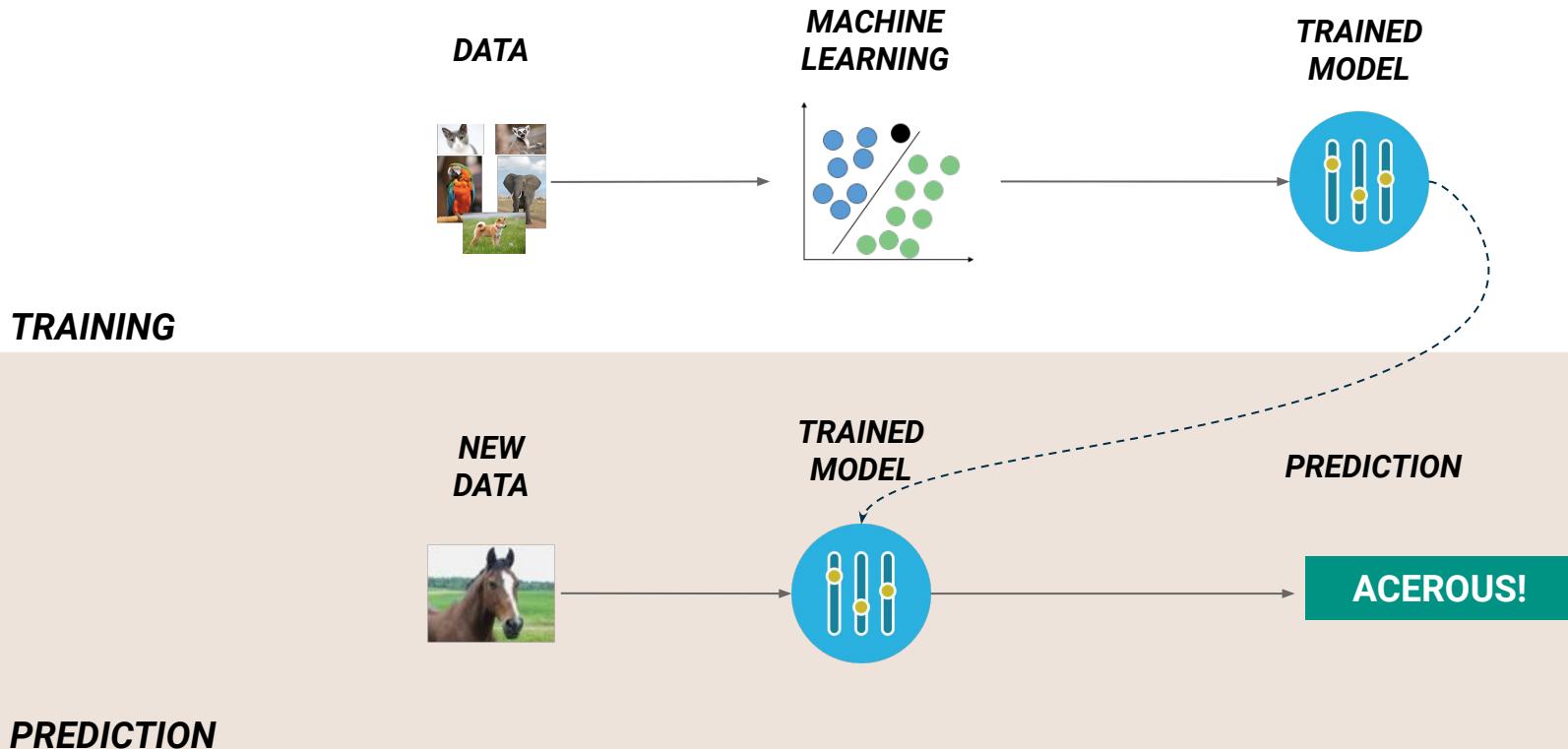
Artificial Intelligence Process



Machine Learning Process



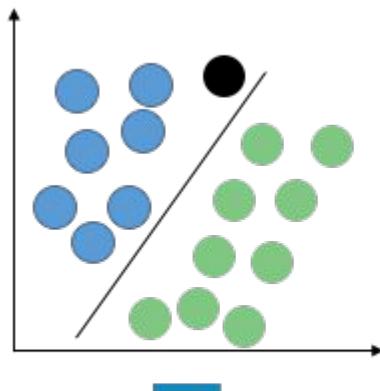
Machine Learning Process - Image Example



