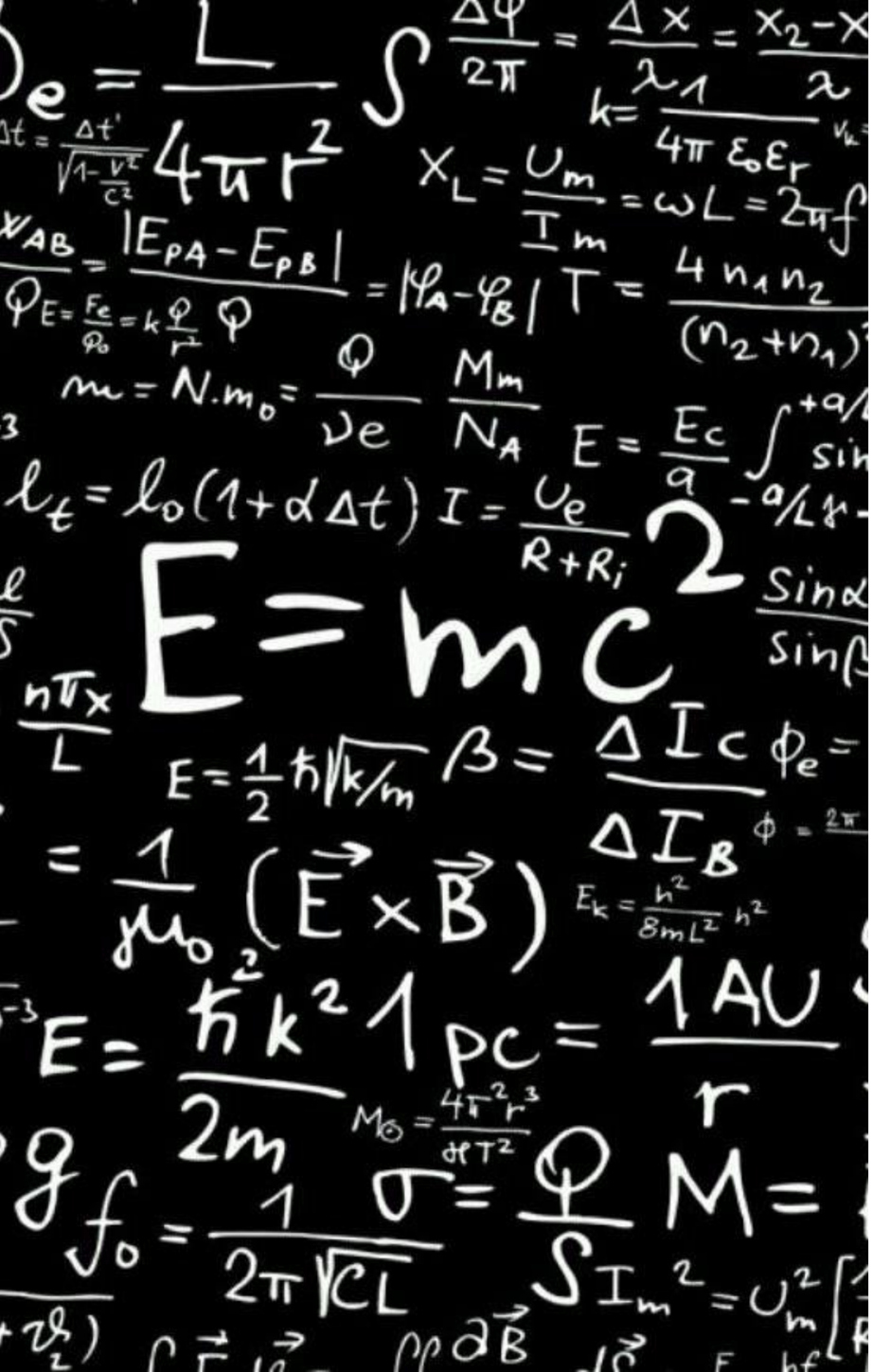


Artificial Intellegence and Machine Learning

AI? What is it?

- You all have heard about AI almost everyday.

- In your mind, what is AI?

AI? What is it?

AI? What is it?

AI? What is it?

- (Hopefully) You all (still) know how to program to solve a simple problem.

- What are the differences between AI and basic programming?

Artificial Intelligence

The science of making
a Computer Agent that
Acts Rationally

Acting Rationally

- Acting Implicitly based on Logic or Reason.

Explicit (adj.)

Tell directly, clearly, and in detail
- Ex. If you see a red sign, turn left

- Most of your programming experience are in this space.

Implicit (adj.)

Imply though not plainly expressed
- Not telling the condition directly
- State the conditions as a logic

- Ex. Best route is the shortest route

- In AI/ML, we will play in this space

Acting Rationally

- Acting Implicitly based on Logic or Reason.

- In AI, basically, the agent takes the best action given the current state (optimal solution).

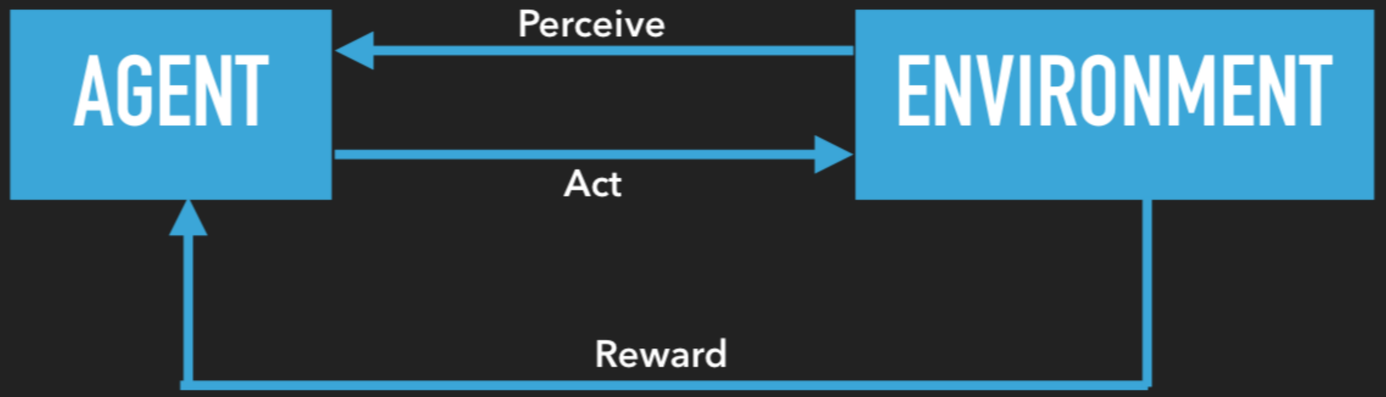
Acting Rationally

- Acting based on Logic or Reason.

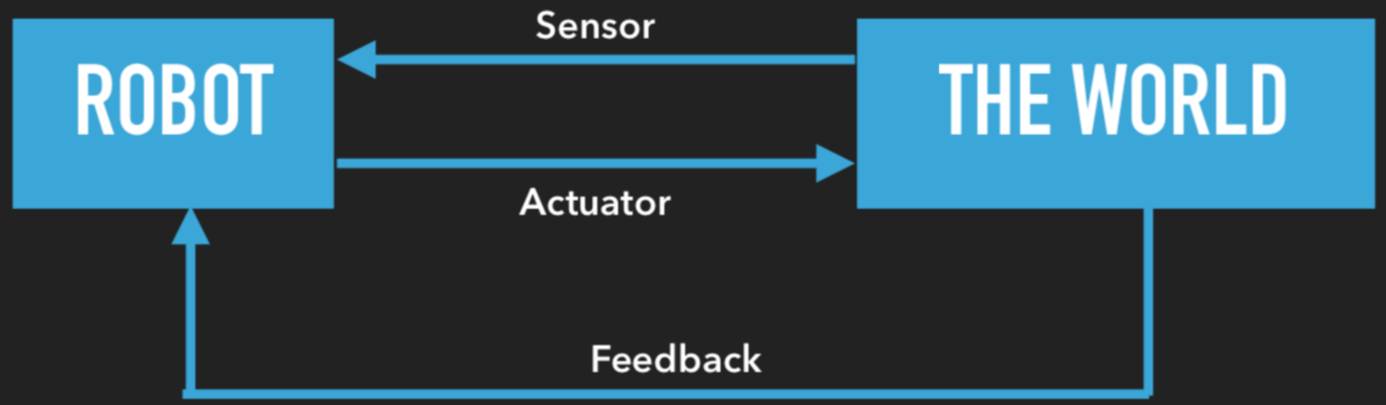
- Basically, the agent takes the best action given the current state.
  - The action that gives the shortest path to the goal.
  - The action that gives the most immediate rewards.
  - The action that gives the most long term rewards.
  - etc.

- It all depends on the state spaces.

