Introduction to data analysis with AI algorithms - Part I

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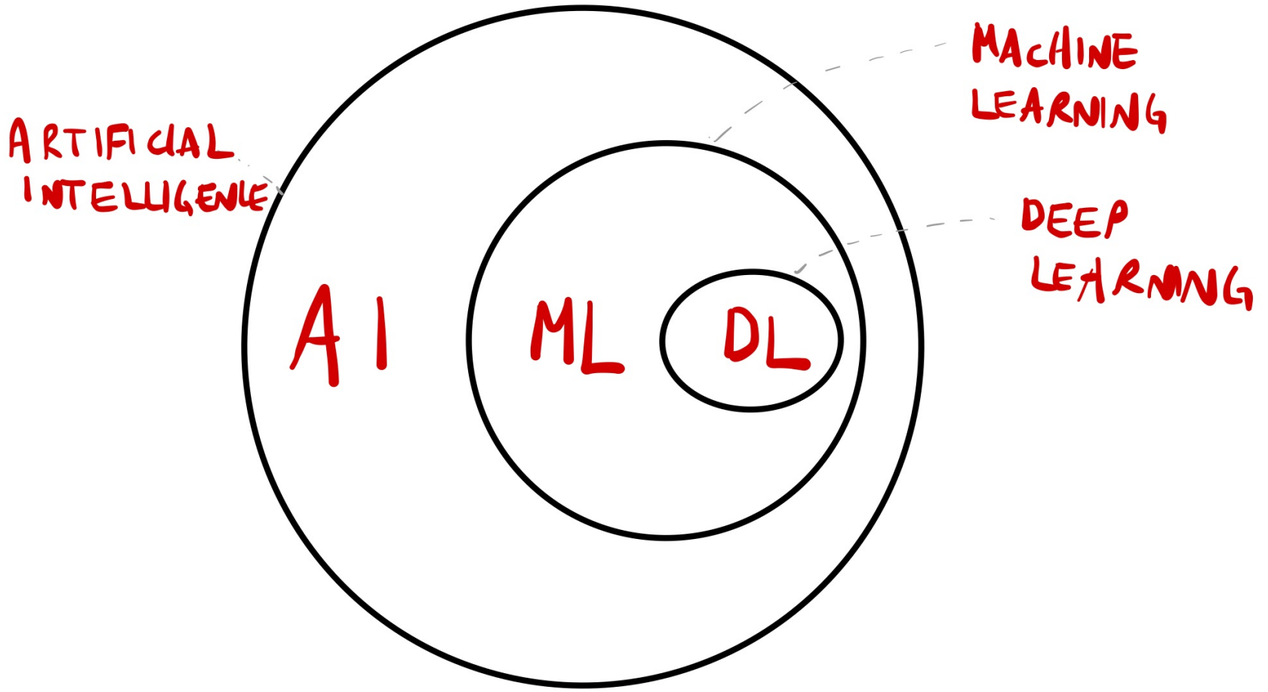
What is AI?

Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions

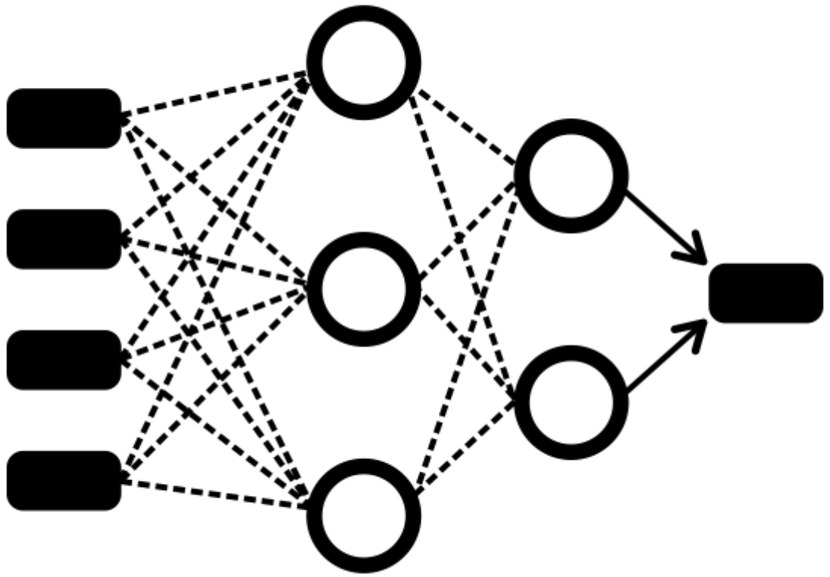


What is ML?

