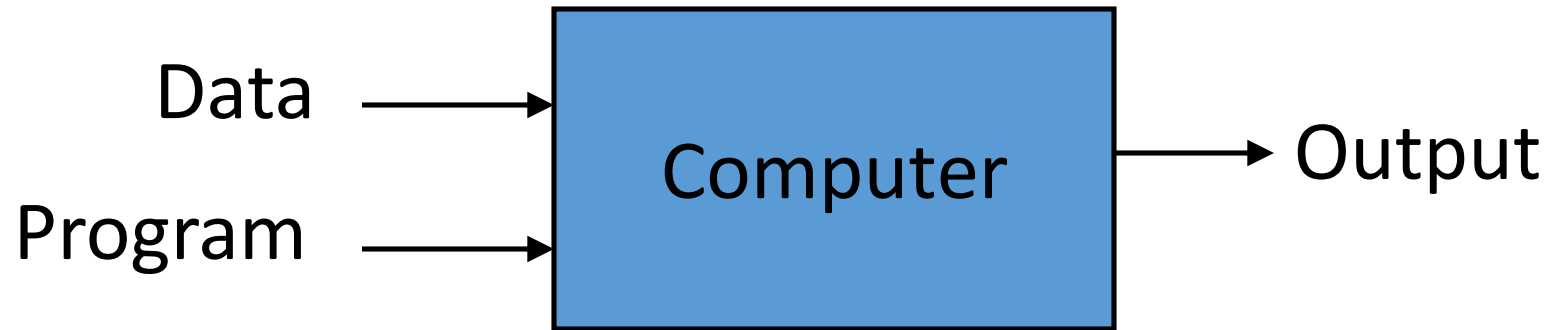# ML introduction

What is machine learning?
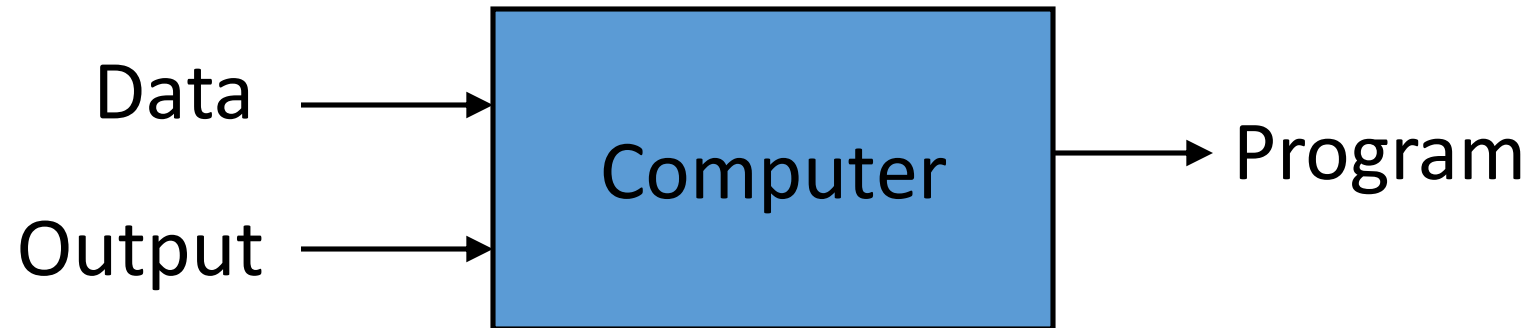
- A branch of **artificial intelligence**, concerned with the design and development of algorithms that allow computers to evolve behaviors based on empirical data.

- As intelligence requires knowledge, it is necessary for the computers to acquire knowledge.