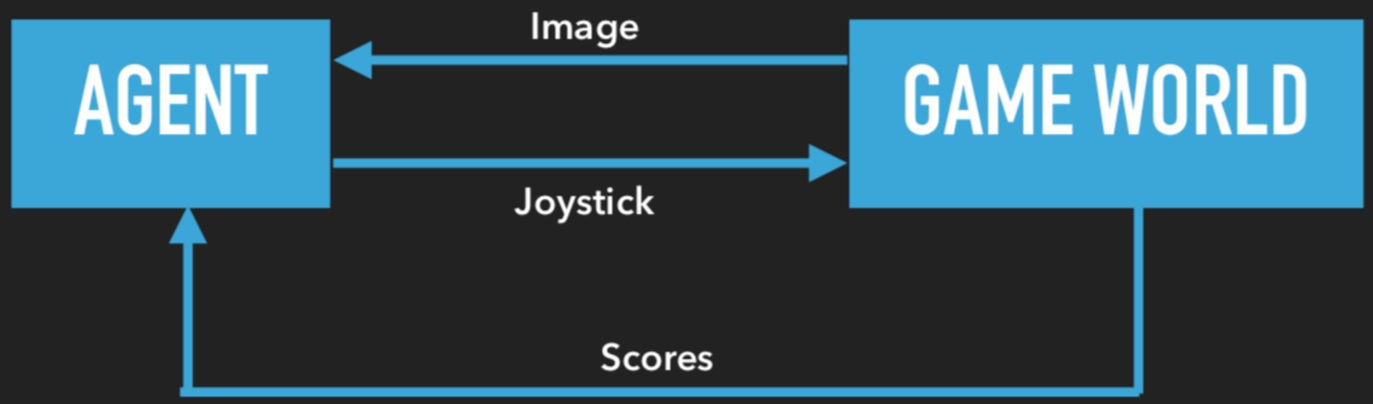
AN INTELLIGENT AGENT

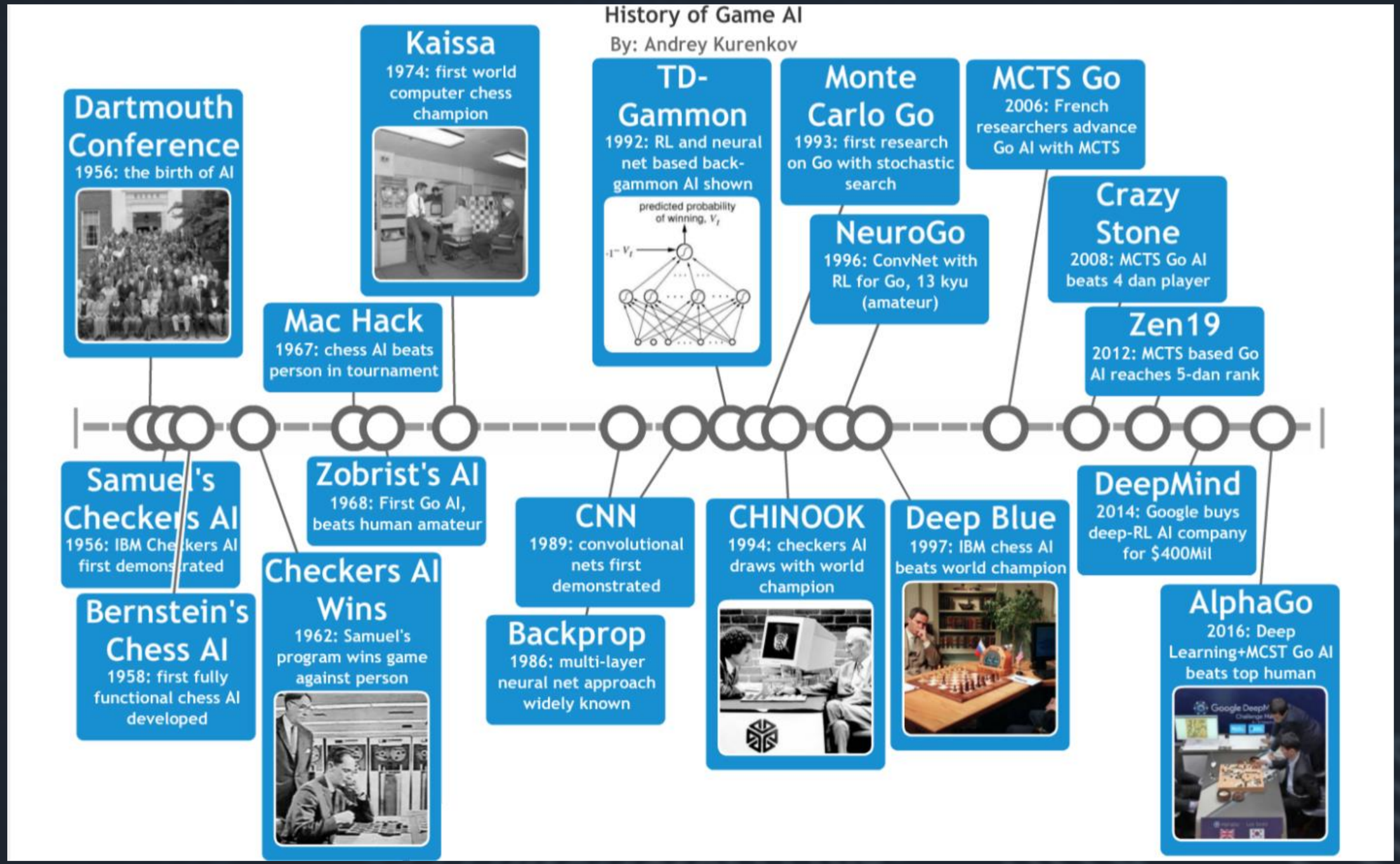


AI IN ROBOTICS



AI IN GAMES

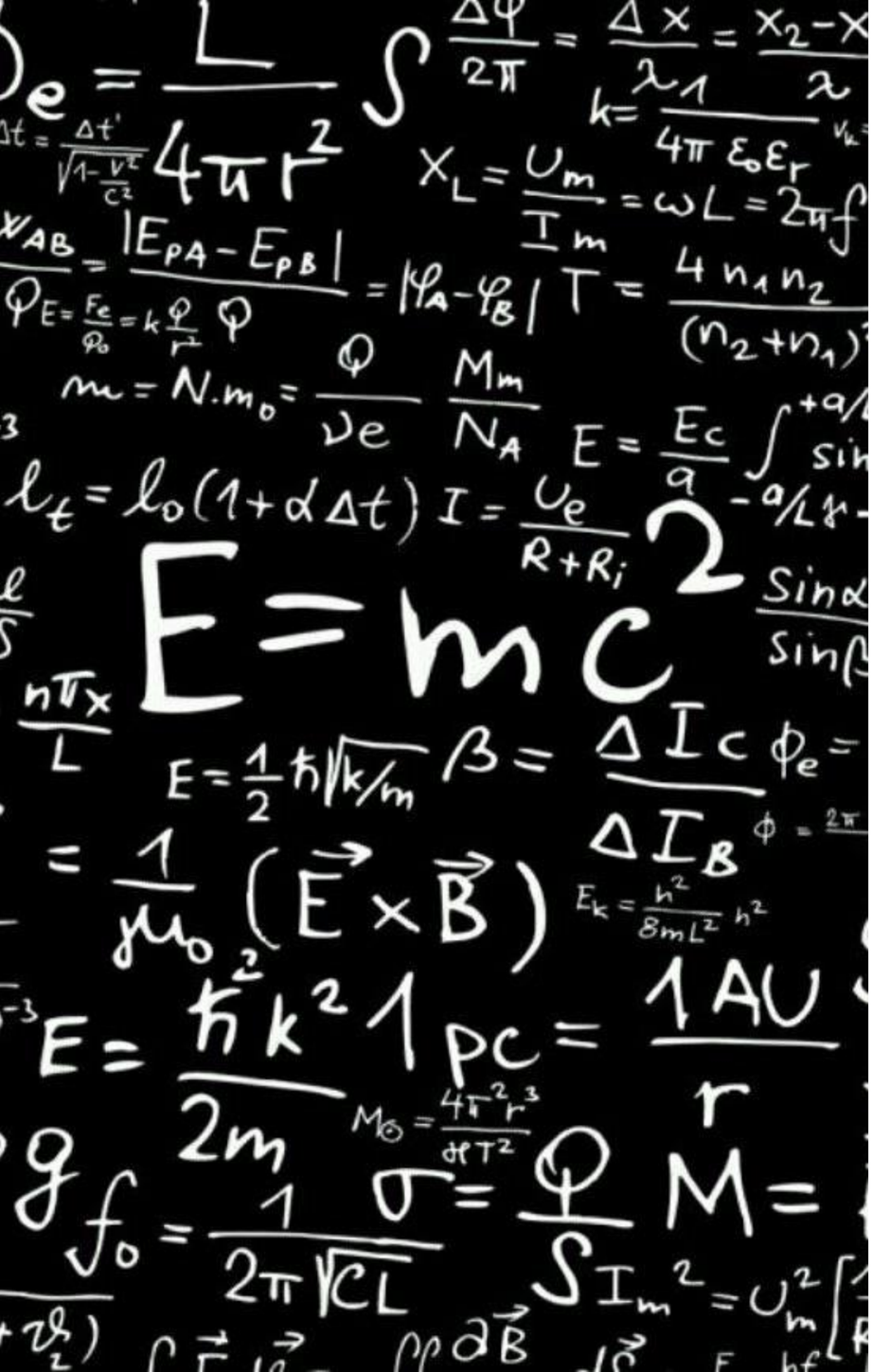




http://www.andreykurenkov.com/writing/images/2016-4-15-a-brief-history-of-game-ai/0-history.png

What can AI do?