- "The study of computer algorithms that improve automatically through experience"
- Machine learning algorithms build a model based on sample data, known as "training data", in order to make predictions or decisions without being explicitly programmed to do so

What is deep learning?

- Class of machine learning algorithms that uses multiple layers to progressively extract higher-level features from the raw input
- The layers are mathematical transformations and give high flexibility in the ability of the deep learning system to come up with the rules



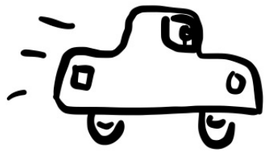
Traditional programming

ACTIVITY DETECTION ALGORITHM

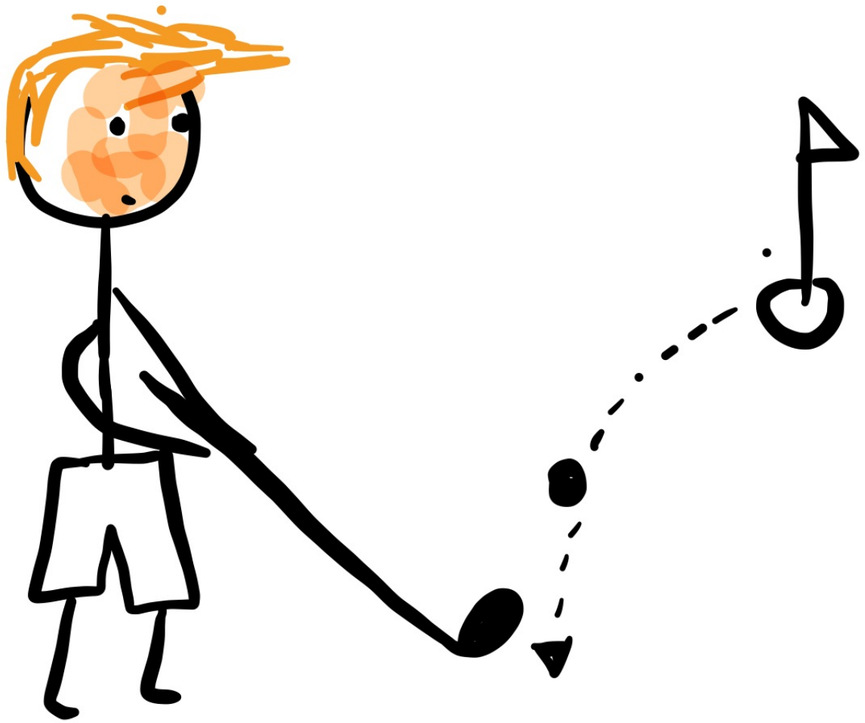
```
if speed == 0:
    state = STAND
```

```
if speed == 0:
    state = STAND
if 0 < speed ≤ 4:
    state = WALK
```

```
if speed == 0:
    state = STAND
if 0 < speed ≤ 4:
    state = WALK
if 4 < speed ≤ 8:
    state = RUN
```