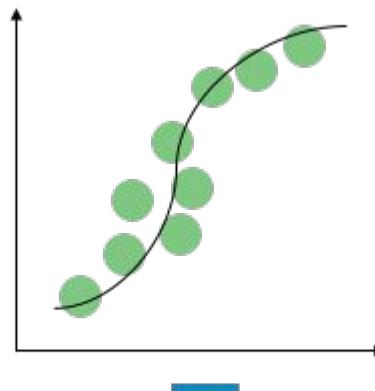
Types of Machine Learning

Classification, Regression & Clustering

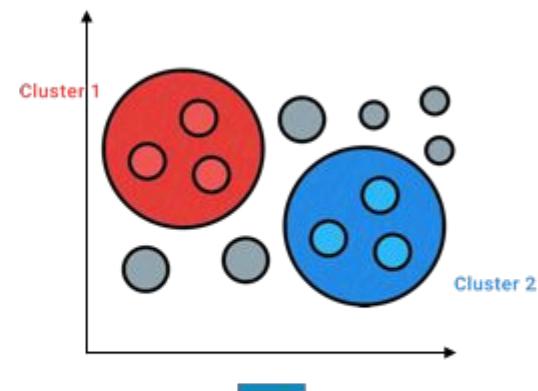
CLASSIFICATION



REGRESSION



CLUSTERING

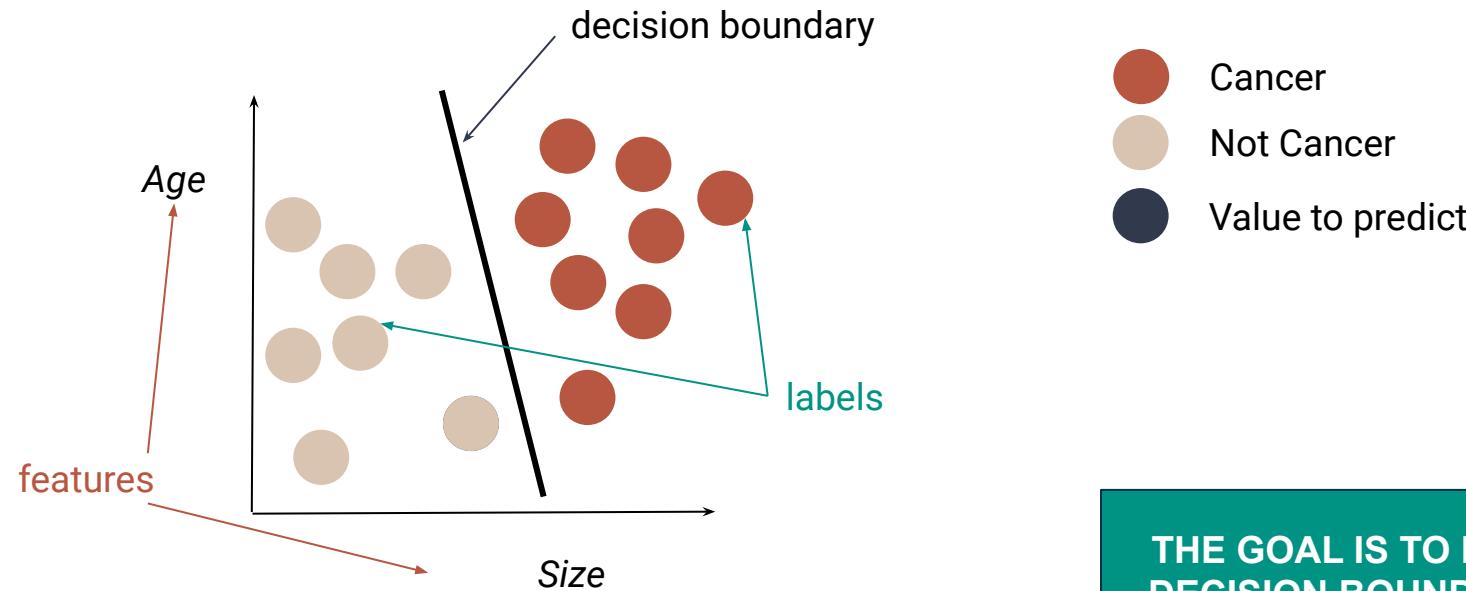


- Supervised
- Output is a discrete number (0,1,2, ...), (SPAM/NOT SPAM),
...