What are the real world applications of AI?



INTRODUCTION TO MACHINE LEARNING

machine learning

The science of getting computers to learn from data without having to be explicitly programmed by humans.

the most basic understanding

- It’s all about letting computer learns what ‘input’ is associated to what ‘output’.
  - Example: given a picture, computer outputs what object appears in the picture (human, car, tree?).
  - Example: given inputs from sensors and cameras, the robotic algorithm pushes out the appropriate movement.

EXAMPLES OF MACHINE LEARNING APPLICATIONS

SPAM CLASSIFICATION

- Email (text) as the input -> Go into classification model -> Output the answer whether this is spam or not.
- Big email platforms can identify spams with 99% accuracy.

machine learning - Google Search

https://www.google.co.th/search?q=machine+learning&oq=machine+learning&aqs=chrome..69i57j69i60l2j69i61j0j...

machine learning

All | Images | News | Videos | Books | More | Settings | Tools

About 18,000,000 results (0.69 seconds)

Machine Learning | Coursera

https://www.coursera.org/learn/machine-learning

About this course: **Machine learning** is the science of getting computers to act without being explicitly programmed. In the past decade, **machine learning** has given us self-driving cars, practical speech recognition, effective web search, and a vastly improved understanding of the human genome.

Machine learning - Wikipedia

https://en.wikipedia.org/wiki/Machine_learning

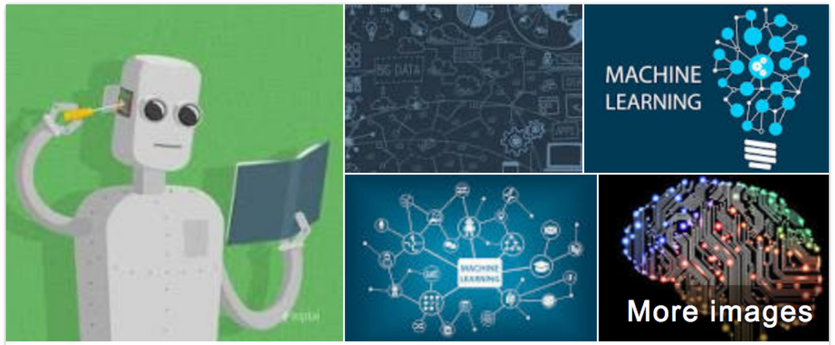
Machine learning is a field of computer science that gives computers the ability to learn without being explicitly programmed. Arthur Samuel, an American pioneer in the field of computer gaming and artificial intelligence, coined the term "**Machine Learning**" in 1959 while at IBM.

Top stories

Workday buys SkipFlag to bolster machine

Are Artificial Intelligence And Machine Learning

Unstructured content: An untapped fuel



Machine learning

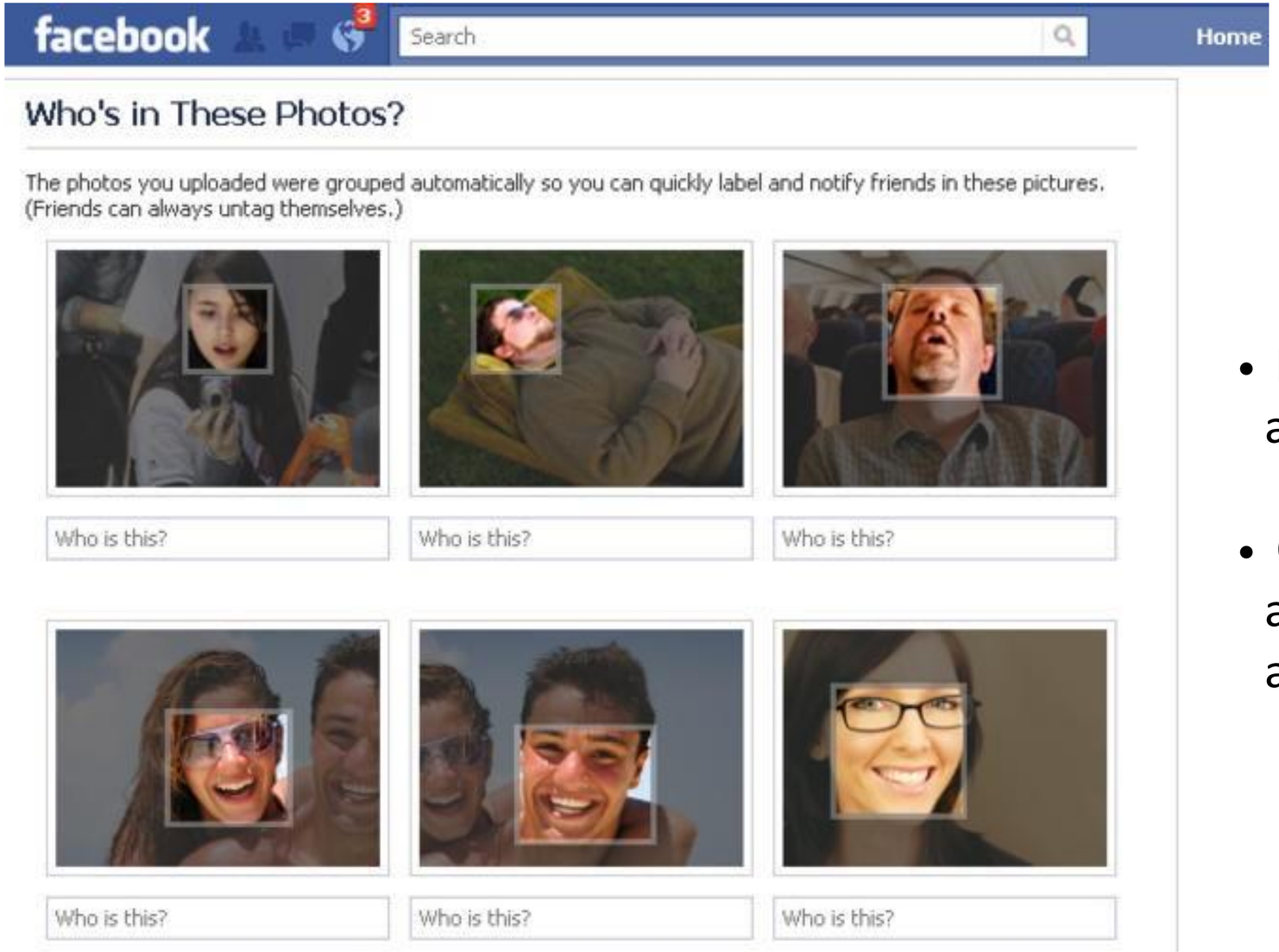
Field of study

Machine learning is a field of computer science that gives computers the ability to learn without being explicitly programmed. Wikipedia

Feedback

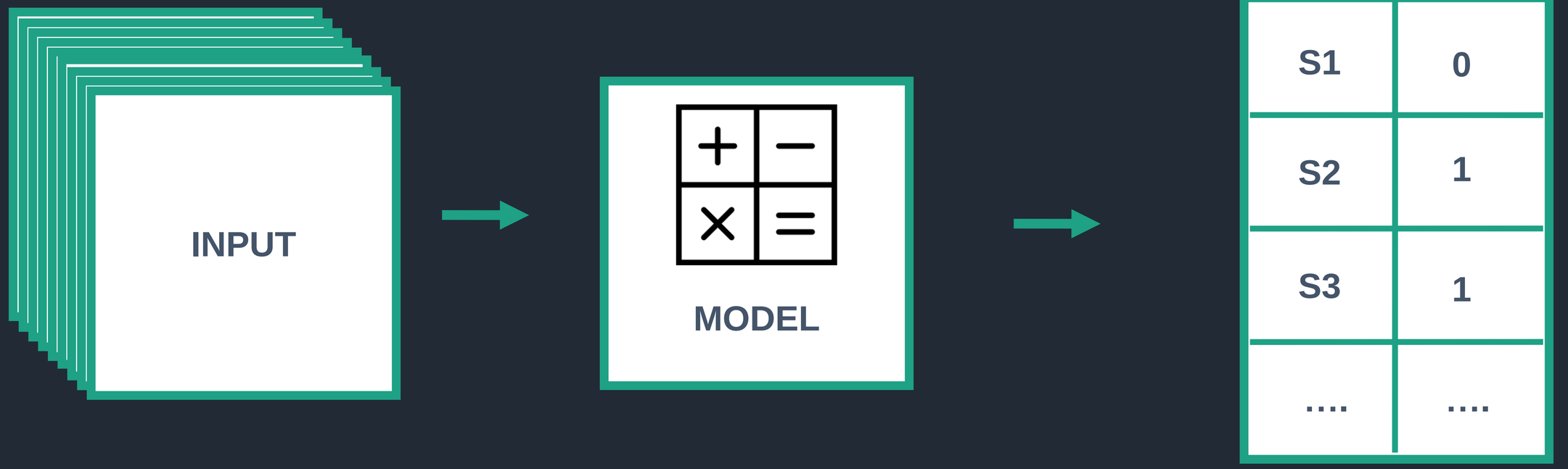
GOOGLE SEARCH ENGINE

FACEBOOK FACE TAGGING



- People provide Facebook the images and tags of names in the photos.
- Over time Facebook learned to associate names with faces and can automatically recognize these people.