Traditional Programming

Data $\longrightarrow$ | Computer | $\longrightarrow$ Output

Program $\longrightarrow$

Machine Learning

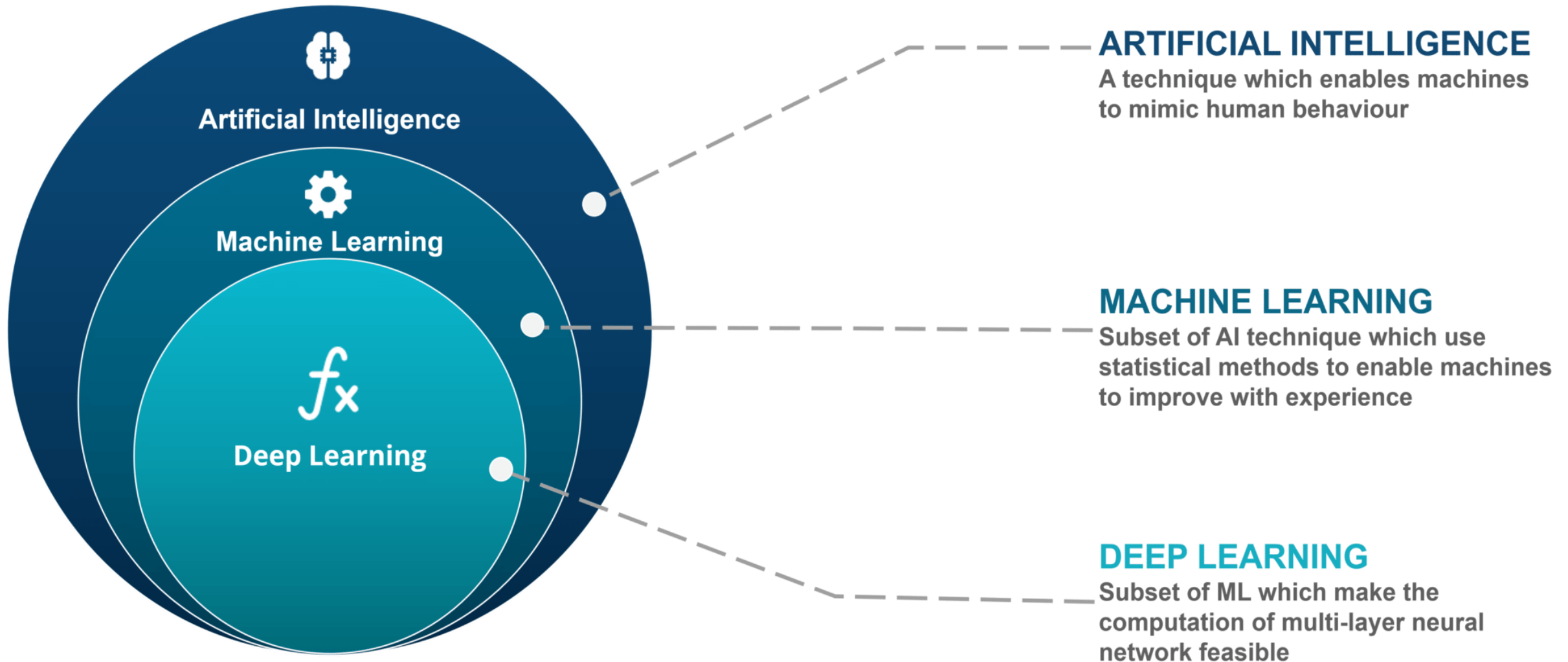Data $\longrightarrow$ | Computer | $\longrightarrow$ Program