- Supervised
- Output is a continuous number

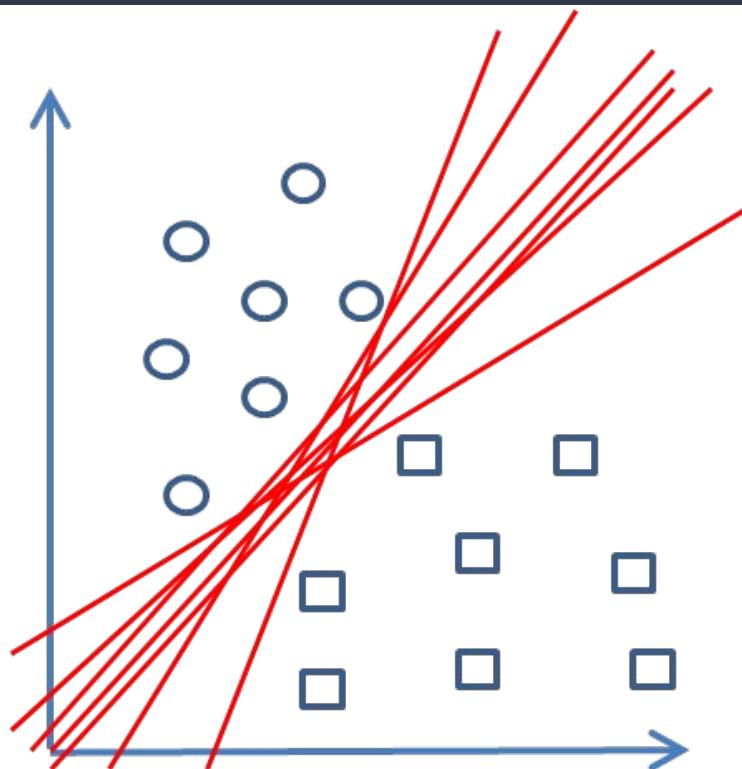
- Unsupervised
- Outputs are clusters

Classification

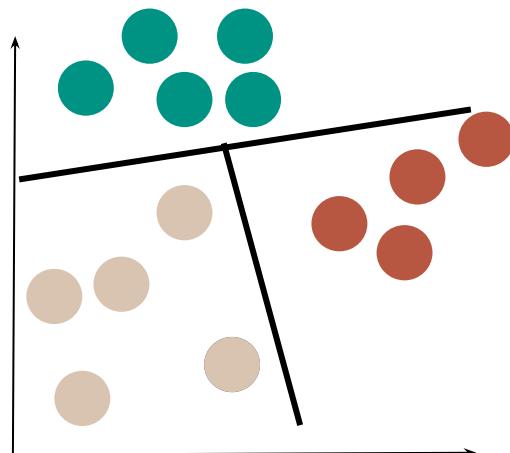


THE GOAL IS TO DETERMINE THE DECISION BOUNDARY THAT BEST SEPARATES THE DATA

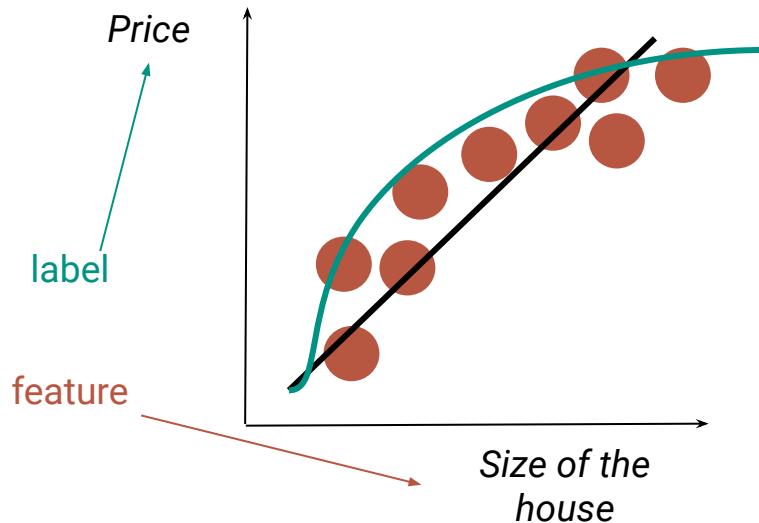
