ML methods

2022

Course structure:

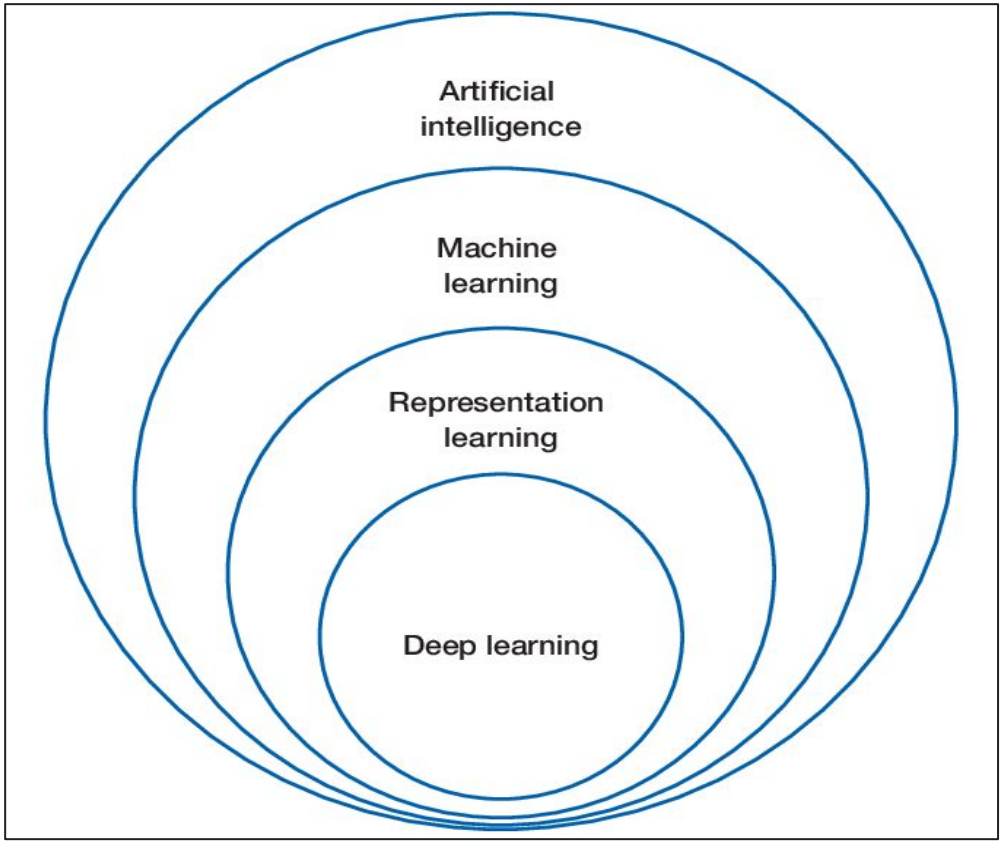
- 10-12 sessions
- 2 sessions a week
- We will choose the most comfortable weekdays later
- One sessions = ~1-1,5 hours: lecture + seminar
- A homework after each session

Why do we need to teach machines?

What is the difference between AI and machine learning

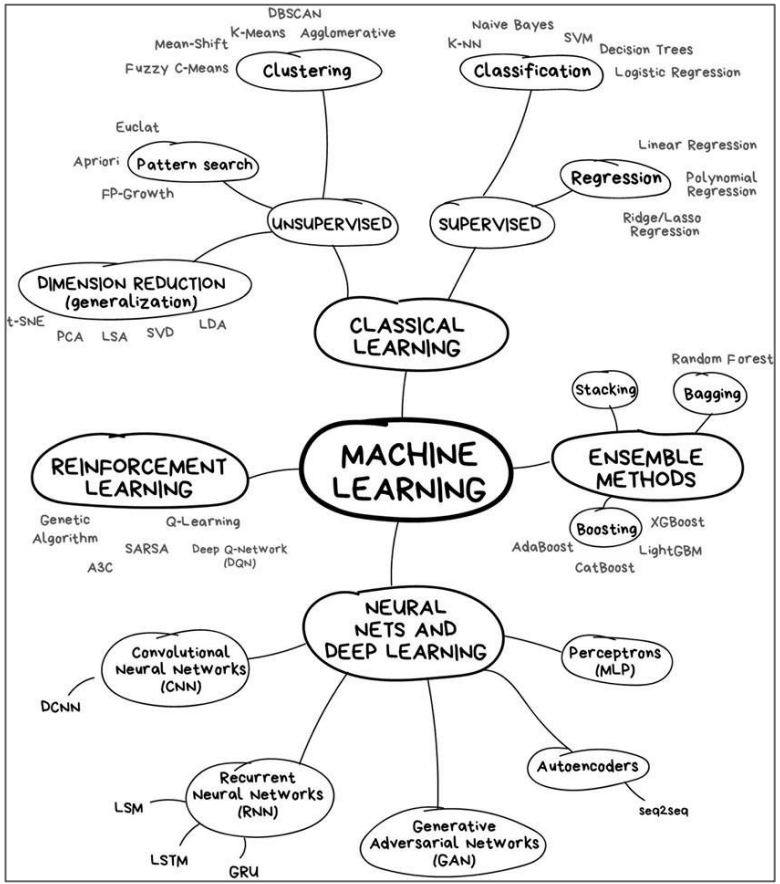
There is a joke about that: if you present it to your costumers then it is AI, if it is a python code then it its machine learning.