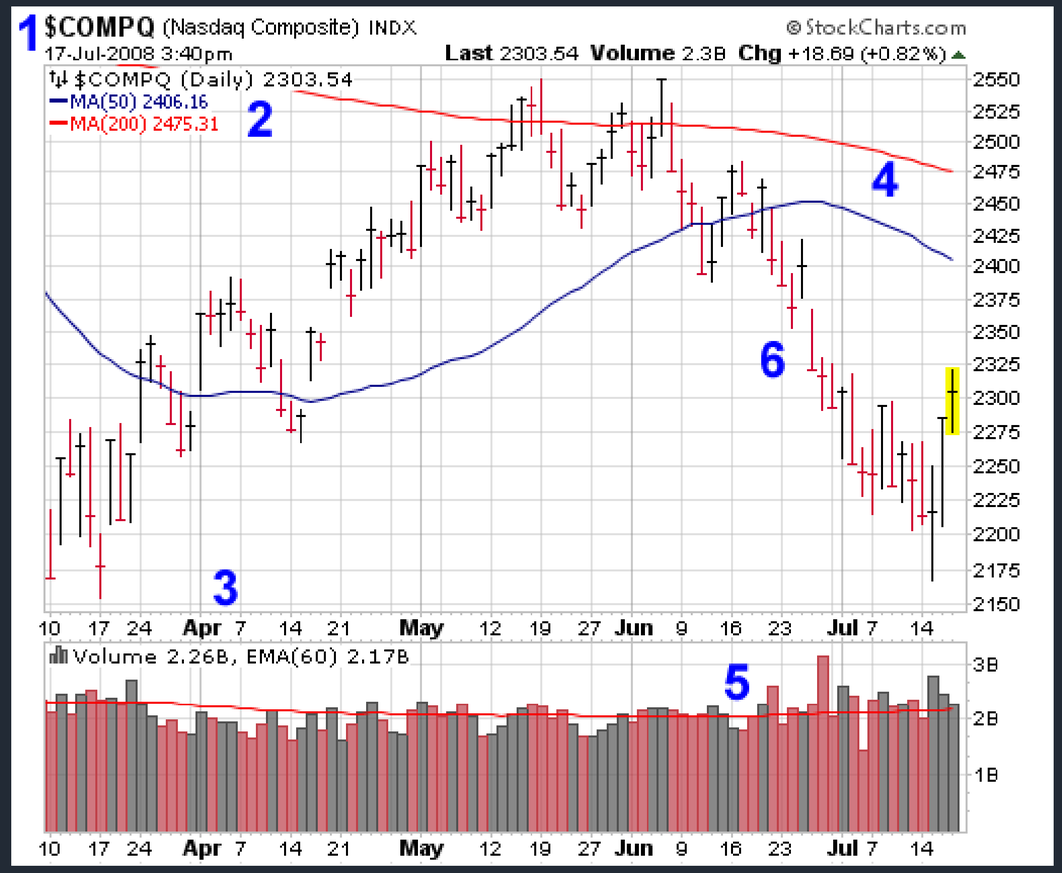
INPUT - MODEL - OUTPUT



another view of machine learning

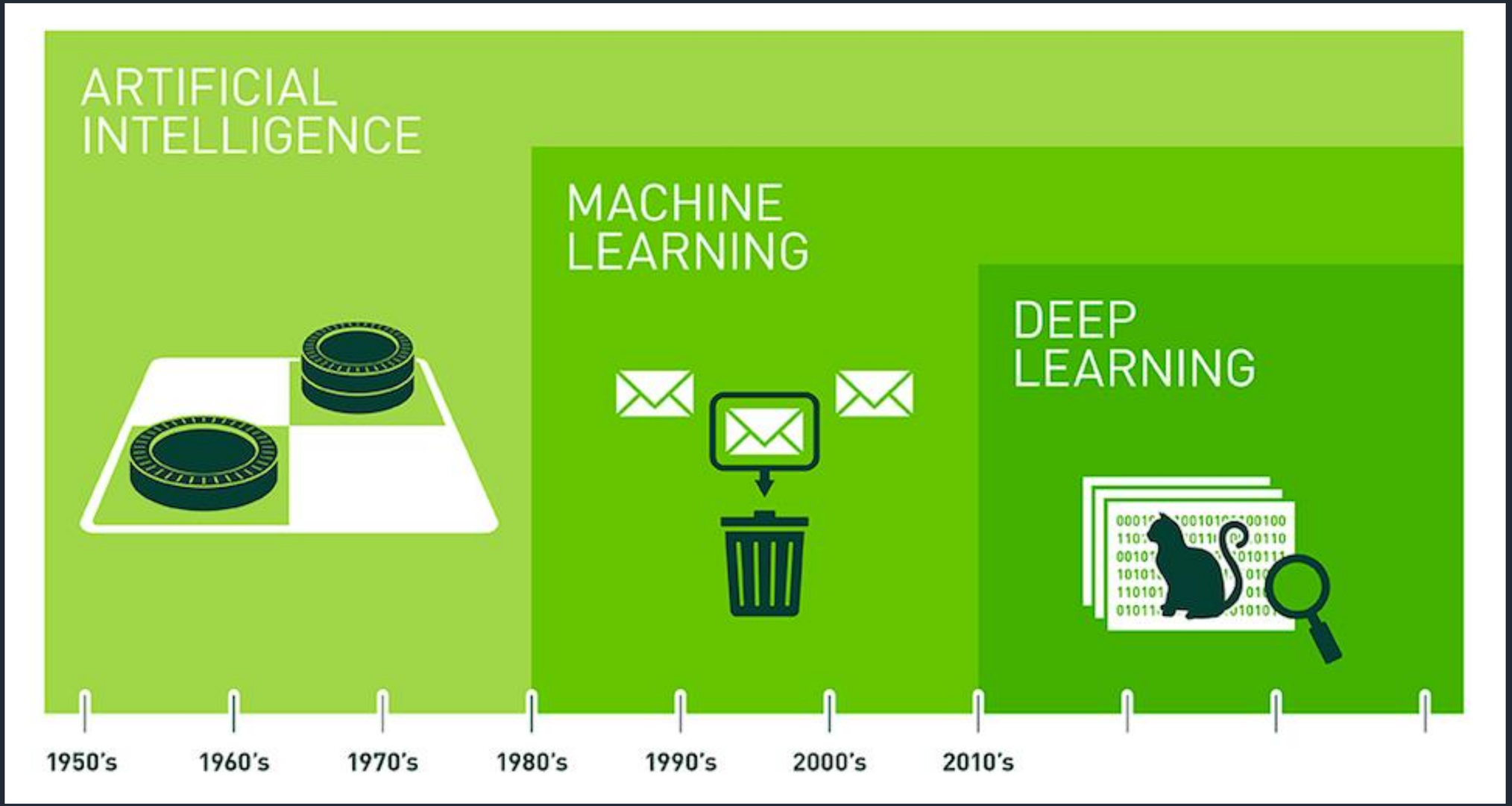
Teaching the computer to learn from experiences and optimize a given performance index as they practice.