Classification



Multi-Class Classification

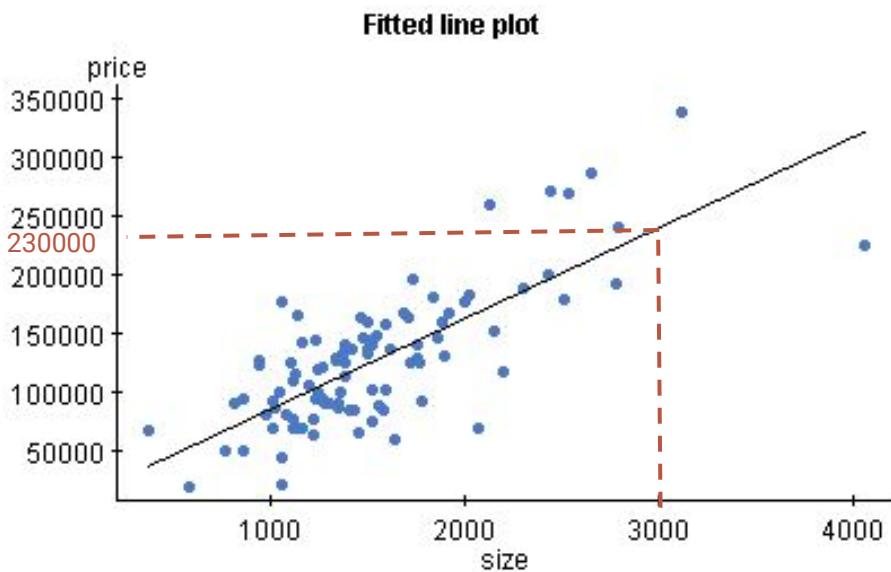


Regression



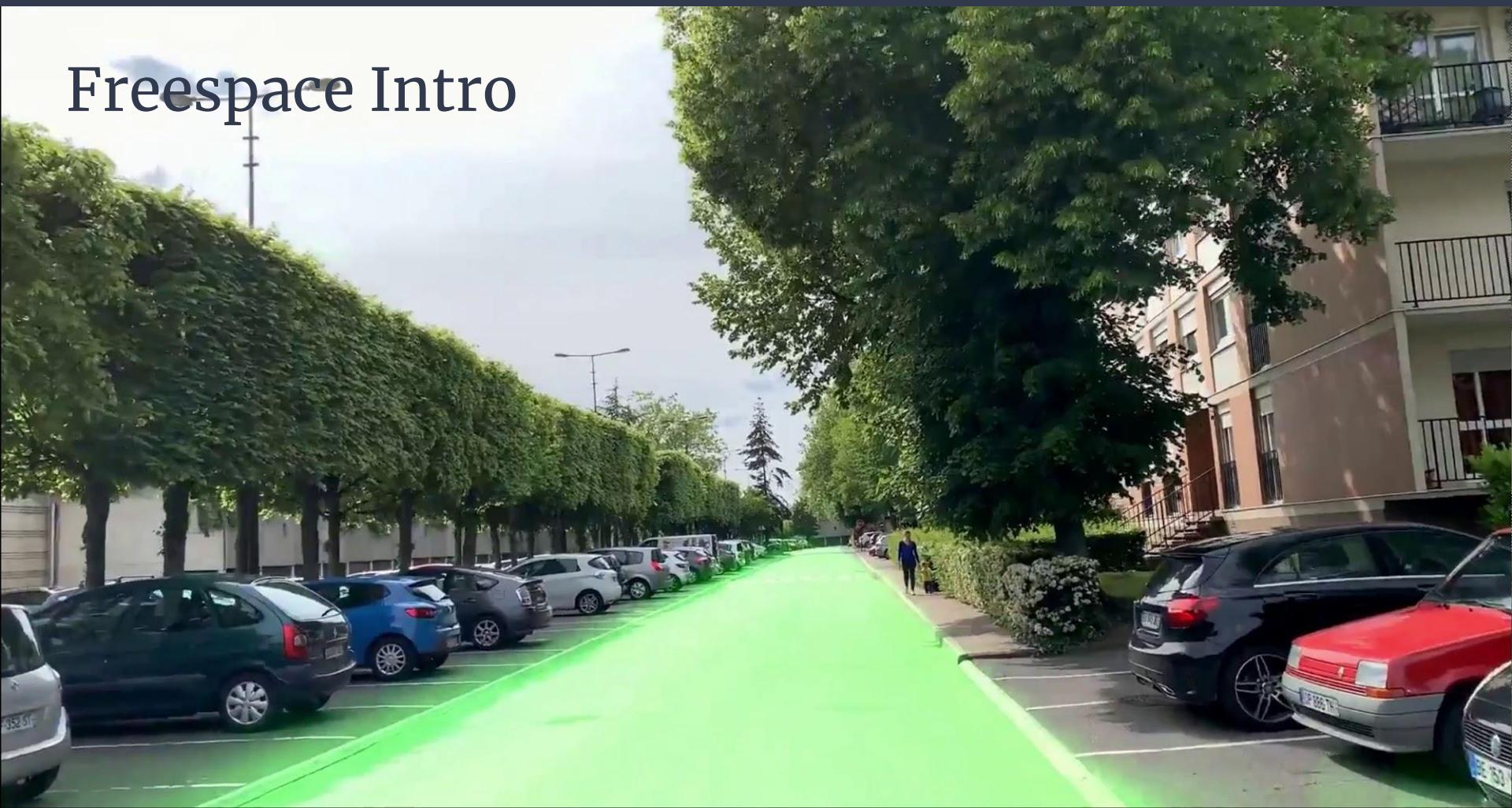
THE GOAL IS TO DETERMINE THE LINE OR CURVE THAT BEST FITS THE DATA

Regression

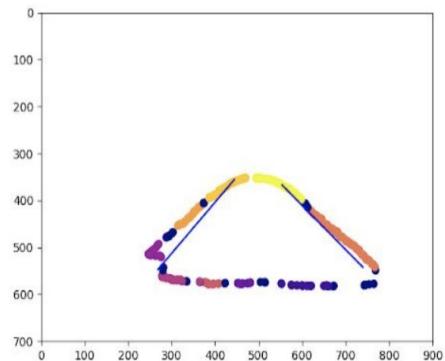
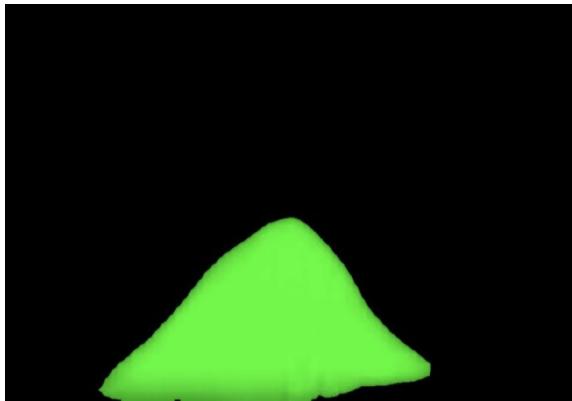