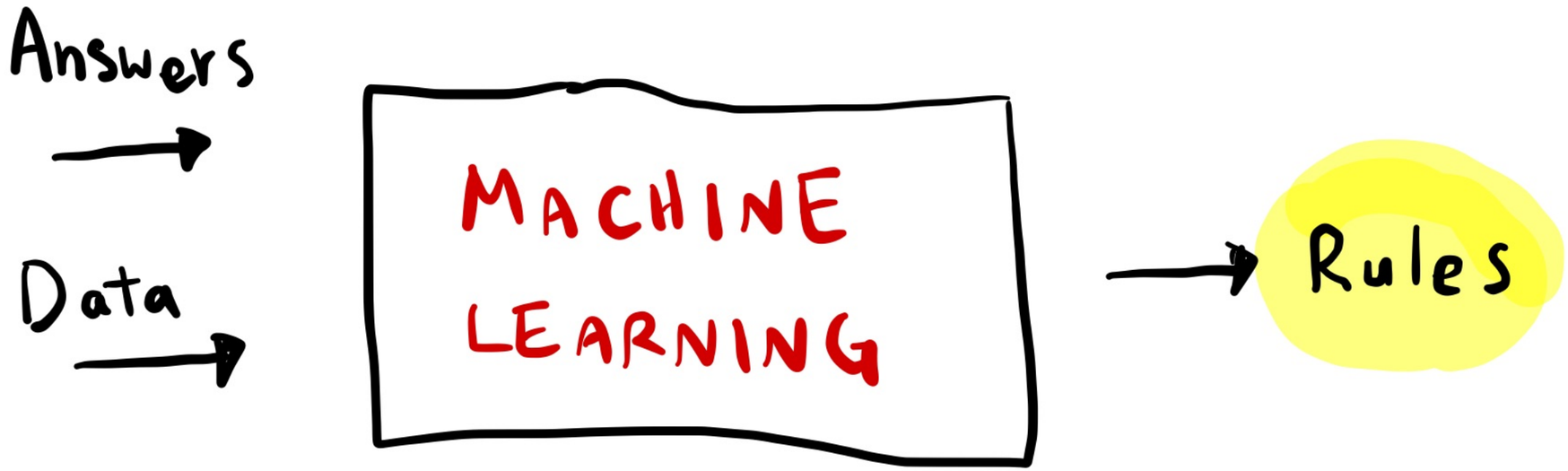


```
if speed == 0:
    state = STAND
if 0 < speed ≤ 4:
    state = WALK
if 4 < speed ≤ 8:
    state = RUN
if speed > 30:
    state = DRIVE
```