intelligent system with machine learning

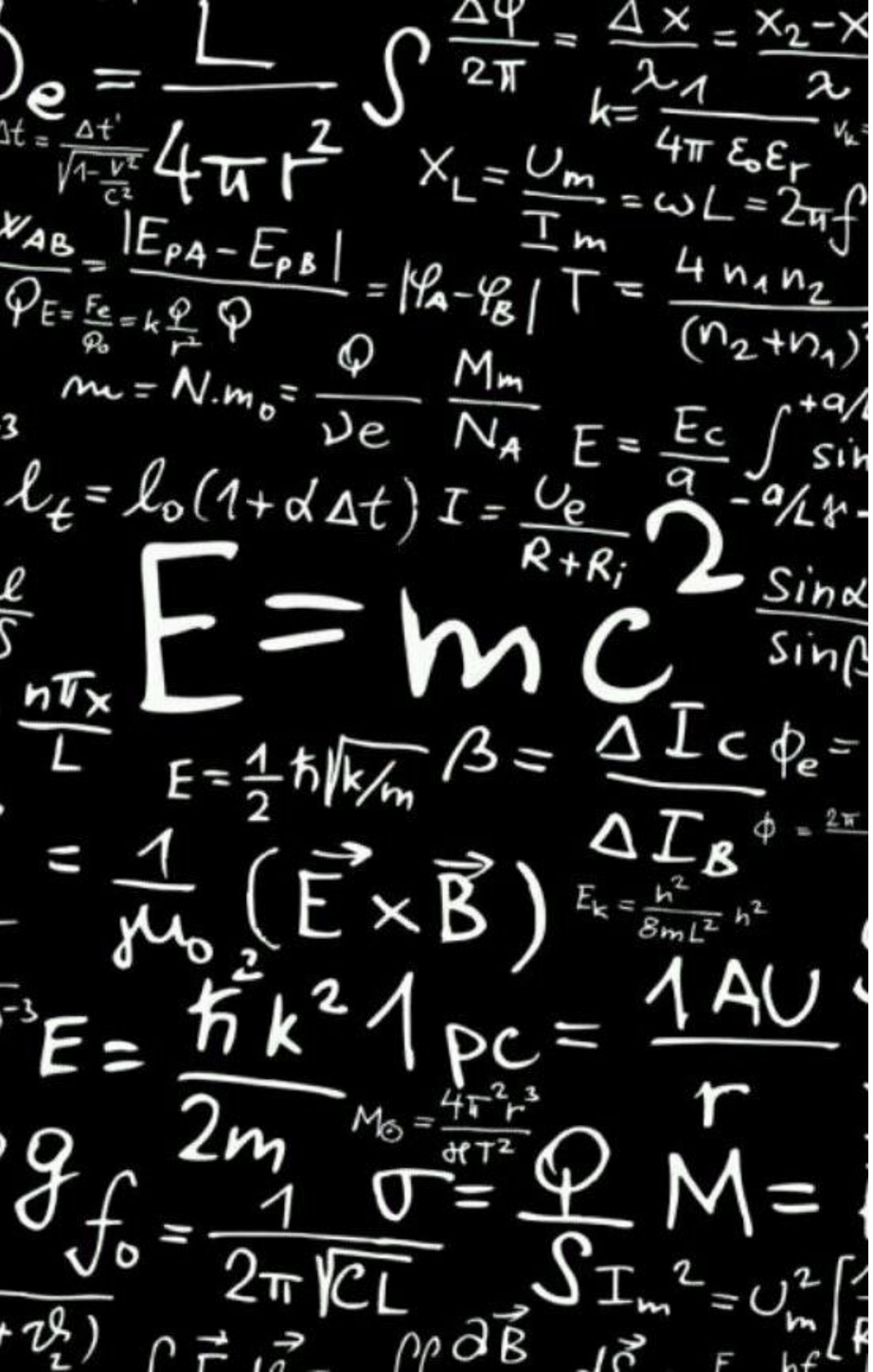


Differences between AI and ML?

Differences between AI and ML?



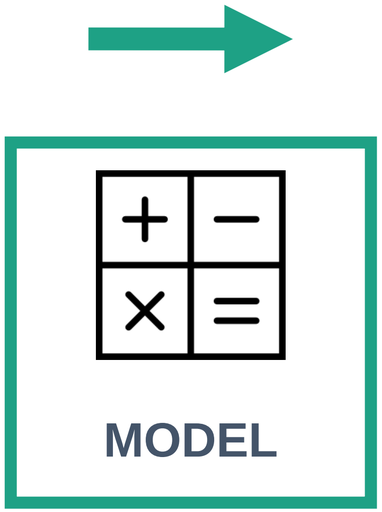
https://www.anexas.net/artificial-intelligence-online-course-in-mumbai



CLASSIFICATION AND REGRESSION

REGRESSION PROBLEM

- Property size
- Property age
- Bedrooms
- Bathrooms
- Parking size

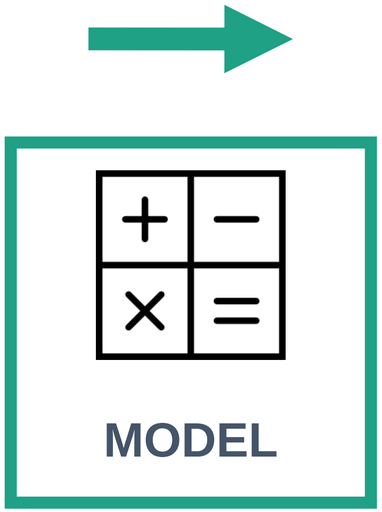


How much should we sell the property? (the answers range from 0 to 1B)

Regression problems are the type of problems where model's answers are continuous numbers.

CLASSIFICATION PROBLEM

- Property size
- Property age
- Bedrooms
- Bathrooms
- Parking size



Tell me, what type of property is this? (residential or commercial)

Classification problems are the type of problems where model's answers are discrete categories.

Regression & Classification

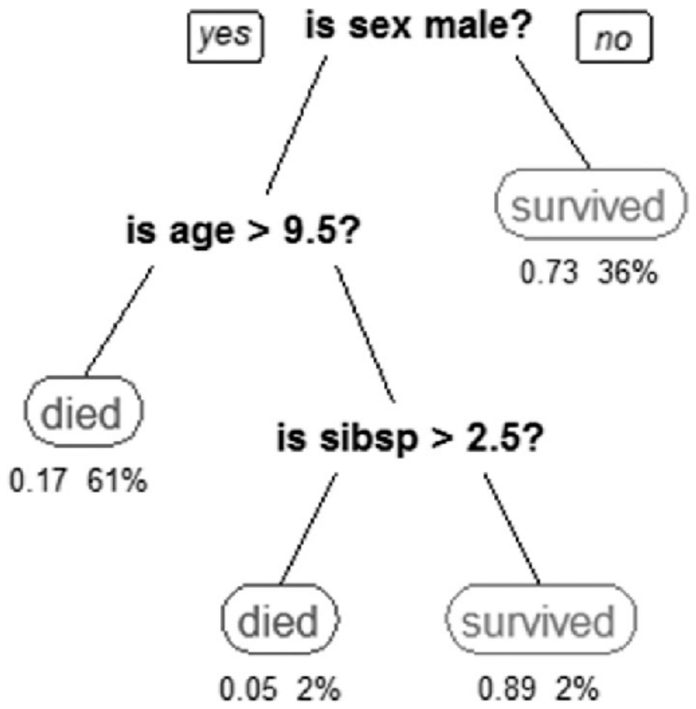
- Regression Problem
  - The answers models come up with are continuous numbers.
- Classification Problem
  - The answers models come up with are discrete categories.
- Note that you can apply both approaches to the same dataset!

Regression or Classification?

- Predict if a Titanic passenger would survive or not?

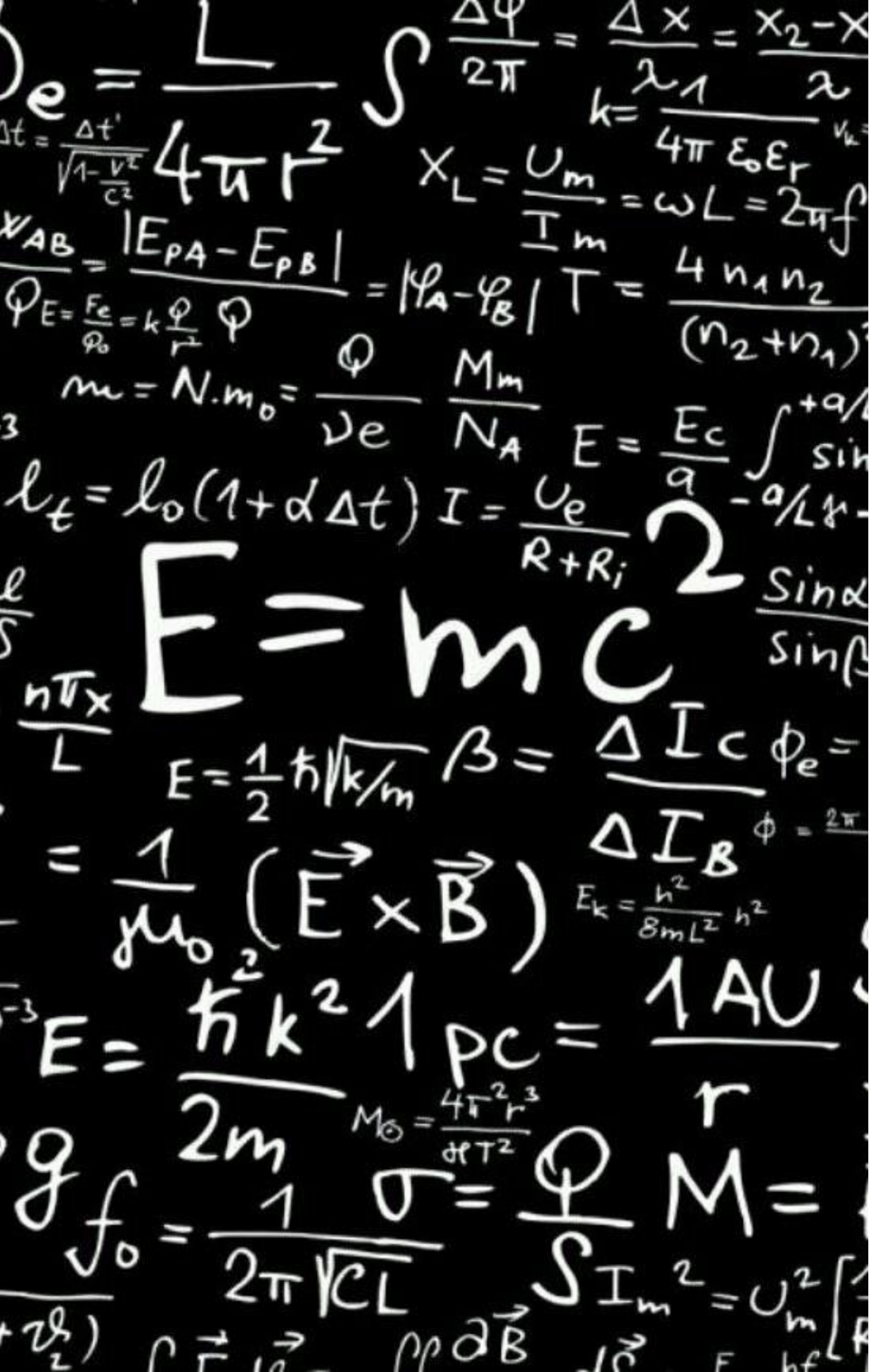
Regression or Classification?