THE GOAL IS TO DETERMINE THE LINE OR CURVE THAT BEST FITS THE DATA

Freespace Intro

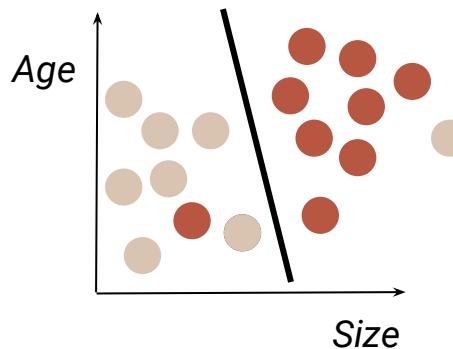


Regression in Practice

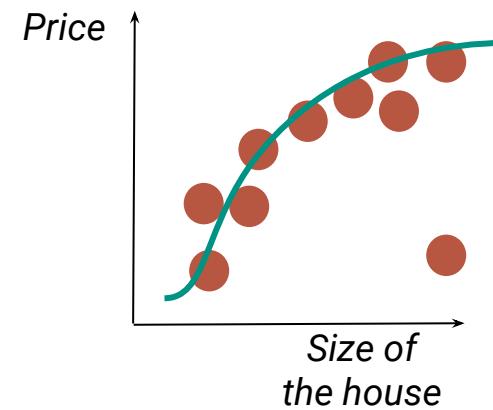


Outliers

CLASSIFICATION



REGRESSION



OUTLIERS ARE TO BE
REMOVED WHEN TRAINING

Classification vs Regression



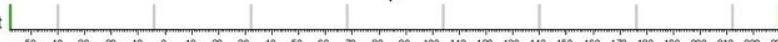
Regression

What is the temperature going to be tomorrow?

PREDICTION

84°

Fahrenheit
°F



Classification

Will it be Cold or Hot tomorrow?

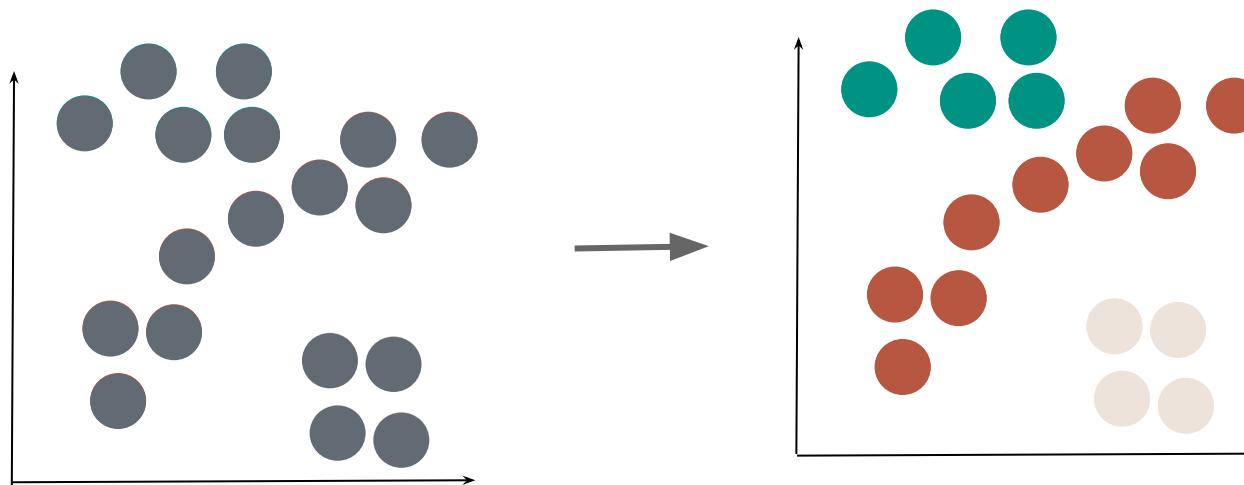
PREDICTION

HOT

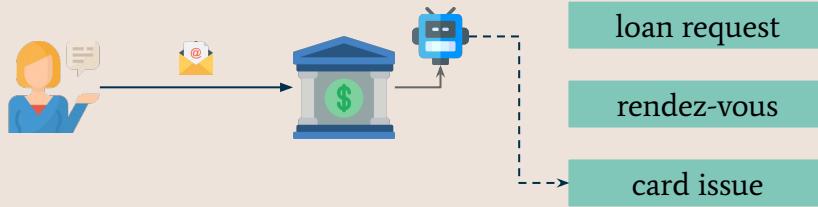
Fahrenheit
°F



Clustering



<https://www.naftaliharris.com/blog/visualizing-k-means-clustering/>



EMAIL PROJECT

Email example

1

Identify the problem



Build a system that can **answer incoming client emails** outside of work hours



The system must:

- **Understand** received emails
- **Answer** coherently

NATURAL LANGUAGE
PROCESSING

CLASSIFICATION

CHATBOT

PROBLEM

DATA

INTENT

ALGORITHM

TEST

Email classifier example

2

Collect some emails



Hello, can you
raise my card
limit?