What is the difference between AI and machine learning



Levels of Artificial intelligence

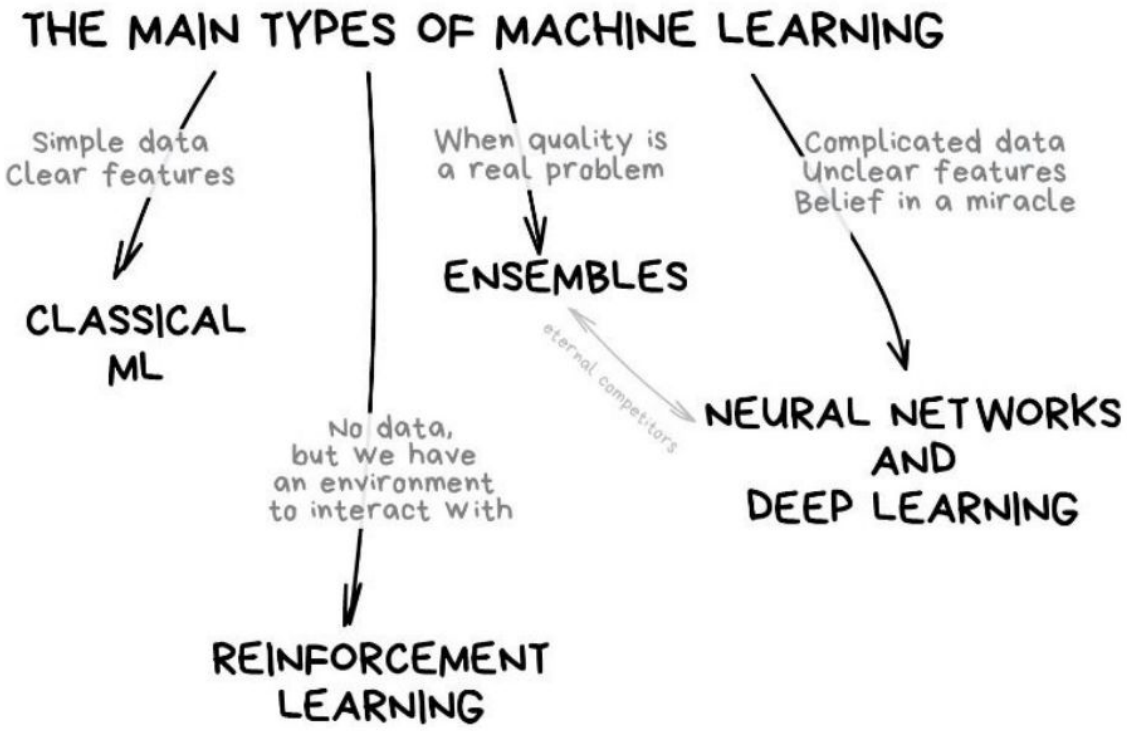
- Weak AI (ANI) - AI that specializes in one field
- Strong AI(AGI), also can be names as human’s level AI - it is a computer capable of solving any mental task that a person is capable of solving.
- Artificial superintelligence (ASI)- Oxford philosopher and leading THINKer in the field of AI Nick Bostrom defines ASI as "intelligence that is much smarter than the best human minds in almost any field, including scientific creativity and social skills."


MACHINE LEARNING
CLASSICAL LEARNING
UNSUPERVISED
SUPERVISED
Clustering
DBSCAN
K-Means
Agglomerative
Mean-Shift
Fuzzy C-Means
Classification
Naive Bayes
K-NN
SVM
Decision Trees
Logistic Regression
Pattern search
Euclat
Apriori
FP-Growth
Regression
Linear Regression
Polynomial Regression
Ridge/Lasso Regression
DIMENSION REDUCTION (generalization)
t-SNE
PCA
LSA
SVD
LDA
REINFORCEMENT LEARNING
Genetic Algorithm
A3C
SARSA
Q-Learning
Deep Q-Network (DQN)
ENSEMBLE METHODS
Stacking
Bagging
Random Forest
Boosting
XGBoost
AdaBoost
LightGBM
CatBoost
NEURAL NETS AND DEEP LEARNING
Convolutional Neural Networks (CNN)
DCNN
Perceptrons (MLP)
Recurrent Neural Networks (RNN)
LSM
LSTM
GRU
Generative Adversarial Networks (GAN)
Autoencoders
seq2seq

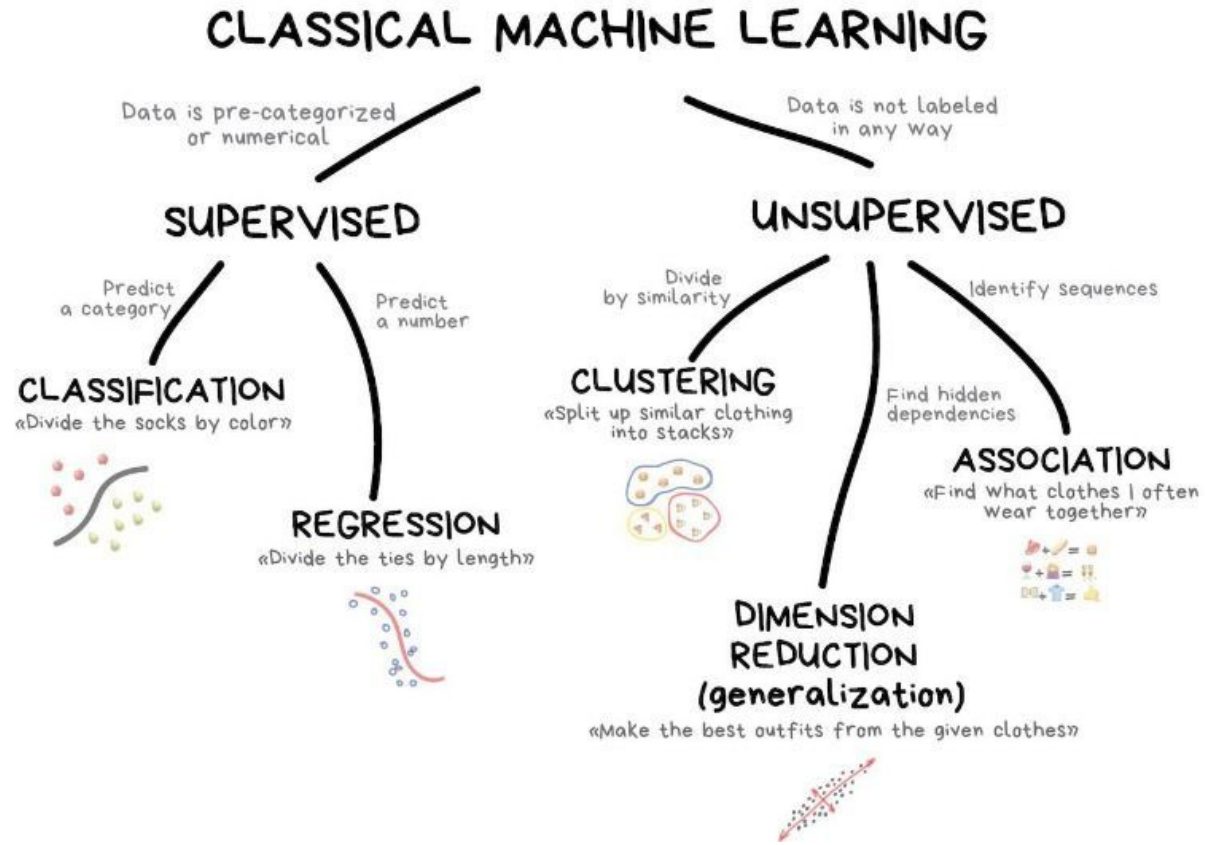
What machine learning consists of

```
Data -> Features  ->  Model
```