- Predict if a Titanic passenger would survive or not?
- Classification



Regression or Classification?

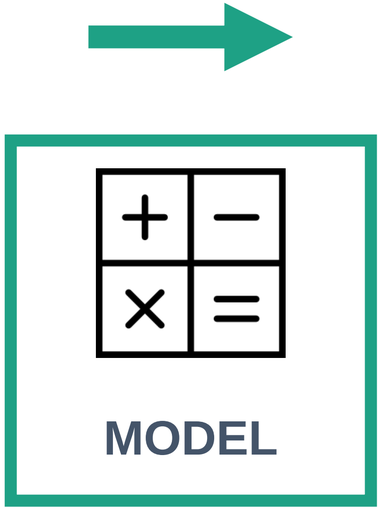
- Predict the house price?
- Predict the letter grade of a student?
- Predict GPA of a student?
- Predict the next president of the United States of America?
- Predict the year that AI will take over the world?



SUPERVISED AND UNSUPERVISED LEARNING

SUPERVISED LEARNING

- Property size
- Property age
- Bedrooms
- Bathrooms
- Parking size



REGRESSION

How much should we sell the property? (the answers range from 0 to 1B)

CLASSIFICATION

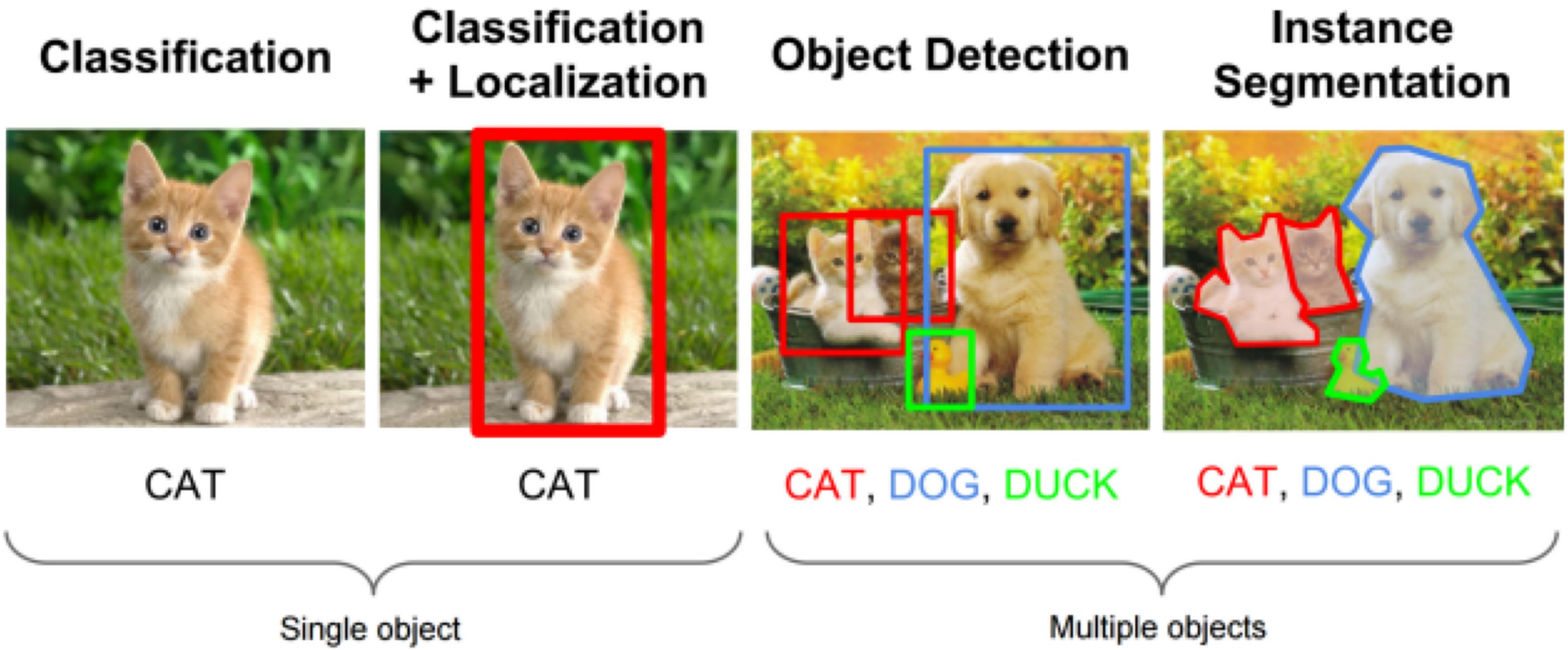
Tell me, what type of property is this? (residential or commercial)

SUPERVISED LEARNING

- We collect a lot of data points from the past,
  e.g. Collecting property qualities, property prices, and property types.
- We use the past data to fit the model
  e.g. Teaching it to understand what quality map with what prices and what types.
- When the model encounters new samples where the answers are not available, it will use knowledge from past data to provide answers.

Supervised learning problems are those problems where the answers that the model predict are already included in the training data.