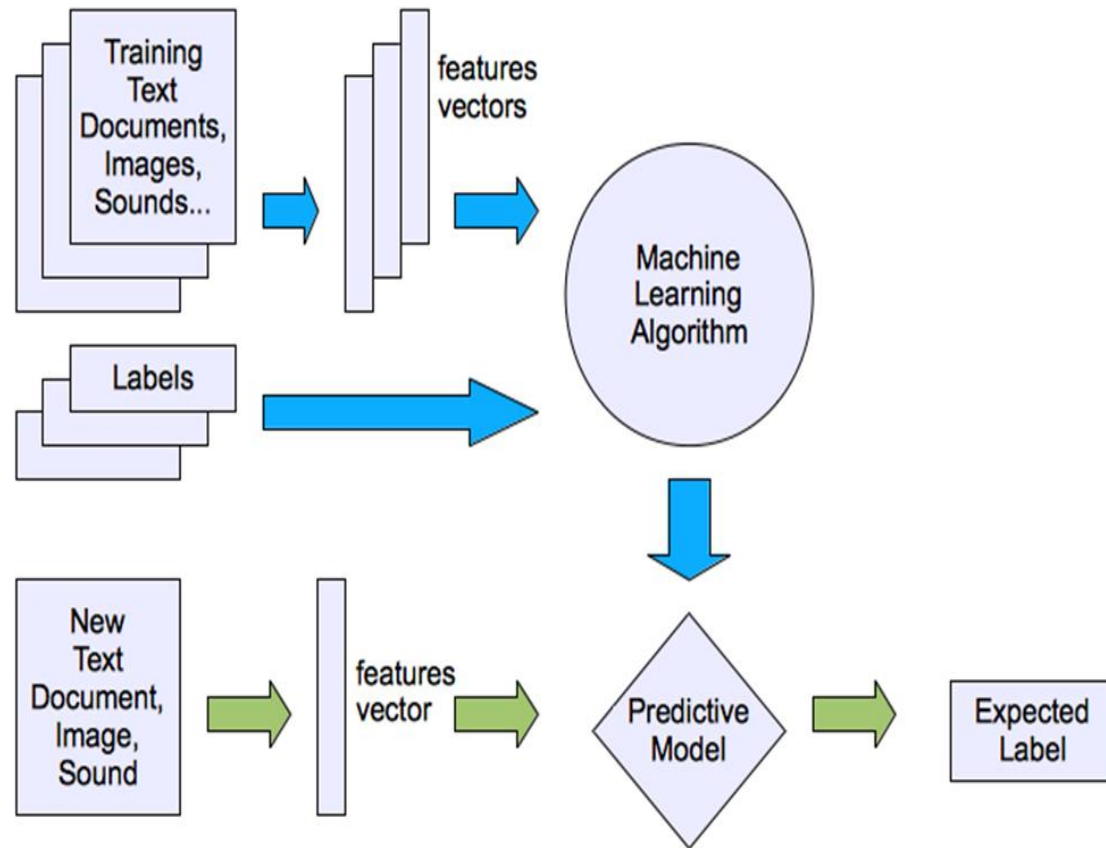Output $\longrightarrow$

Characteristics Desired ML

- We would like our ML techniques to have the following properties

  - Be able to generalize, but not too much

  - Be robust

  - Be reliable

  - Learn models of high quality

  - Be scalable and efficient

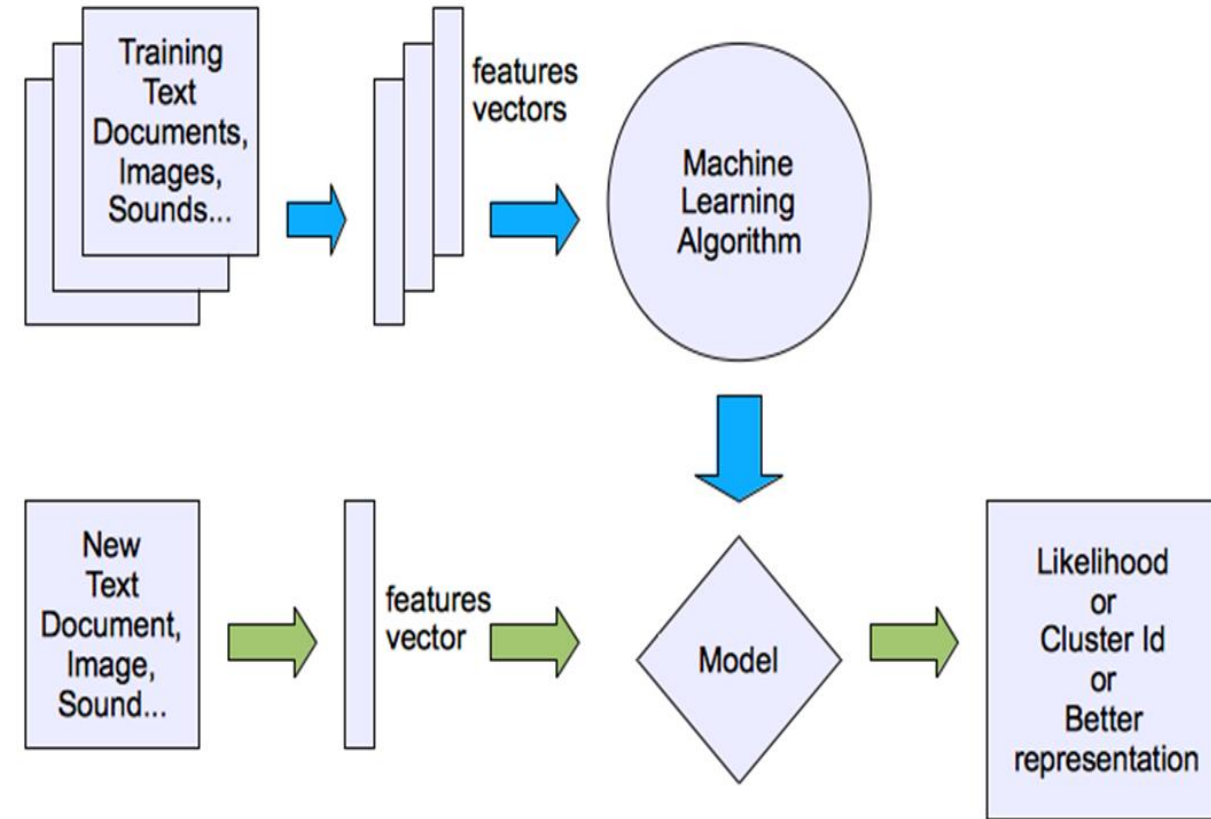 - Be explicative

  - Be determinist

Artificial Intelligence, Machine Learning and Deep Learning

ARTIFICIAL INTELLIGENCE
A technique which enables machines to mimic human behaviour

MACHINE LEARNING
Subset of AI technique which use statistical methods to enable machines to improve with experience

DEEP LEARNING
Subset of ML which make the computation of multi-layer neural network feasible

SUPERVISED LEARNING

Training Text Documents, Images, Sounds... → features vectors → Machine Learning Algorithm

Labels →

New Text Document, Image, Sound → features vector → Predictive Model → Expected Label

UNSUPERVISED LEARNING

Training Text Documents, Images, Sounds... → features vectors → Machine Learning Algorithm

New Text Document, Image, Sound... → features vector → Model → Likelihood or Cluster Id or Better representation