Types of Machine Learning



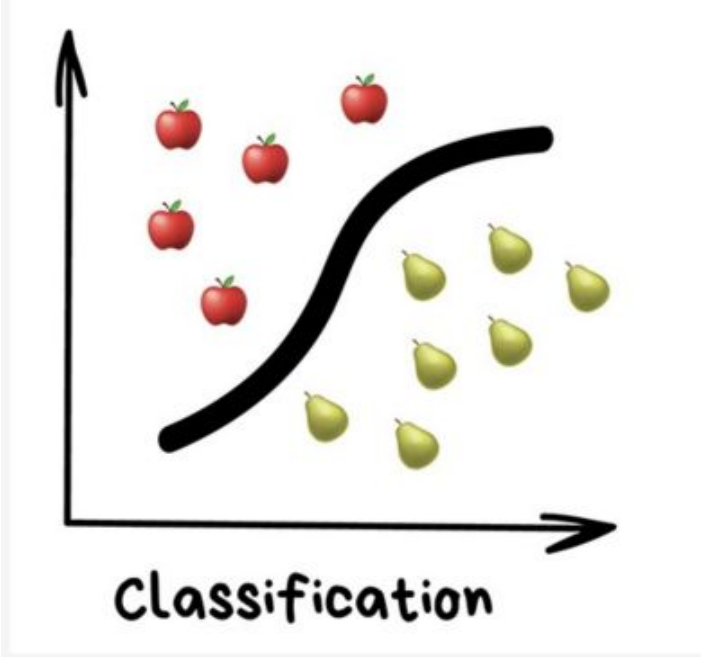
Types of Machine Learning



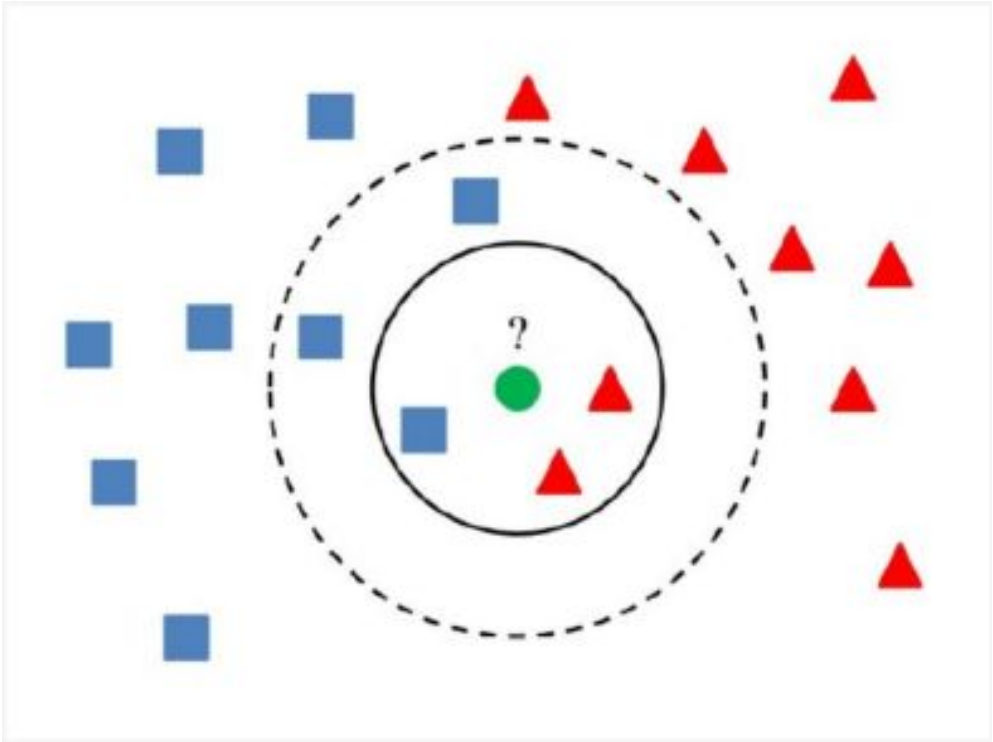
Classification

Classification

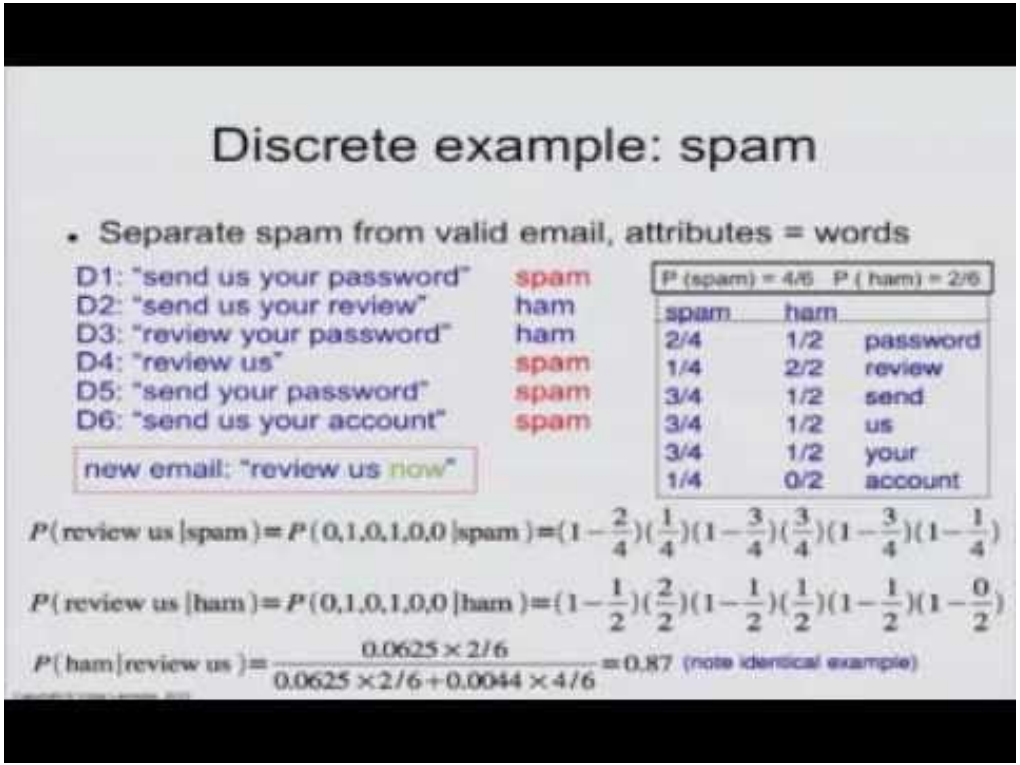
- Spam filters
- Language detection
- Search for similar documents
- Hand-written digits recognition
- Identification of suspicious transactions