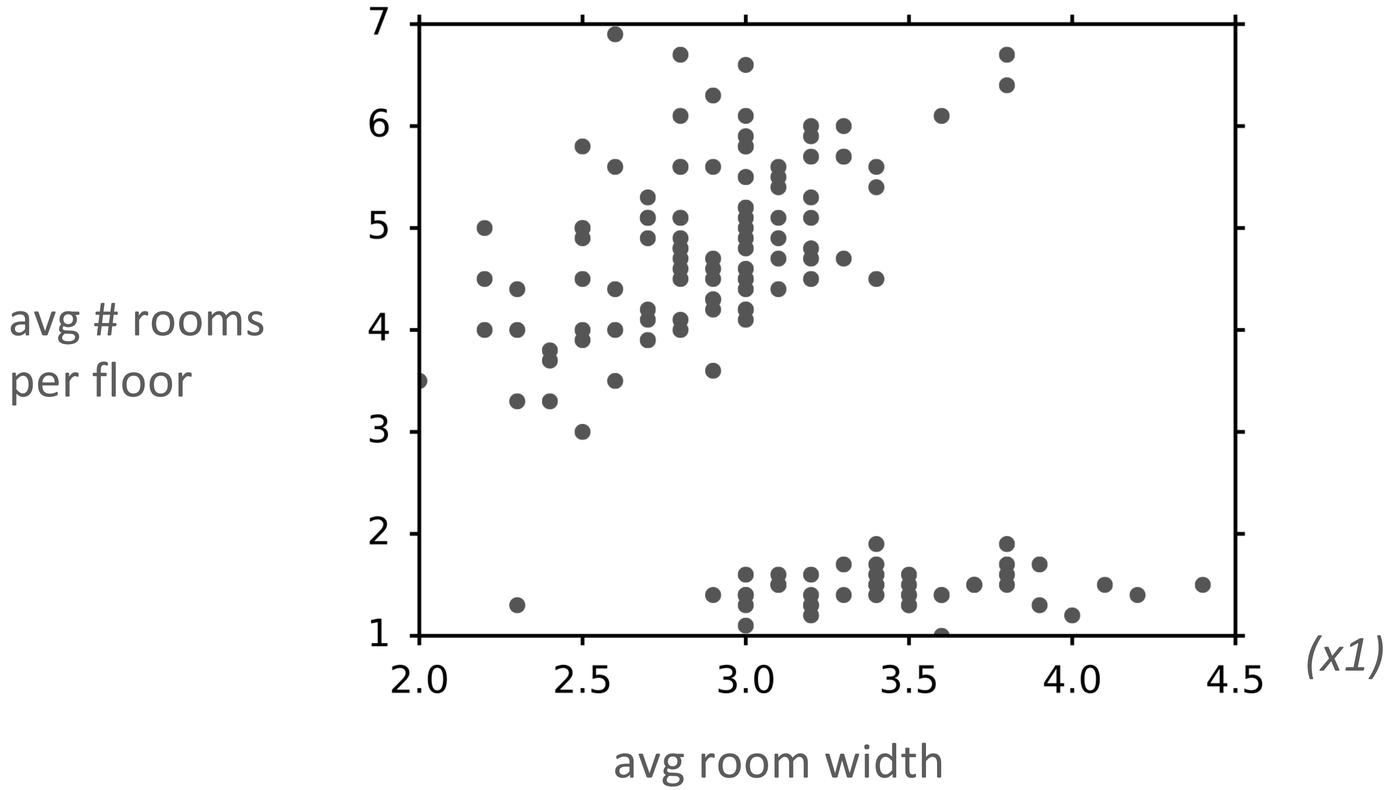
SUPERVISED LEARNING



SUPERVISED LEARNING

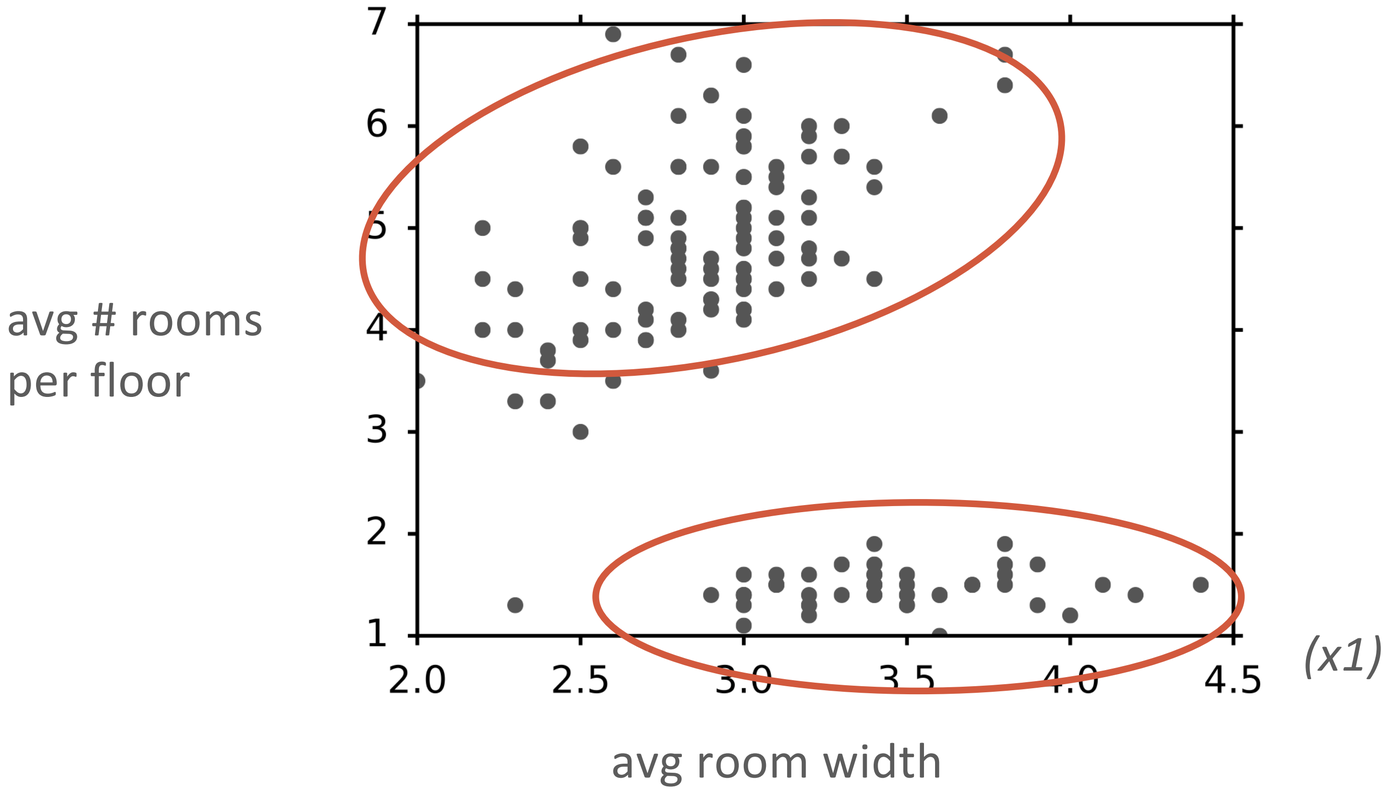
- Requires a lot of manually-labeled data.
- Requires business people to help decide “what to predict” (sometimes it’s hard to know what is the most useful thing to predict).
- Requires business people to identify and gather “appropriate inputs”.
- If done right, they are the most simple and reliable techniques to use. They are the core of most AI systems we see today.

UNSUPERVISED LEARNING



- What if you want to predict property categories, but don't know the answers in advance?
- You have to infer categories from the structure of the data.
- You are going to use unsupervised learning in this case.

UNSUPERVISED LEARNING

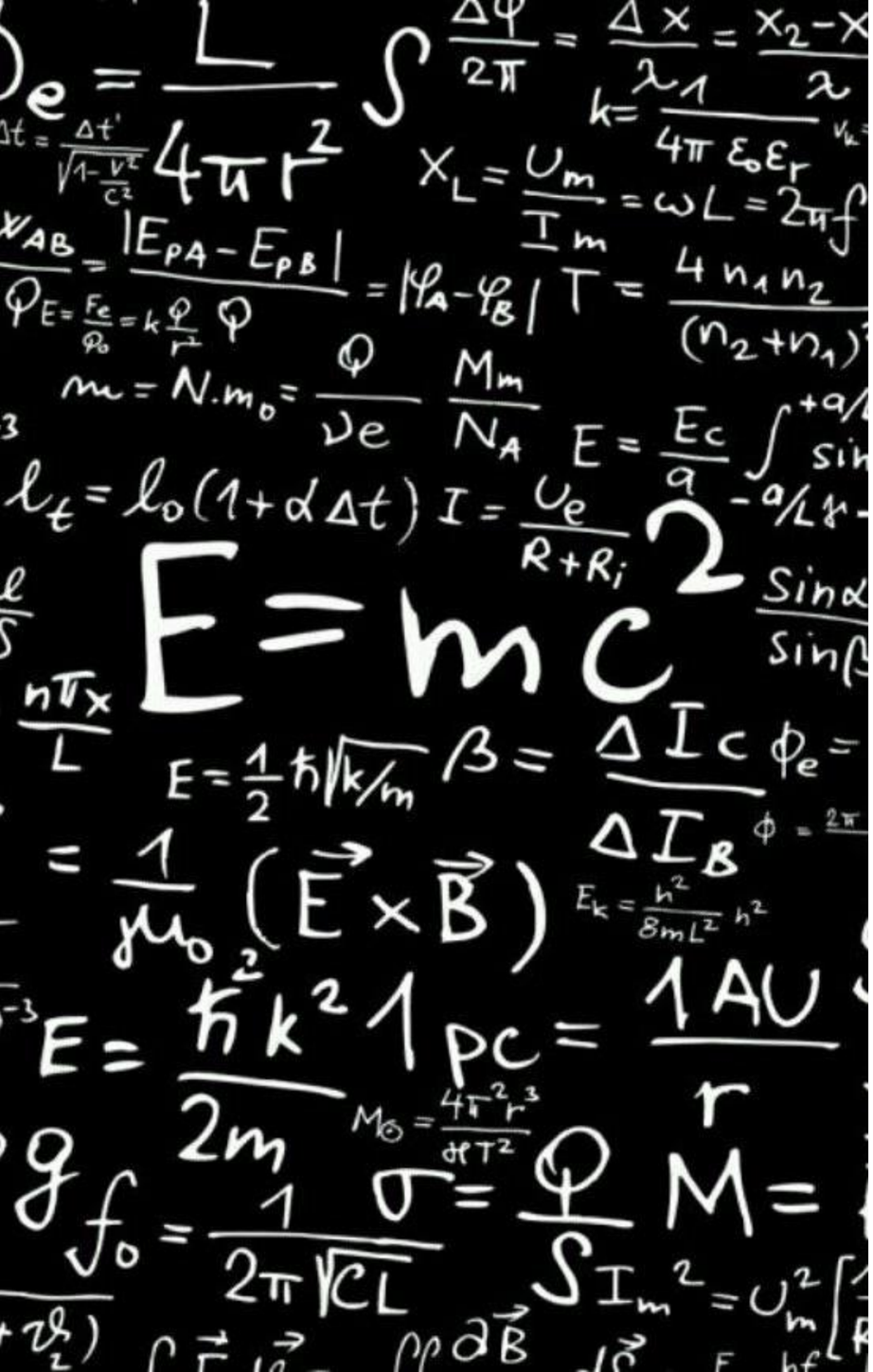


- What if you want to predict property categories, but don't know the answers in advance?
- You have to infer categories from the structure of the data.
- You are going to use unsupervised learning in this case.