Types of Machine Learning

Machine Learning

| Supervised	Unsupervised	Reinforcement
Task driven (Regression / Classification)	Data driven (Clustering)	Algorithm learns to react to an environment
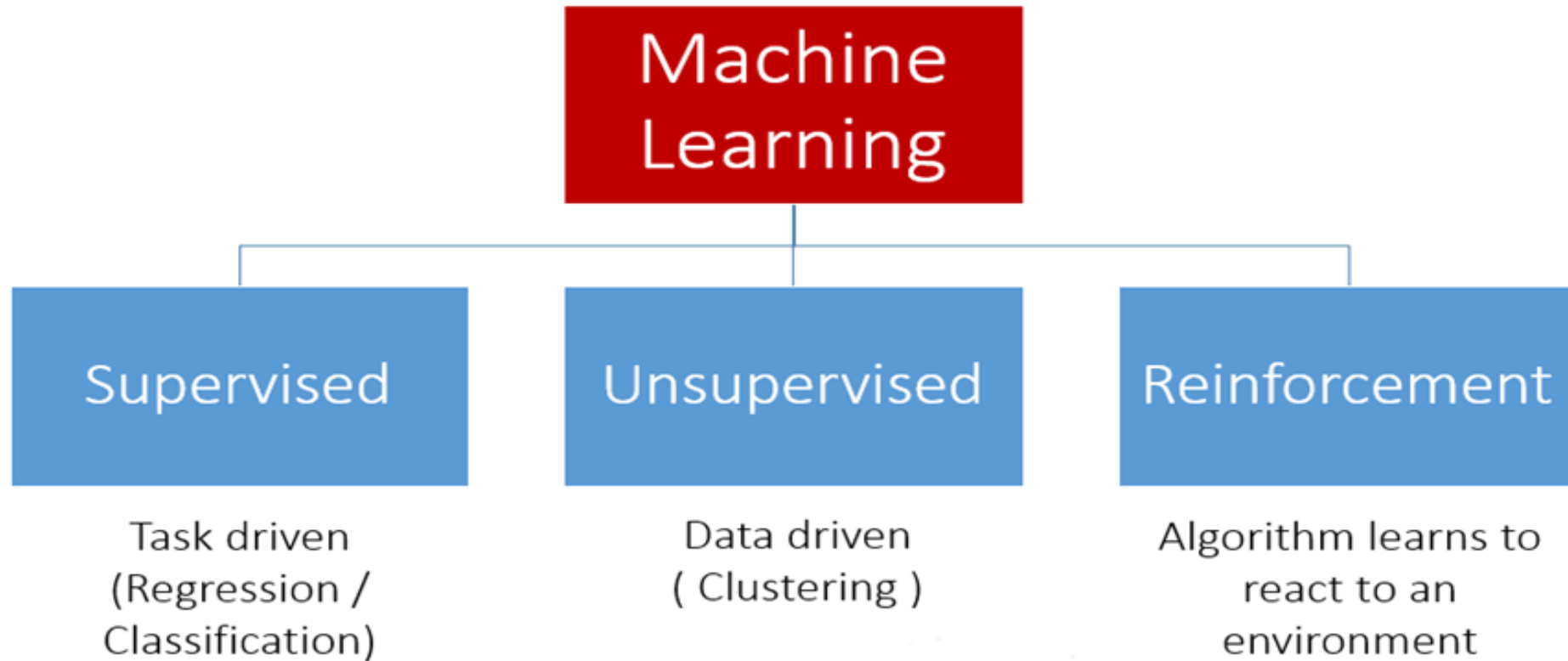
- Supervised Learning – Train Me!
- Unsupervised Learning – I am self sufficient in learning
- Reinforcement Learning – My life My rules! (Hit & Trial)