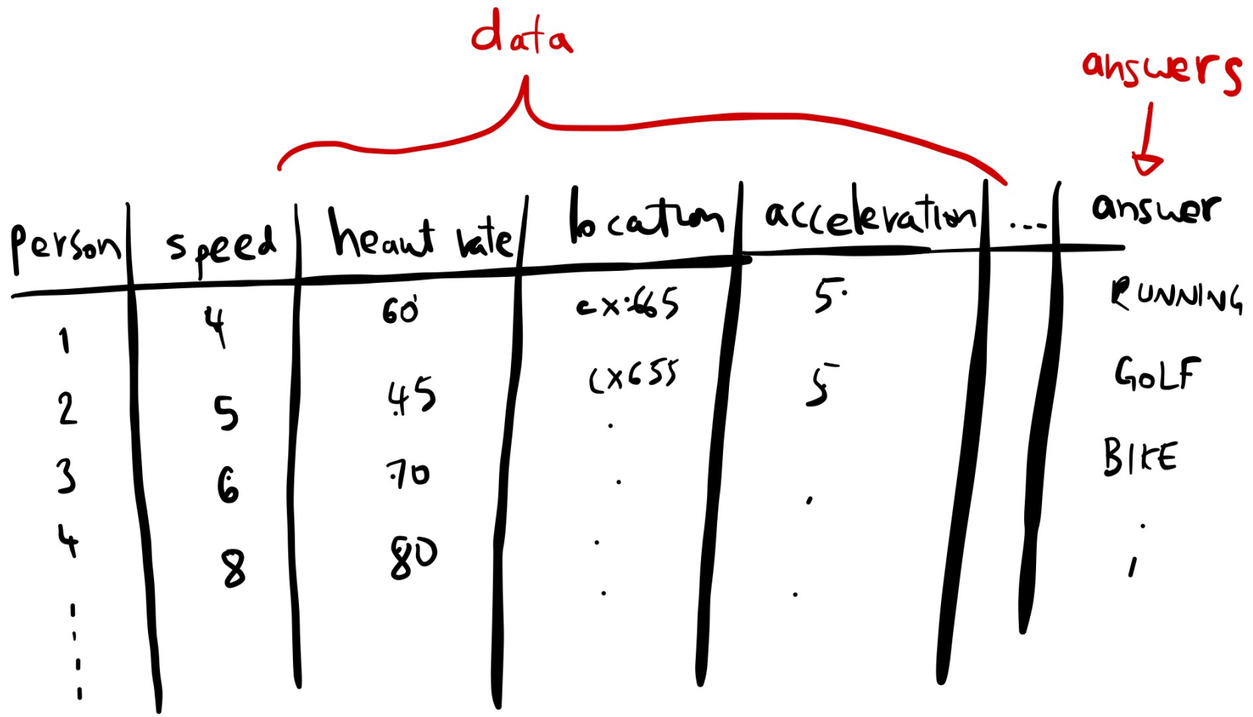


What are the rules to detect a golfer?

Difference of machine learning to traditional programming



The dataset

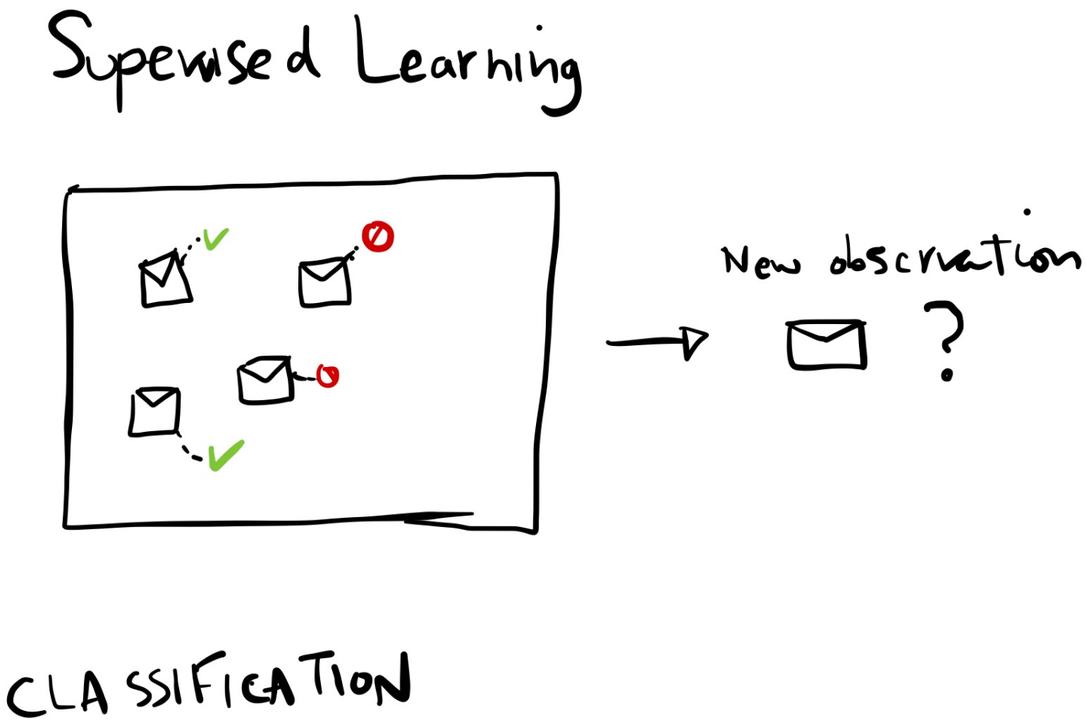

data
answers
person
speed
heart rate
location
acceleration
...
answer
1
2
3
4
4
5
6
8
60
45
70
80
ex:65
(x65
5
5
RUNNING
GOLF
BIKE