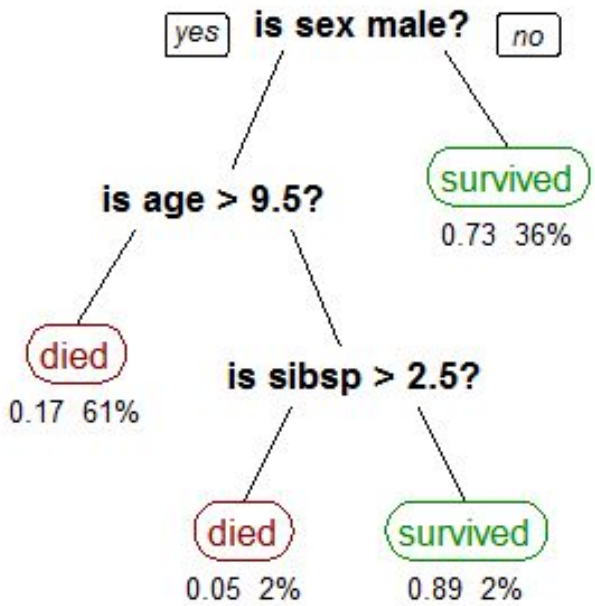
Classification: KNN



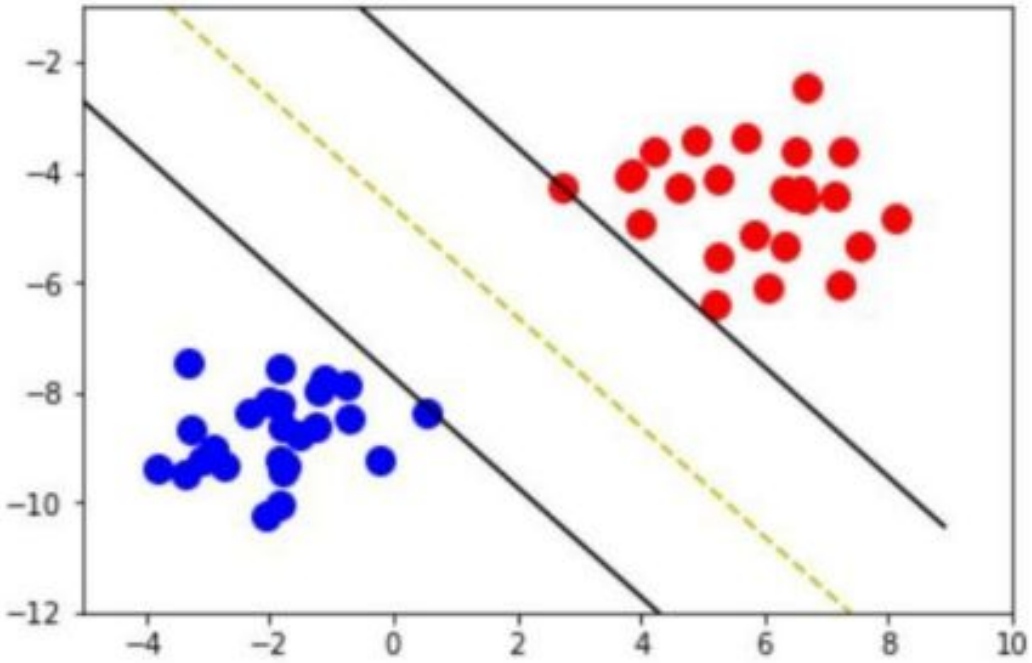
Classification: Naive Bayes



Classification: Desicion Trees



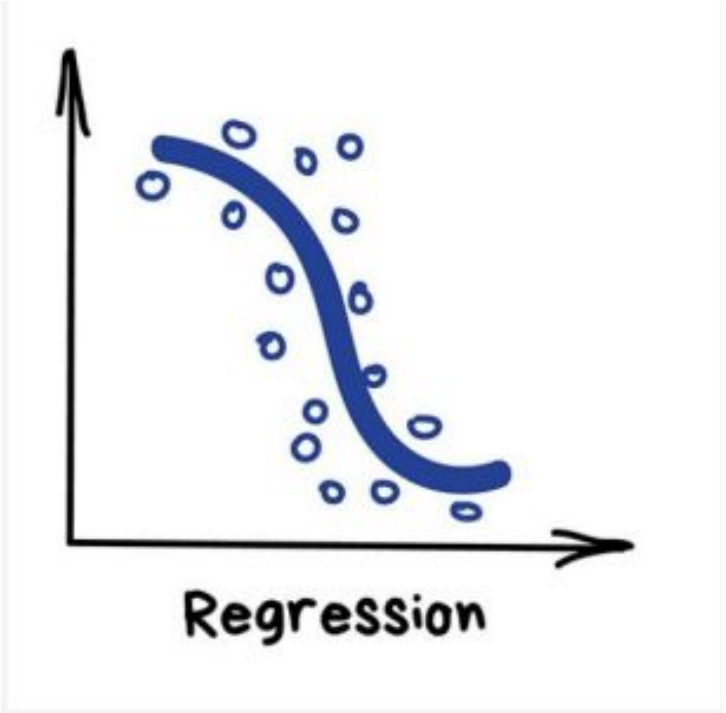
Classification: SVM



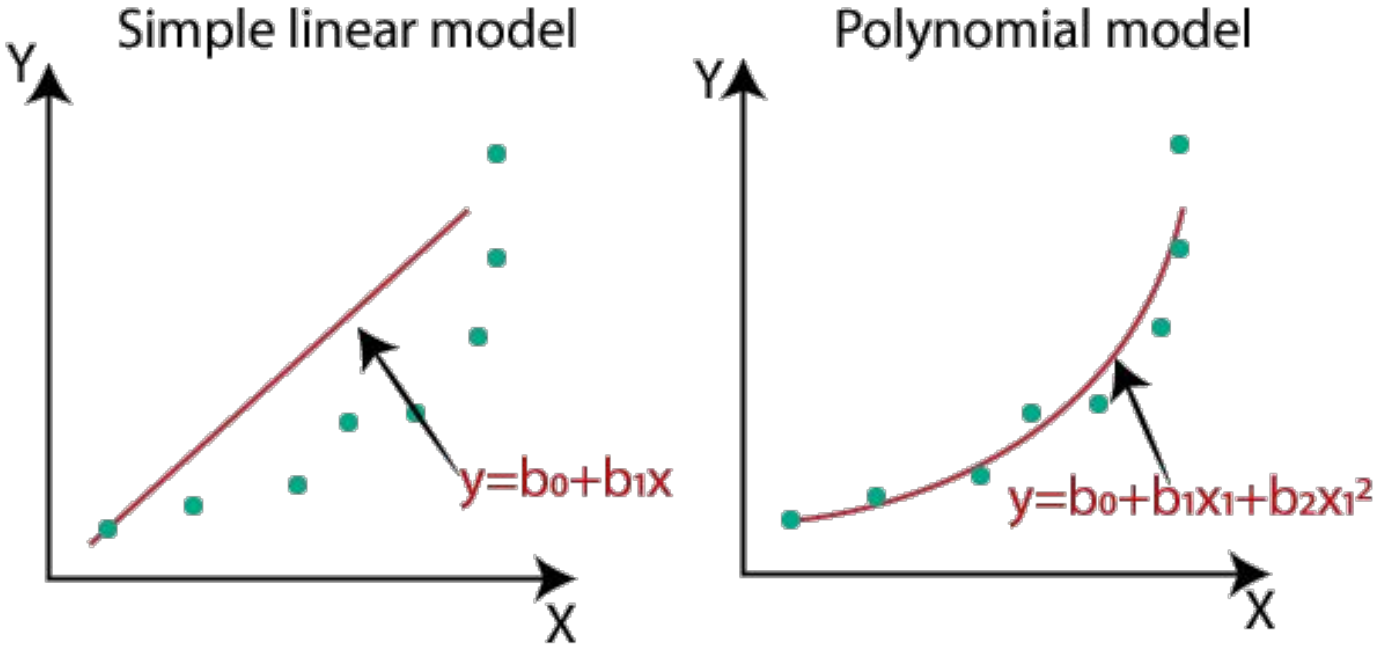
Regression

Regression

- Prediction of the value of securities
- Analysis of demand, sales volume