I want a RDV now



My limit is too
low!!!



I want to open an
account for my
son



Hello, I need a
loan and a
meeting to
discuss this
matter



Hello, could we
meet this week?



I need some
money to buy a
new house



My card is
blocked

PROBLEM

DATA

INTENT

ALGORITHM

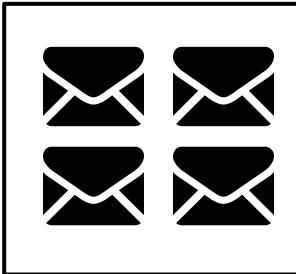
TEST

Email classifier example

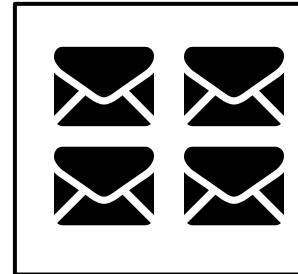
3

Set some intents/classes

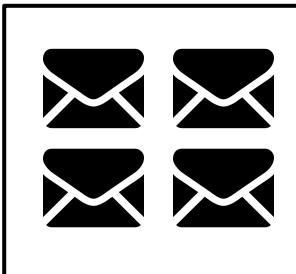
BLOCKED CARD



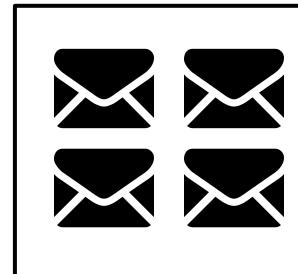
RDV



LIMIT



LOAN



PROBLEM

DATA

INTENT

ALGORITHM

TEST

Email classifier example

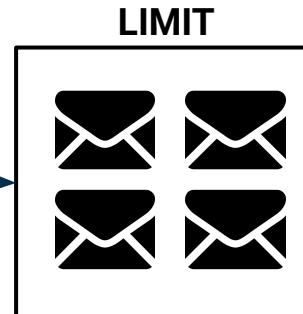
4

Choose an algorithm

"Hello,

Could you **raise** my **credit card limit** to the **next level**?

Thanks,"



PROBLEM

DATA

INTENT

ALGORITHM

TEST

Email classifier example

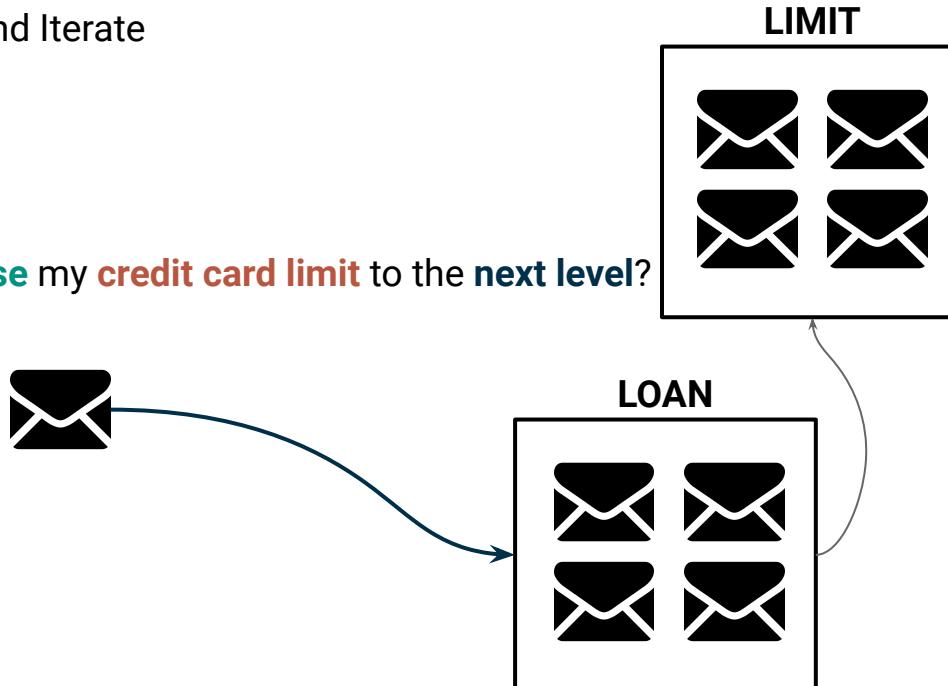
5

Test and Iterate

"Hello,

Could you **raise** my **credit card limit** to the **next level**?