Types of ML systems

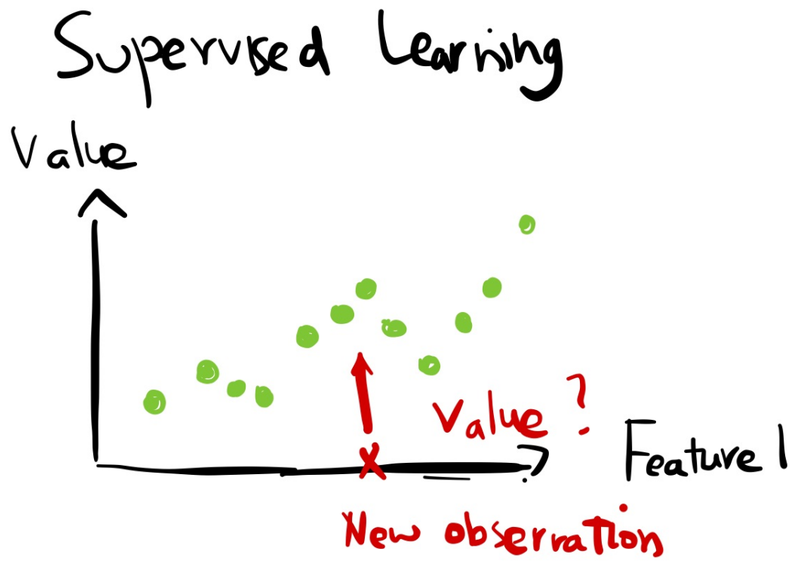
Does it require human supervision?
- supervised
- unsupervised
- semi-supervised
- reinforcement