- Medical diagnoses
- Any dependencies of a number on time



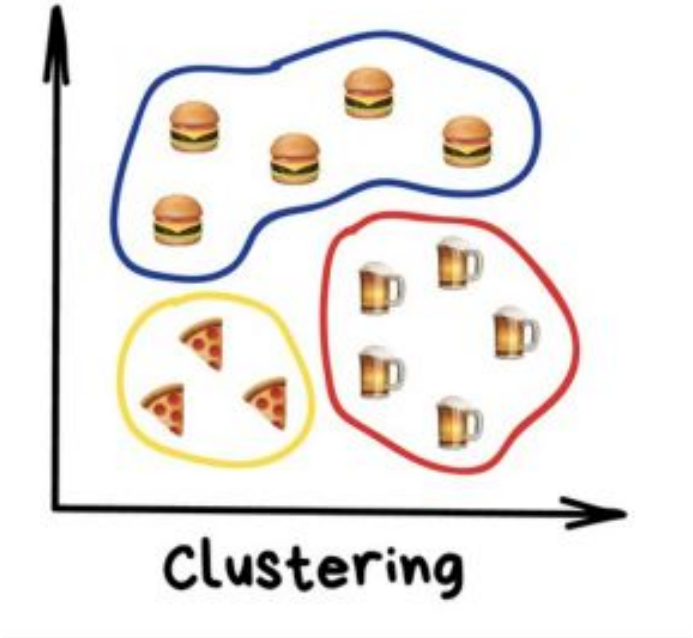
Regression: types of regression



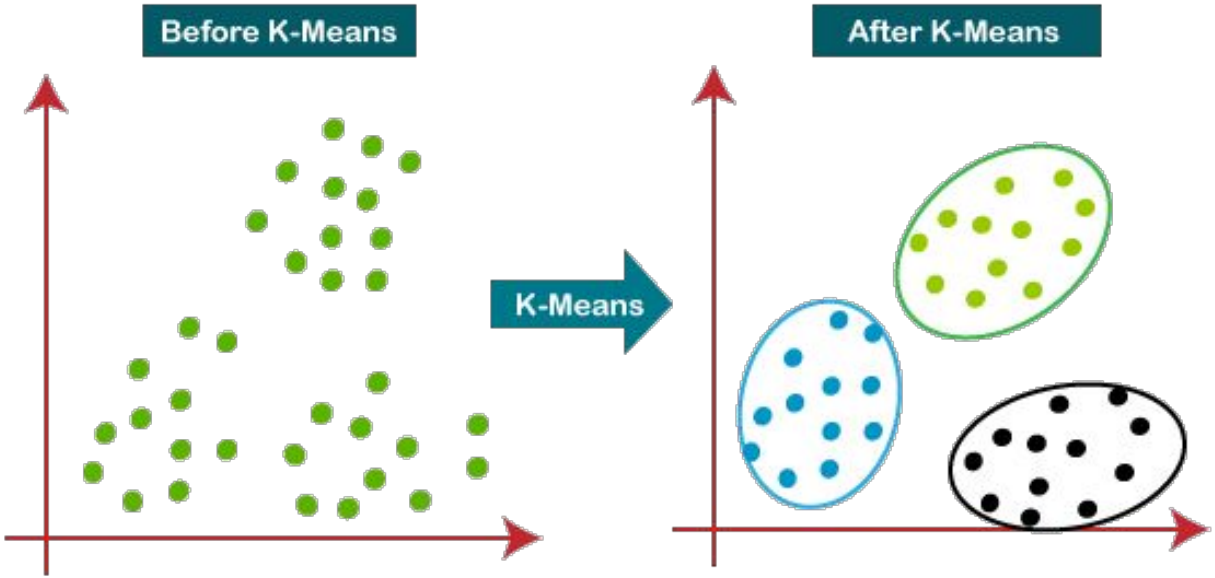
Unsupervised learning

Unsupervised learning

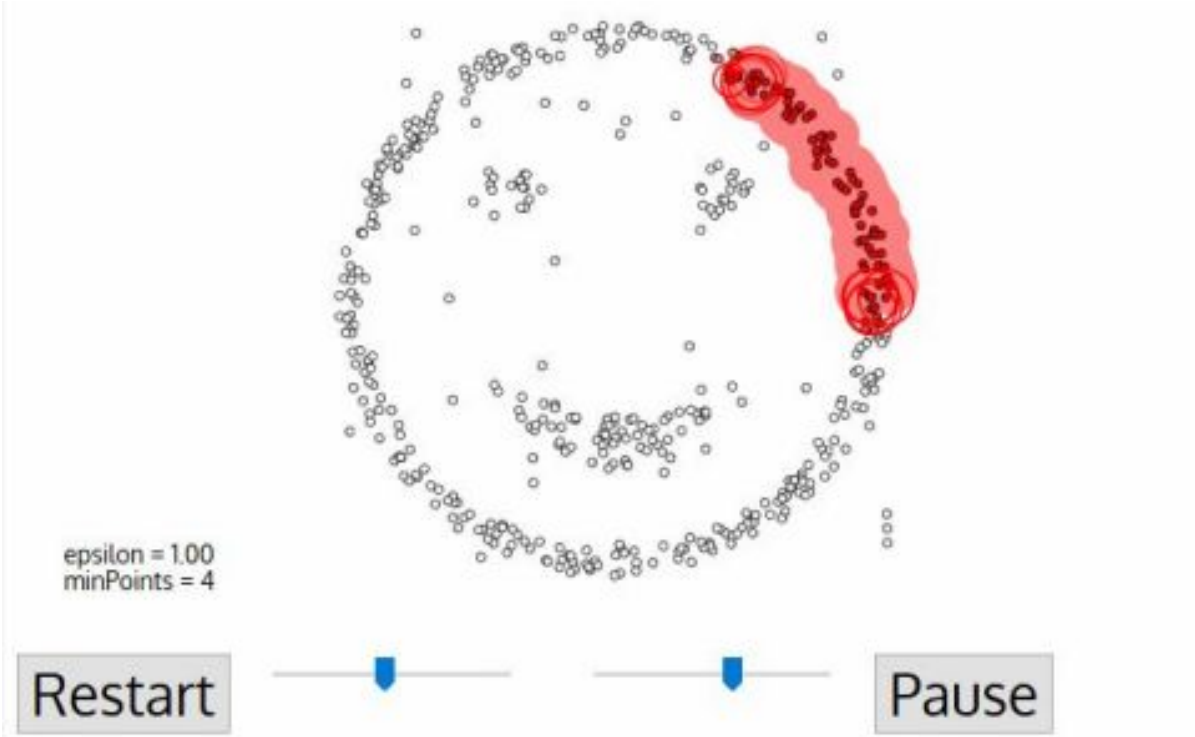
- Market segmentation (types of customers, loyalty)
- Combine close points on the map
- Image compression