Thanks,"



PROBLEM

DATA

INTENT

ALGORITHM

TEST

Email classifier example



CLIENTS

- Gives data
- Identify problem
- Defines intent



TECHNICAL TEAM

- Evaluate data
- Work on data and algorithms
- Delivers solution

PROBLEM

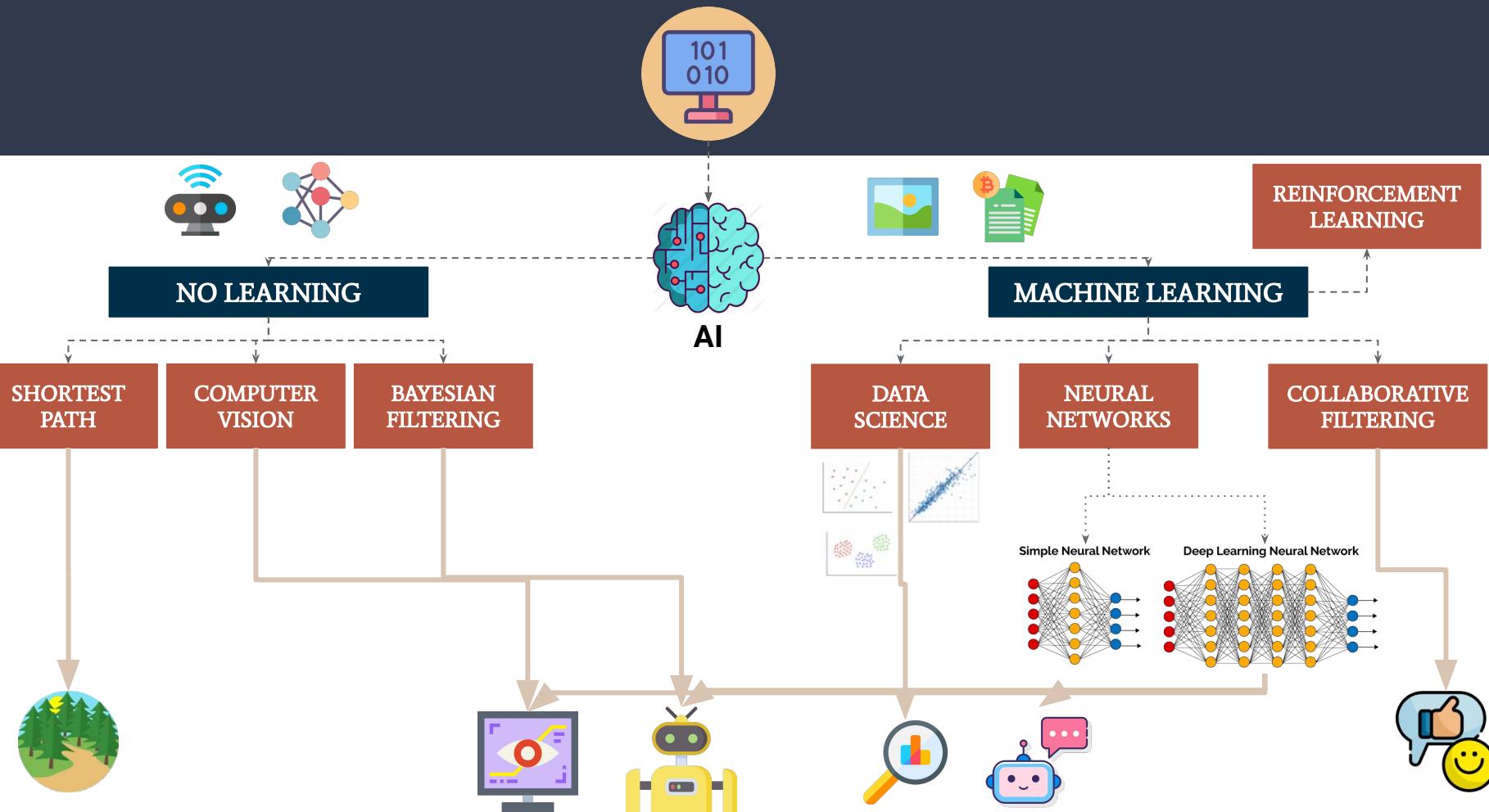
DATA

INTENT

ALGORITHM

TEST

COMPUTER SCIENCE



Tools

Languages



In this course



High Level Language

Interpreted

Useful for Machine Learning research because easy to read and to learn

Python vs Other Languages

C++ "Hello World"

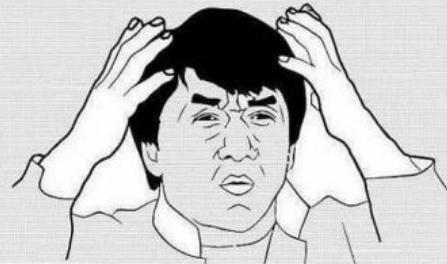
```
#include<iostream.h>
main()
{
cout << "Hello World";
}
return 0
```

JAVA "Hello World"

```
class HelloWorldApp
{
    public static void main(String[] args)
    {
        System.out.println("Hello World!");
    }
}
```