Does it need to retain all the data?
- model based
- instance based

Supervised learning

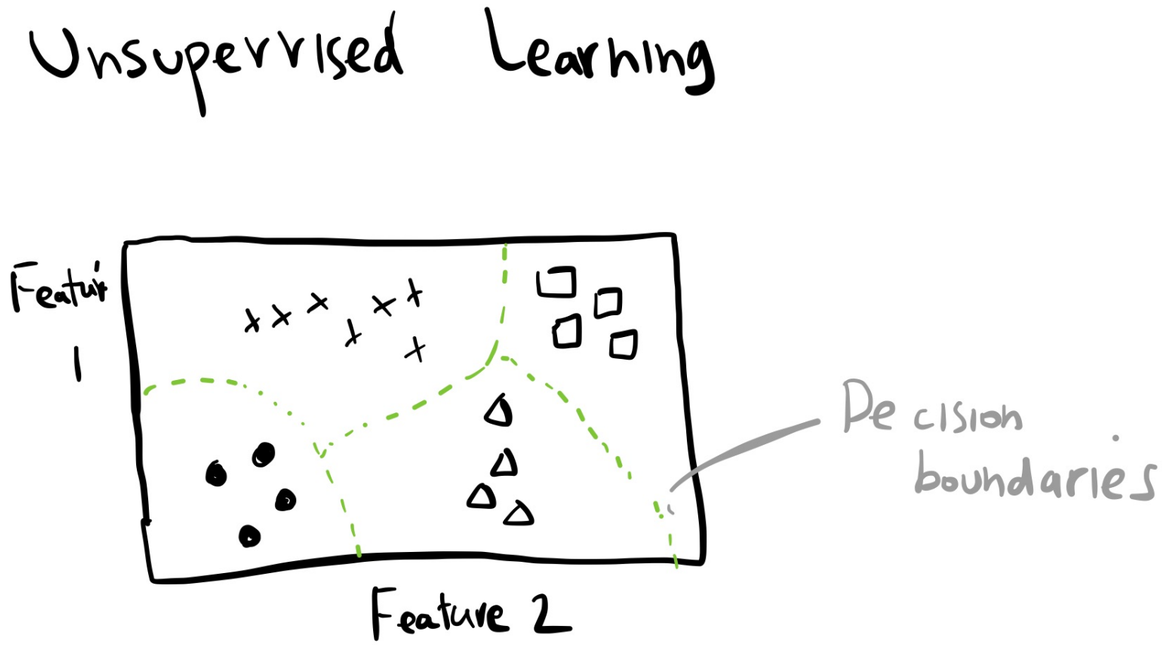


Supervised learning

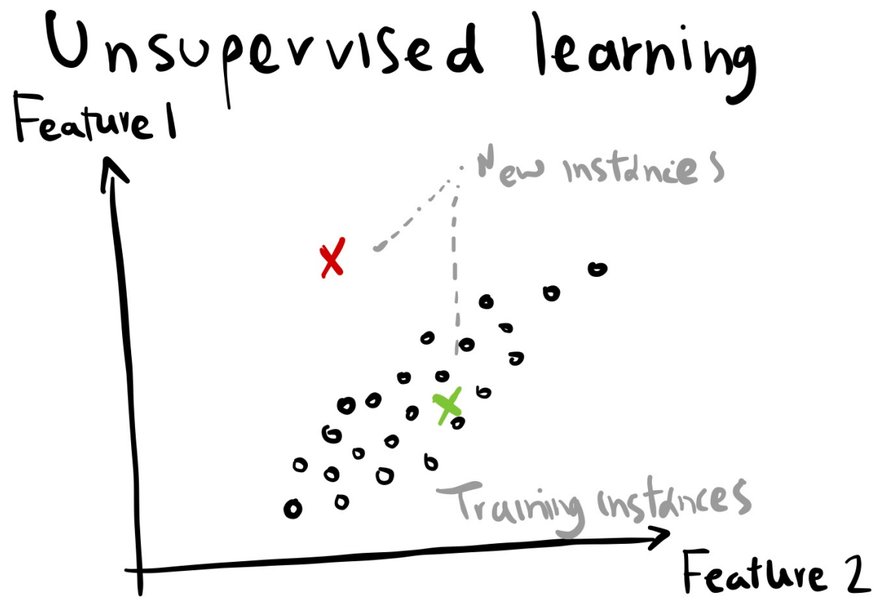


REGRESSION

Unsupervised learning

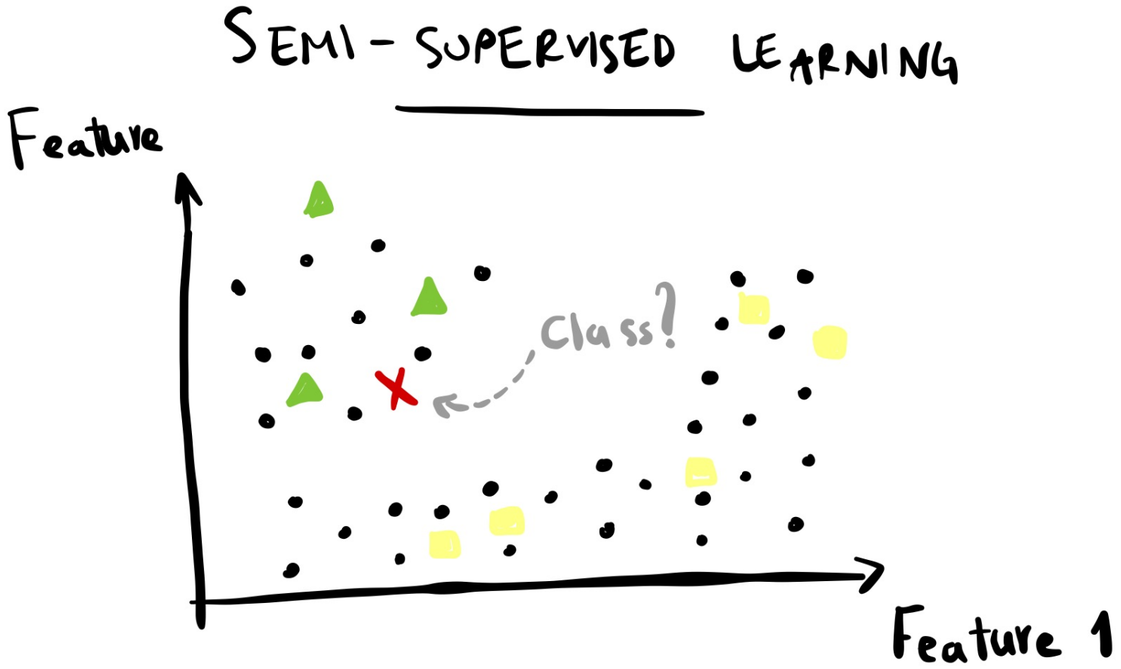


Unsupervised learning



ANOMALY DETECTION