Clusterization: K-means



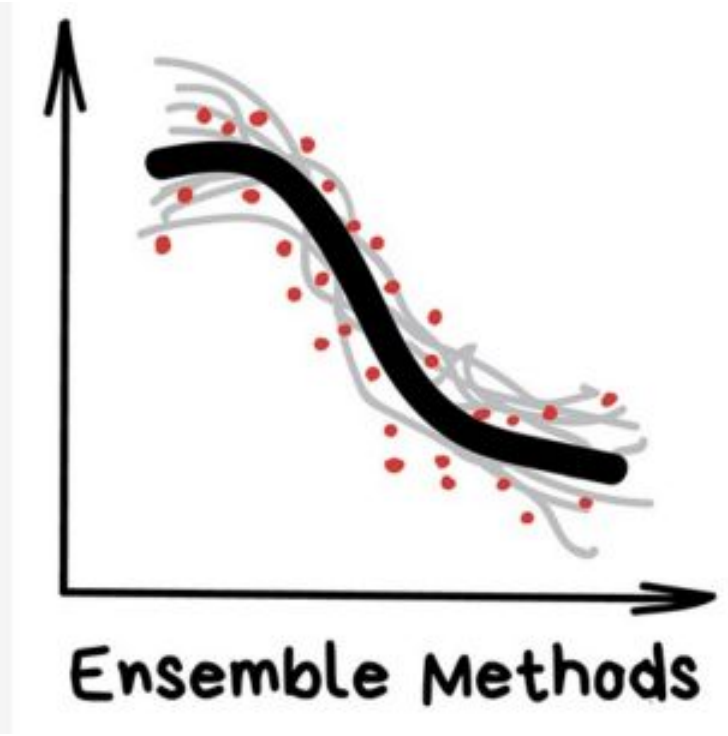
Clusterization: DBSCAN



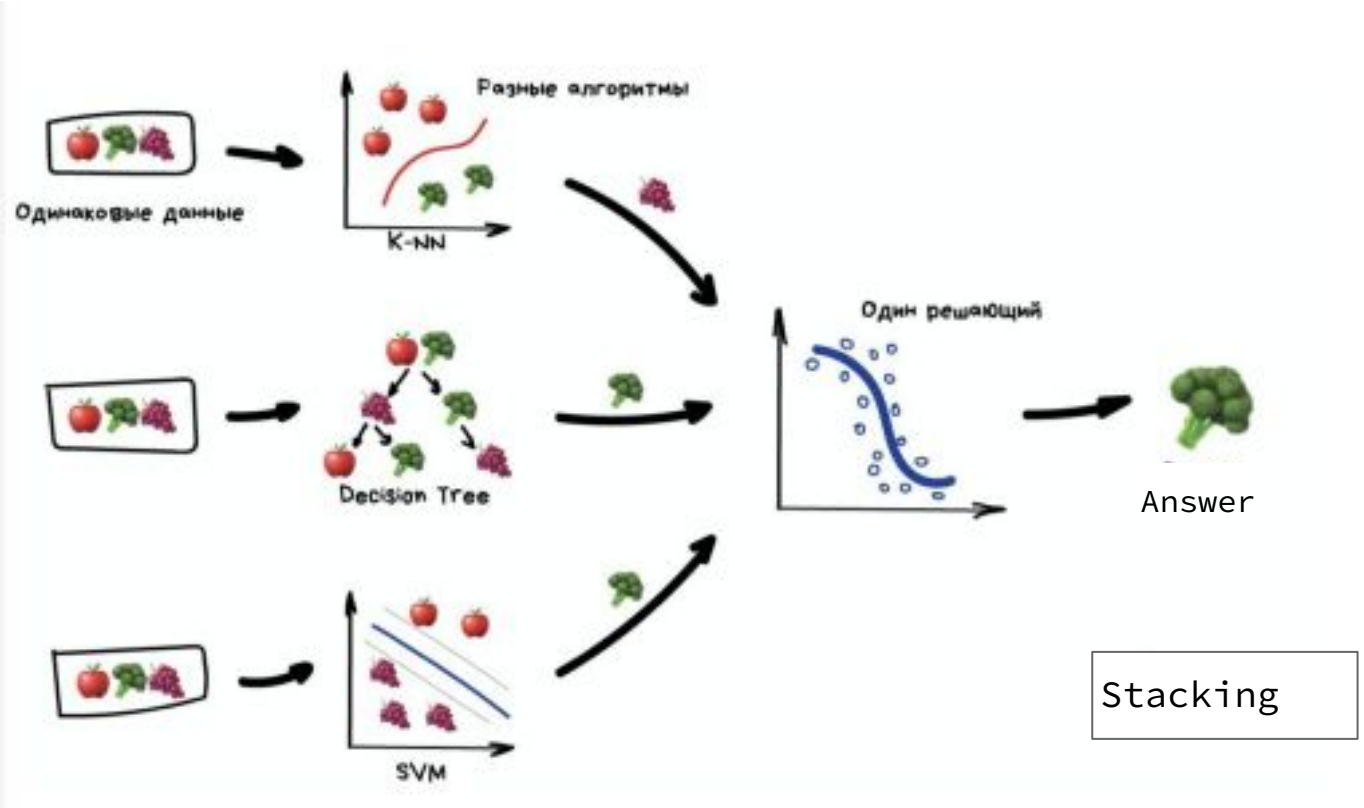
Ensembles

Ensembles

- Made for all things where classic algorithms fit
- Search engines
- Computer vision
- Objects recognition