PYTHON

```
print "Hello World"
```



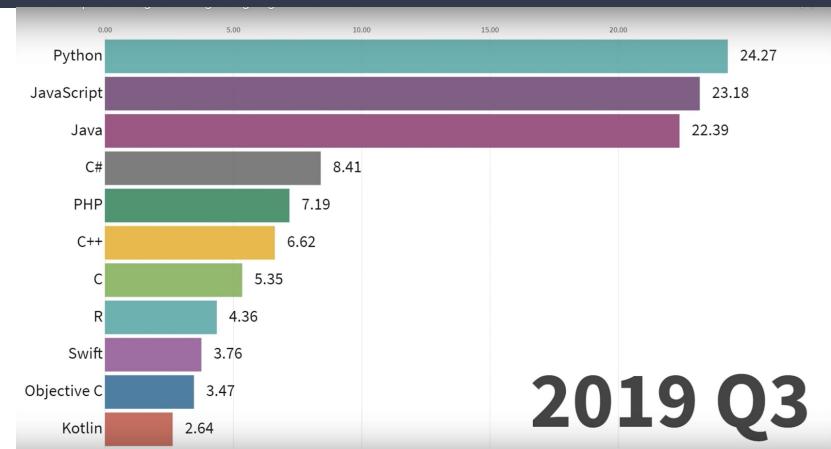
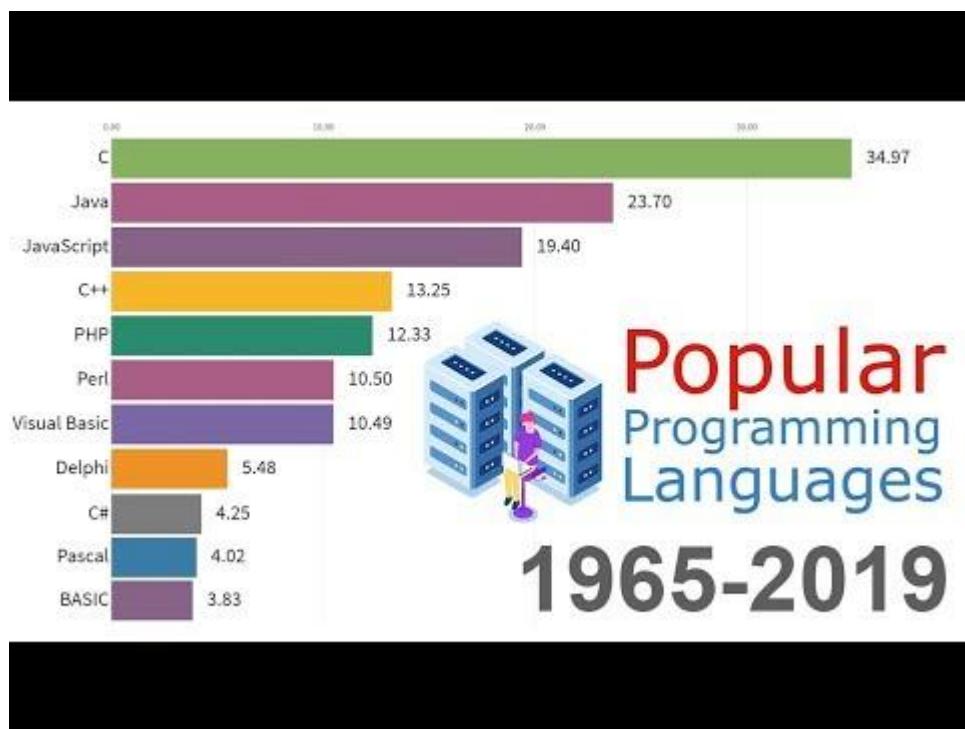
C++

const int variable = 3;

Python

variable = 3

Language Popularity



Libraries



OpenCV

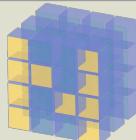
K Keras

T TensorFlow



PYTORCH

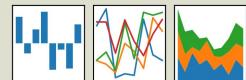
++
Caffe2



NumPy

matplotlib

pandas
 $y_{it} = \beta' x_{it} + \mu_i + \epsilon_{it}$



In this course



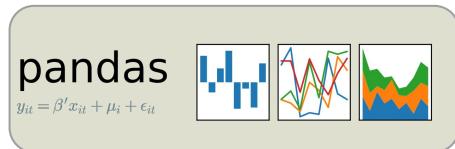
Machine Learning algorithms



Python framework for vectors and matrices



Deep Learning framework



Dataframes

Other tools



Online Code Editor with the possibility to visualize code output and add text, pdfs, ...



Notebook client for Google with the possibility to run code on Google's machines (more powerful)



ANACONDA®

Install packages on a part of your computer. Activate the conda environment when you need the package and disable it right after.

Thank You

jeremycohen.podia.com

<https://www.linkedin.com/in/jeremycohen2626/>