REINFORCEMENT LEARNING

EVOLUTIONARY LEARNING

Learning takes place as a result of interaction between an agent and the world, the idea behind learning is that
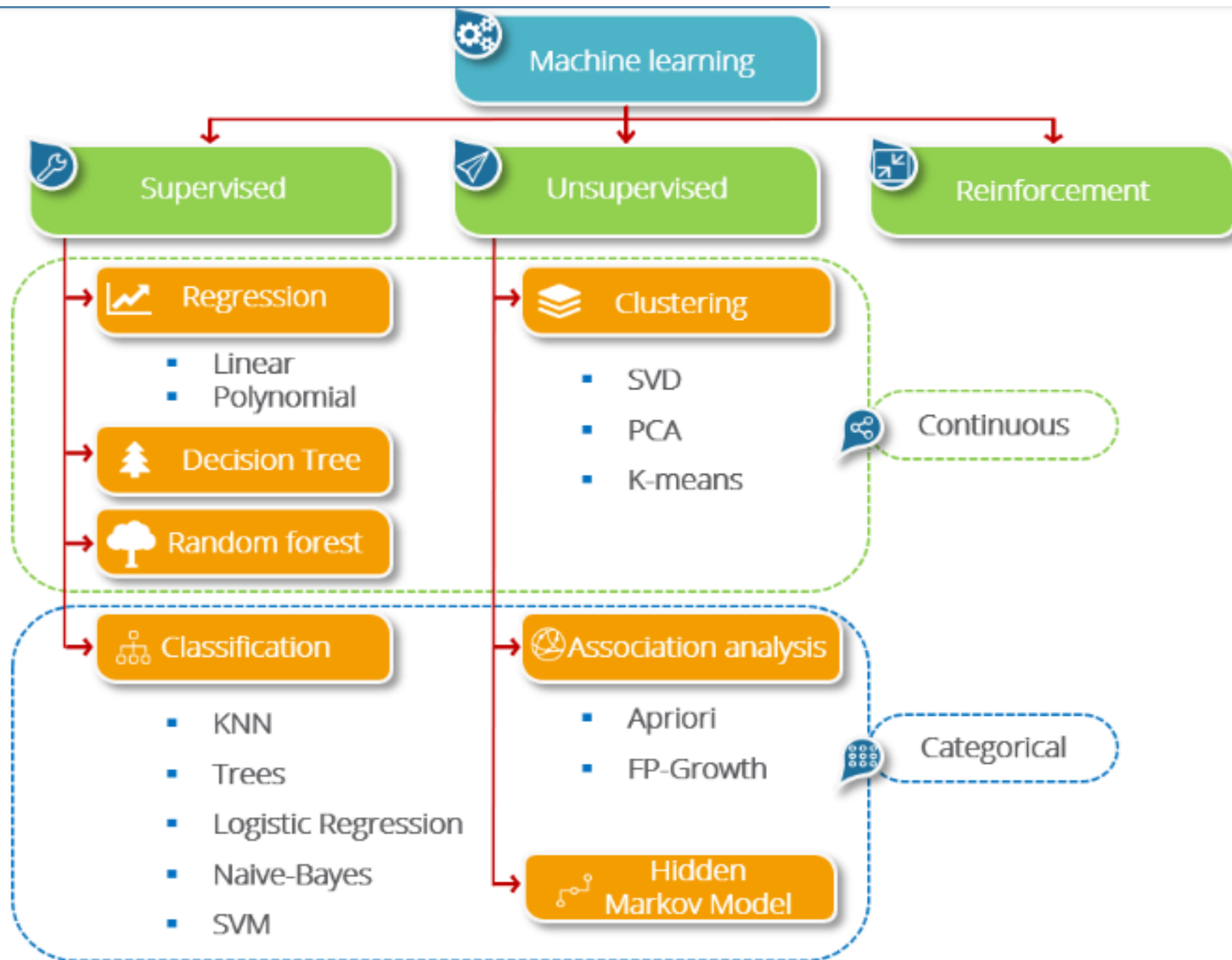
Percepts received by an agent should be used not only for acting, but also for improving the agent's ability to behave optimally in the future to achieve the goal.