Unsupervised learning problems are those problems where the answers that the model predict are not available in the training set. We infer categories from data structure.

supervised v.s. unsupervised learning

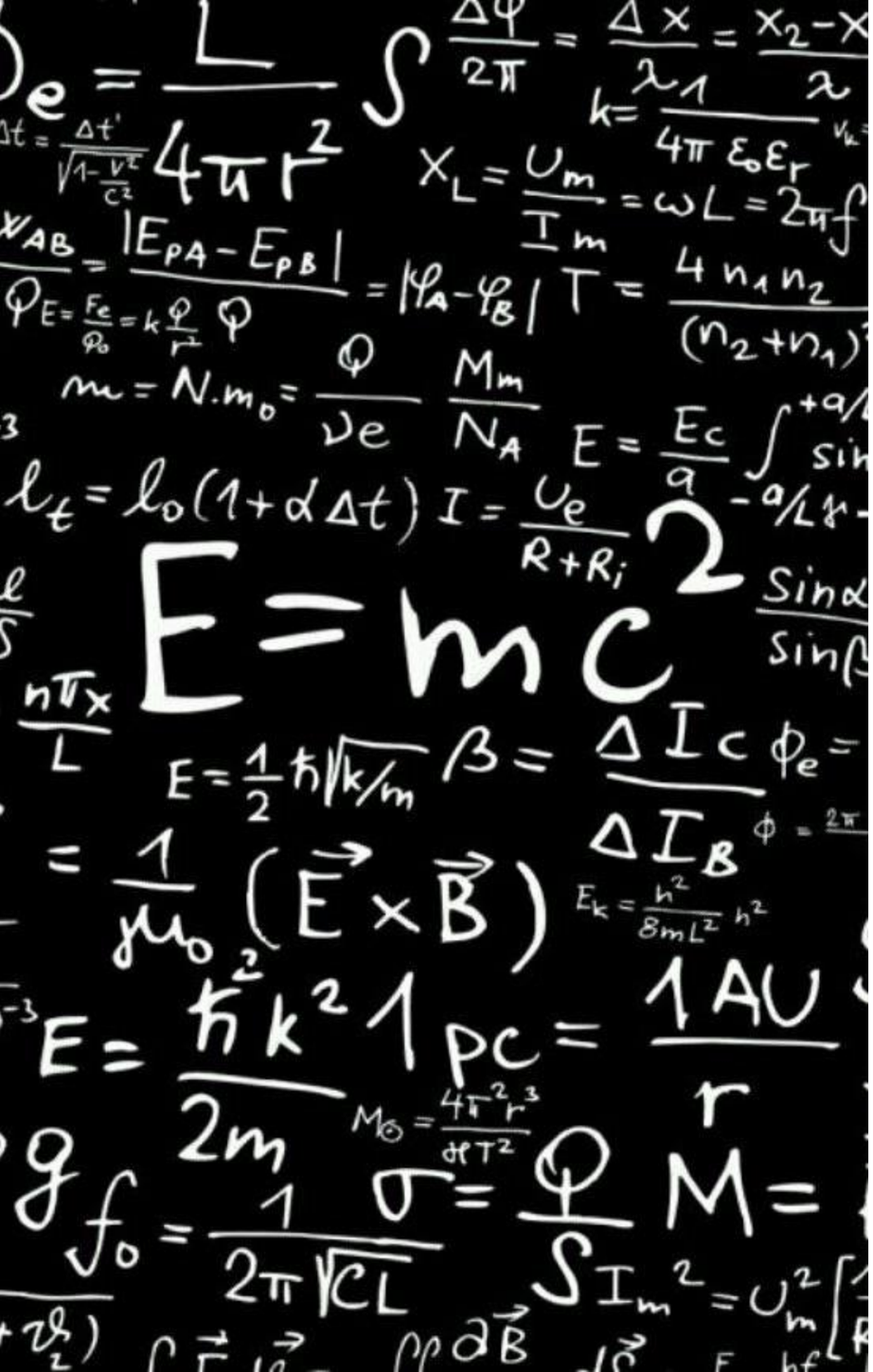
- Supervised learning
  - The answers are included in the training data, note that answers can be numerical or categorical.
- Unsupervised learning
  - You would like to discover the categories, you usually don’t even know how many categories or what categories are there.
- Note that you can apply both approaches to the same dataset!



REINFORCEMENT LEARNING

REINFORCEMENT LEARNING

- Environment defines a set of states, actions, and rewards. Models is trained to understand what actions to take, at what states, to optimize rewards.
- Example: given stock prices (states) and let bots decide each day to buy, sell, or hold a particular stock (actions), bots will make decisions to optimize rewards (profit).



ML PROCESS

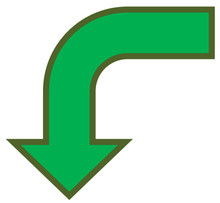
ML Cycle

Gathering Data

Data Acquisition

- Pre-existing dataset
- Survey
- Internet

ML Cycle



Gathering Data

Data Preprocessing

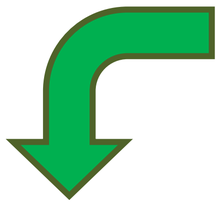
Prepare the data for the model to learn

- Usually, the data is ‘dirty’. We need to ‘clean’ it.
- Missing data, bad distribution, skew data

Feature Engineering

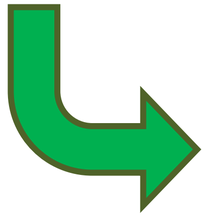
- The gathered data may not be in the form that we want
- We need to transform some features of the dataset

ML Cycle



Gathering Data

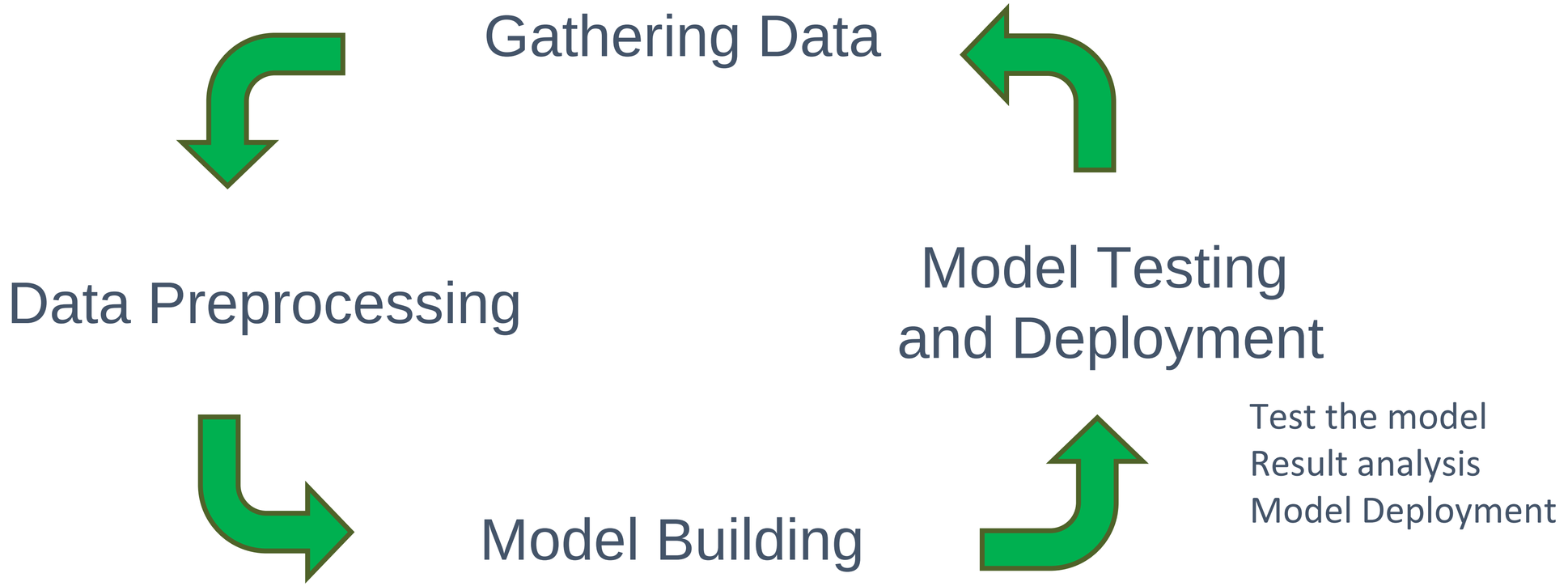
Data Preprocessing



Model Building

Build and Train the model
Tune the model

ML Cycle


Gathering Data
Model Testing
and Deployment
Data Preprocessing
Model Building
Test the model
Result analysis
Model Deployment