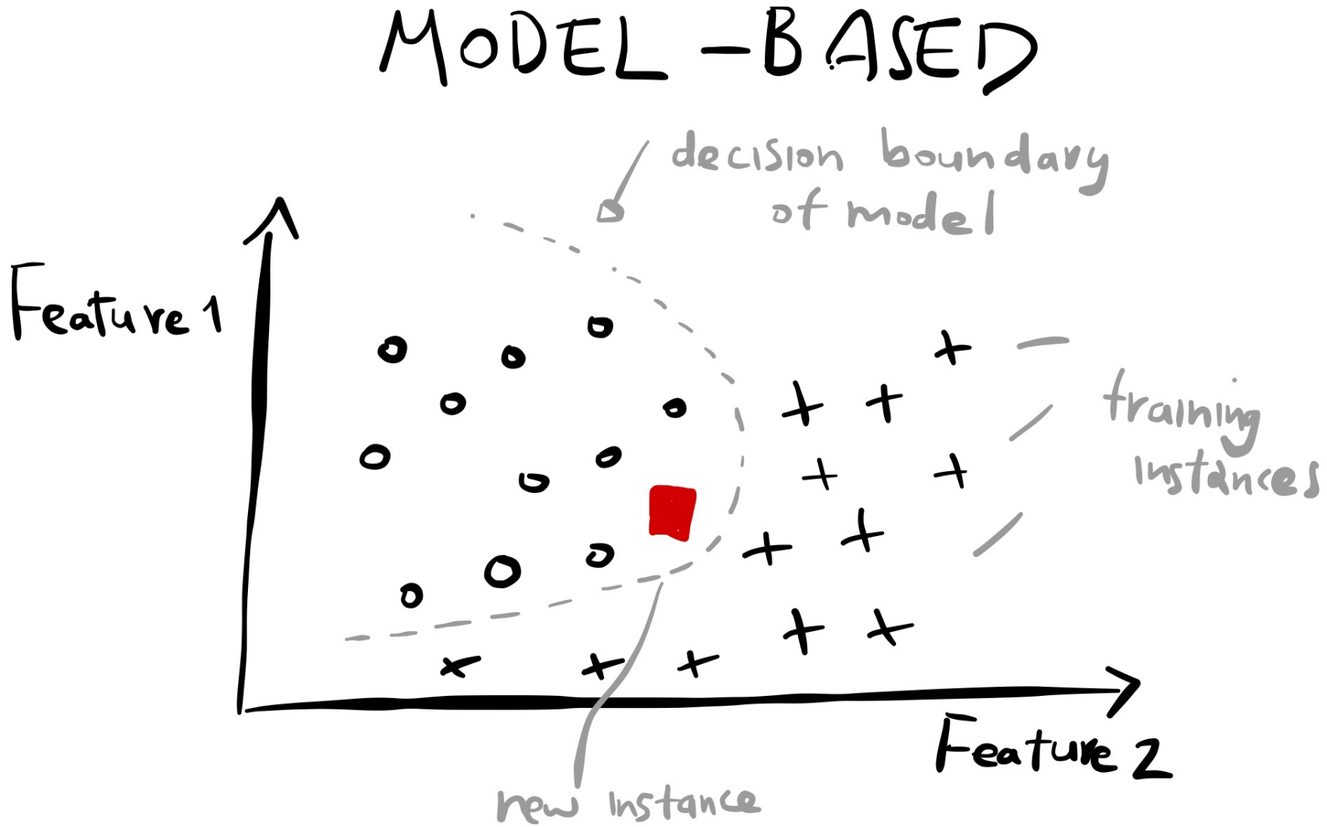
Semi-supervised learning



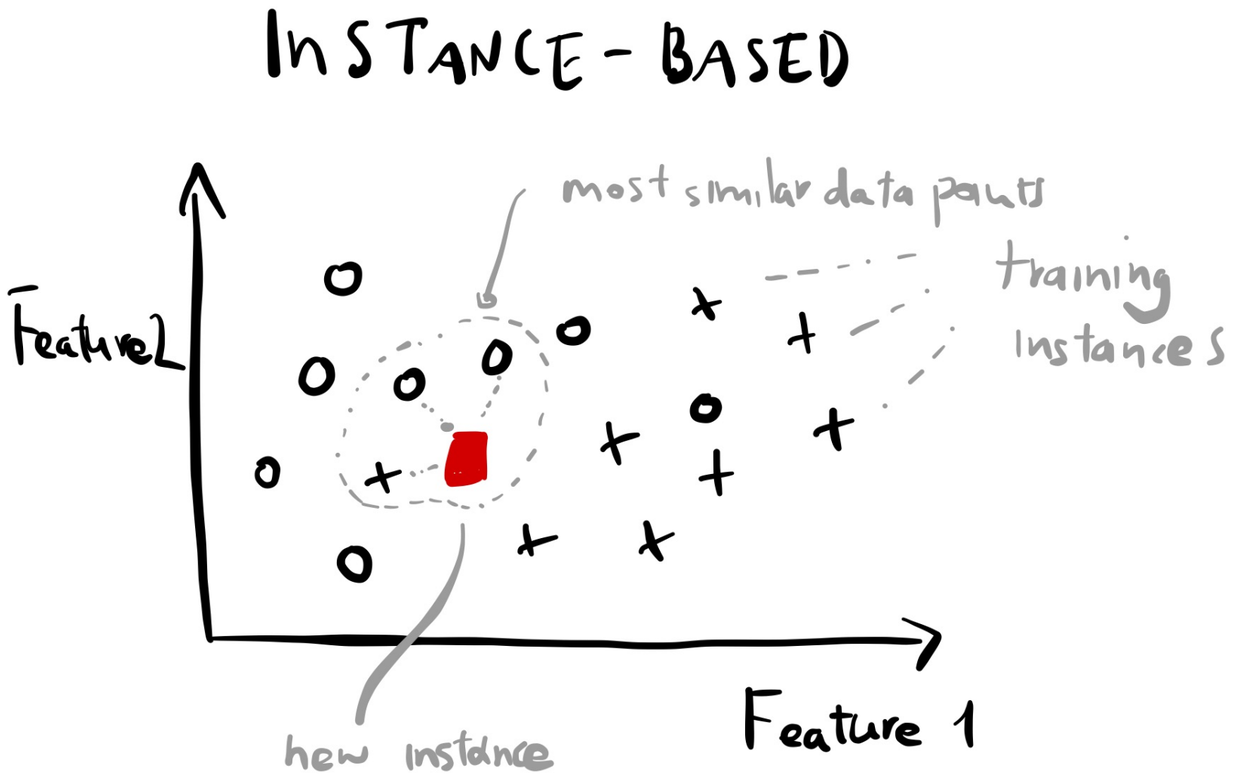
Reinforcement learning

- An agent (the learning system) observes the environment and then selects and performs actions
- After performing these actions, the agent gets rewards or penalties in return
- The agent has to find the best strategy by itself - called "policy" to get the most reward over time

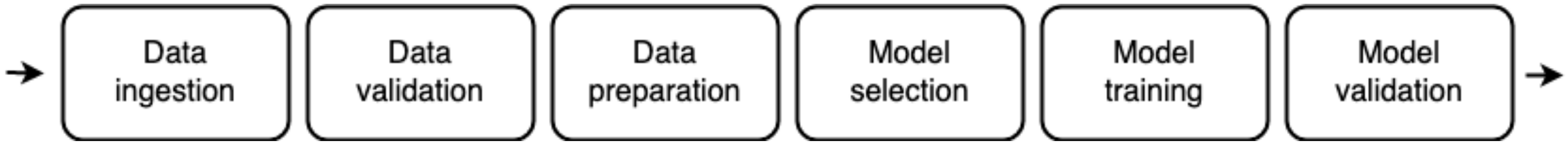
Model-based learning



Instance-based learning



ML workflow


Data ingestion
Data validation
Data preparation
Model selection
Model training
Model validation