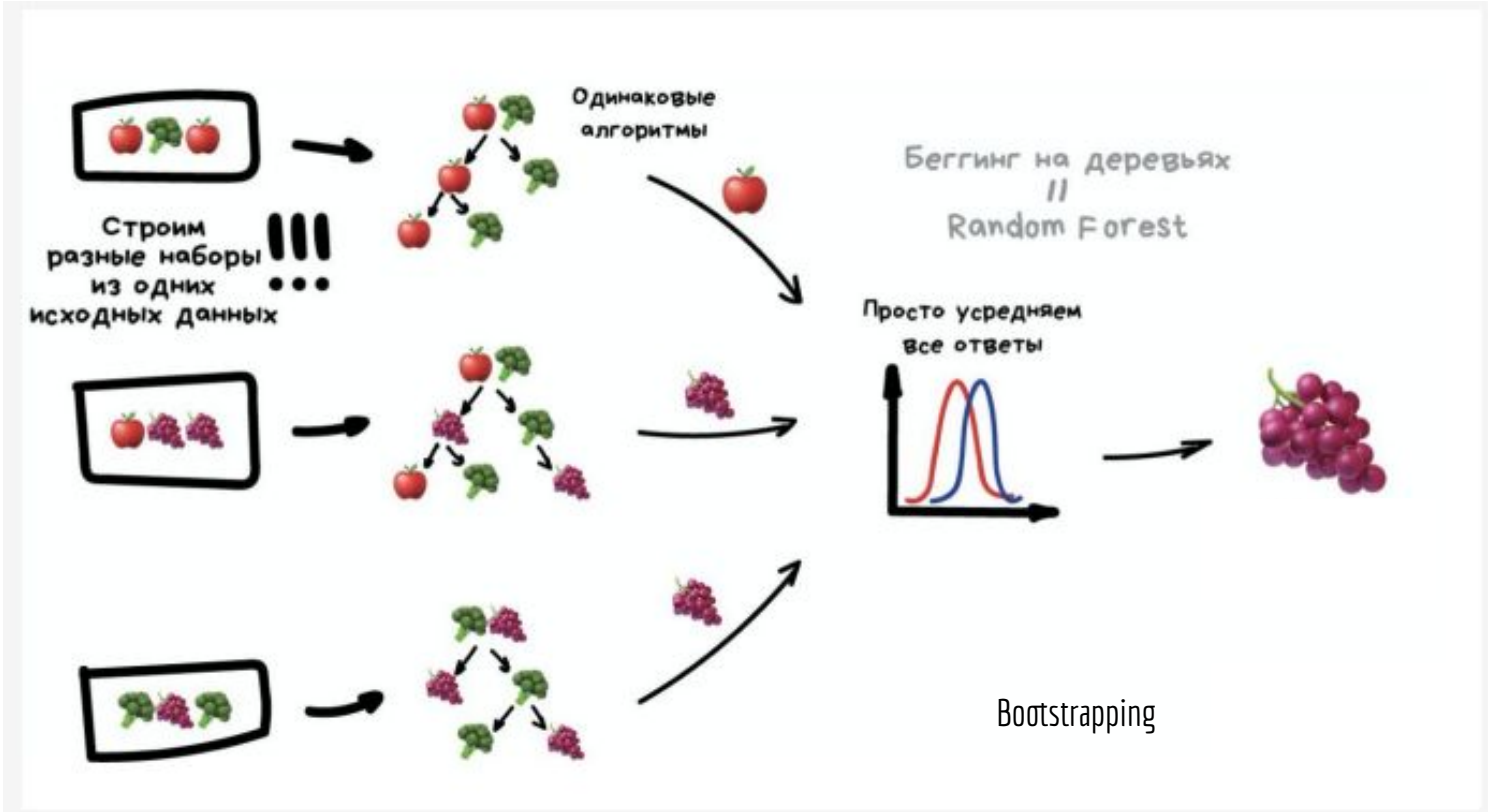


Ensembles: stacking



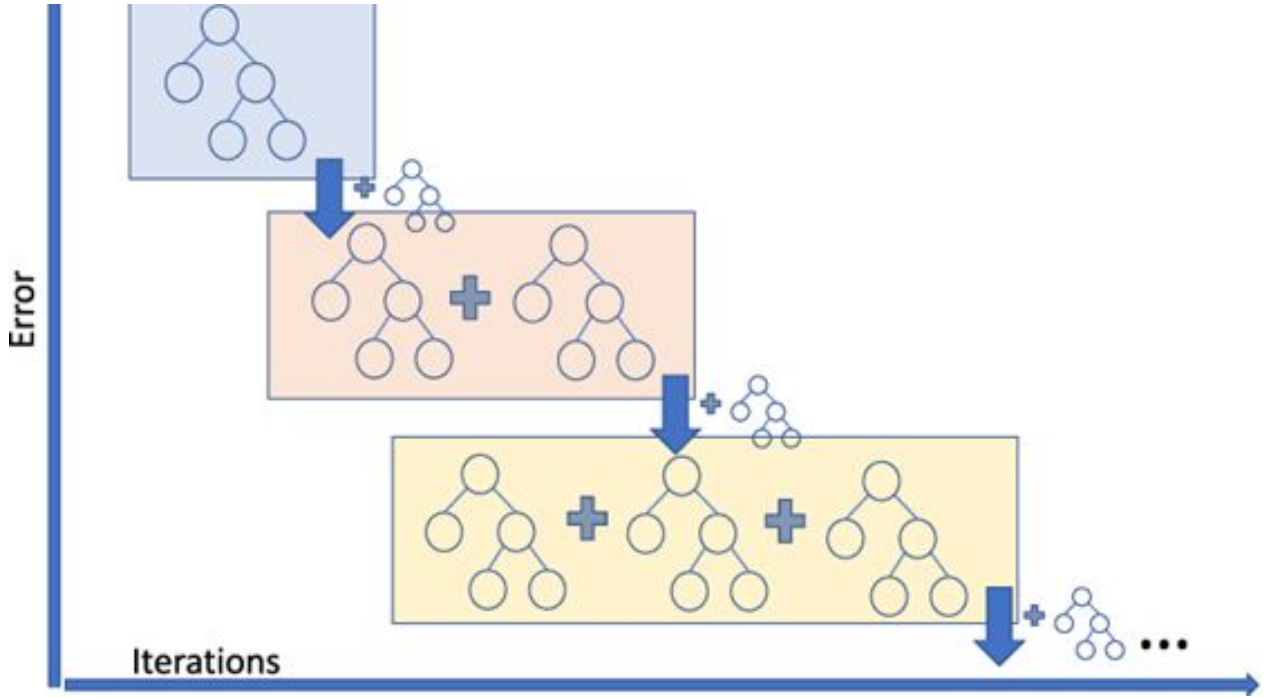
Stacking

Ensembles: Bootstrapping



Bootstrapping

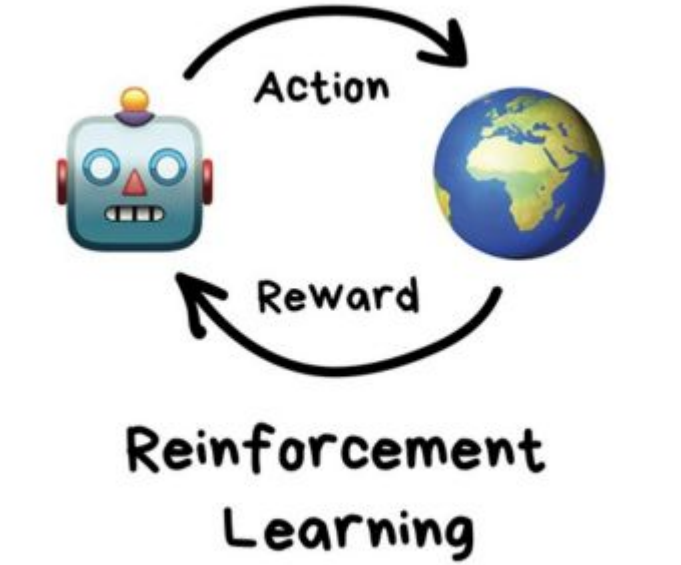
Ensembles: boosting



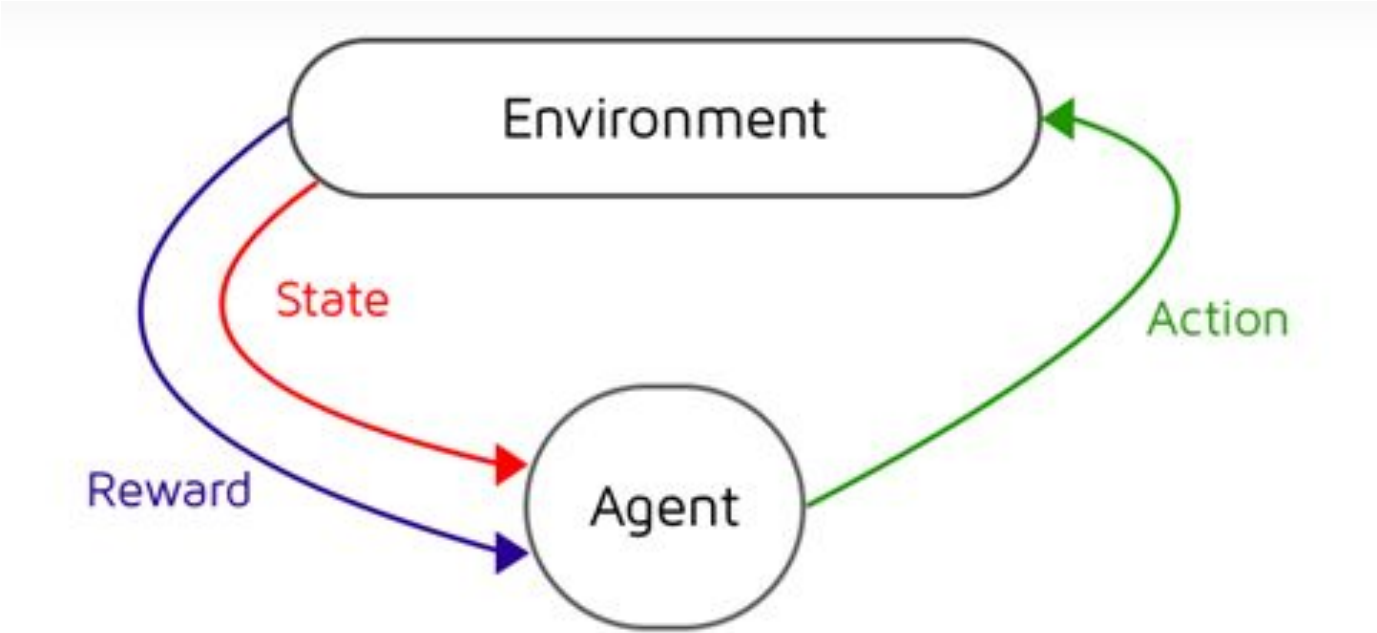
Reinforcement learning

Reinforcement learning

- Self-driving cars
- Robot Vacuum Cleaners
- Bots at games
- Enterprise Resource Management



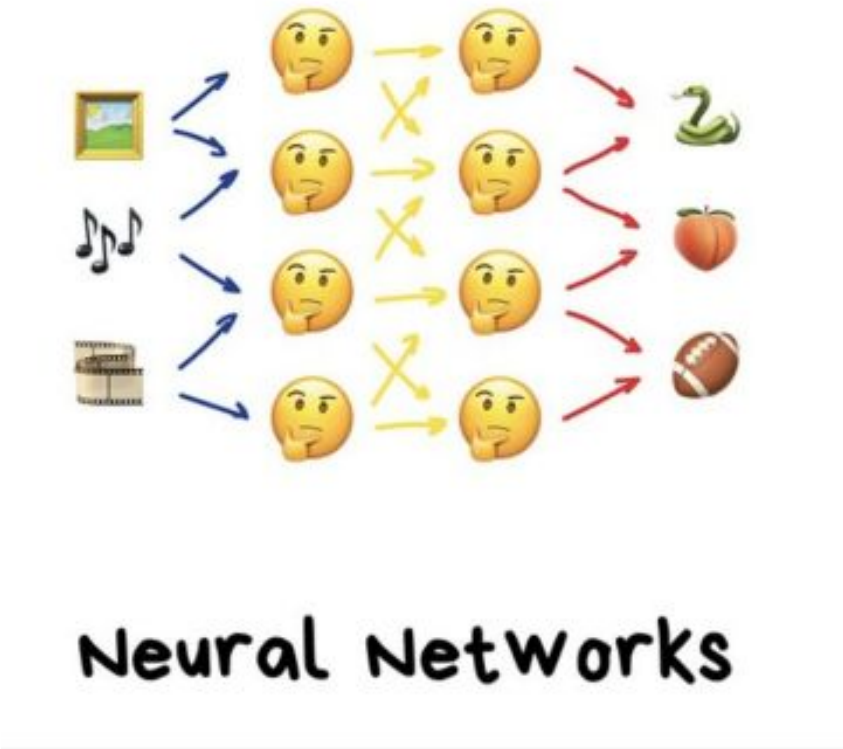
Reinforcement learning: Markov process



Neural networks

Neural networks

- Instead of all of the above algorithms
- Identify objects in photos and videos
- Speech recognition and synthesis
- Machine translation



Questions?

Break

Interesting links

https://waitbutwhy.com/2015/01/artificial-intelligence-revolution-1.html

https://waitbutwhy.com/2015/01/artificial-intelligence-revolution-2.html

https://vas3k.com/blog/machine_learning/