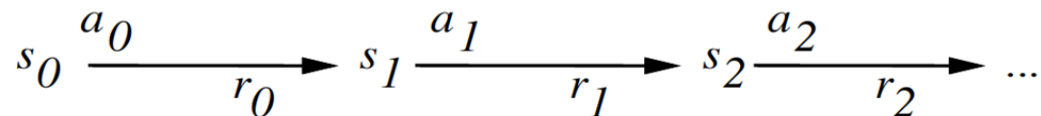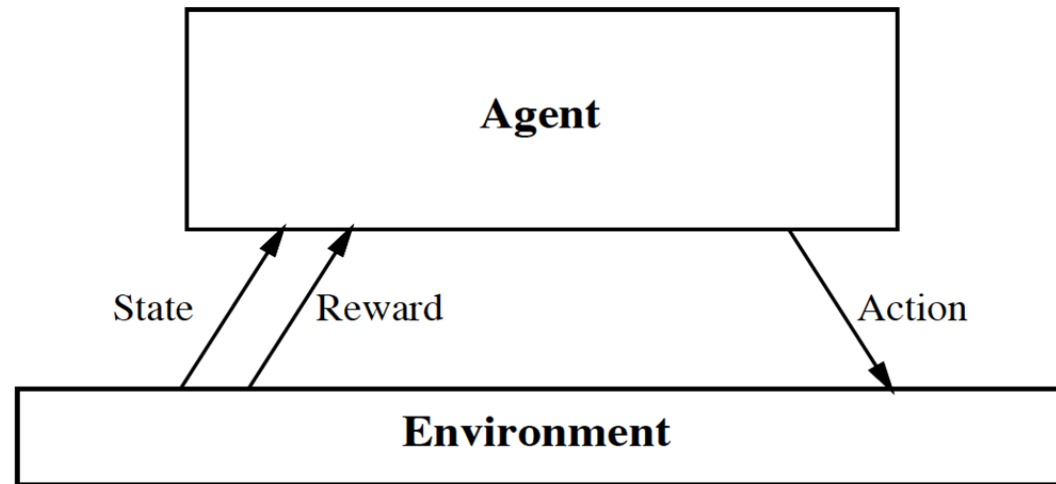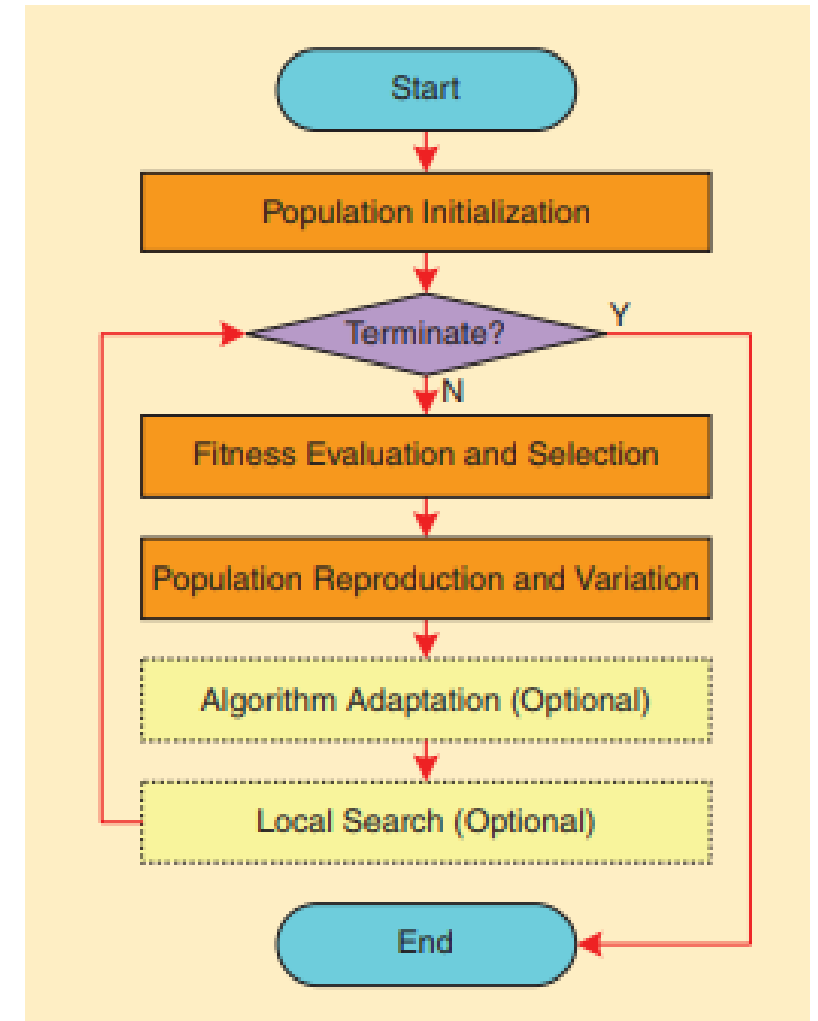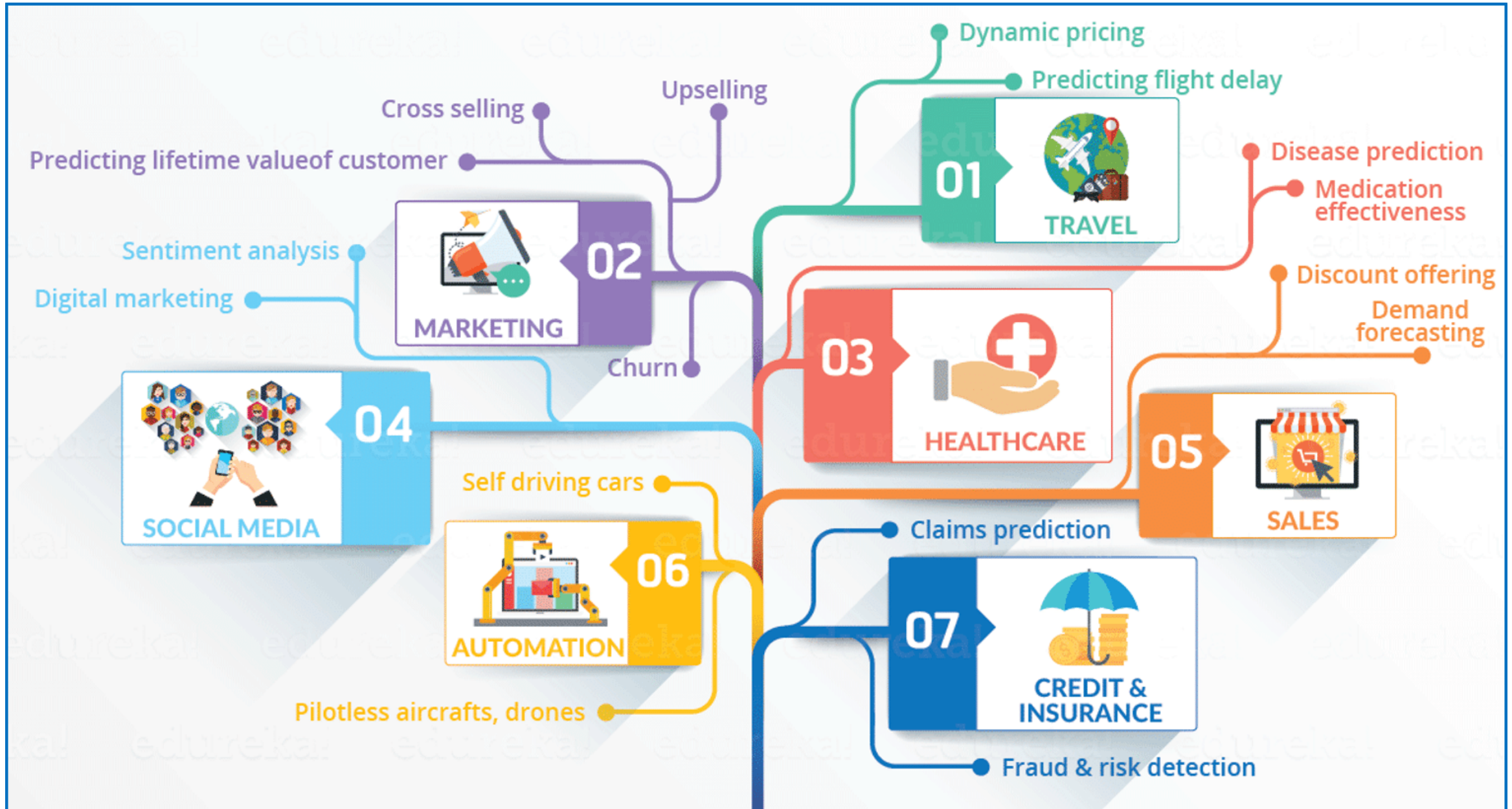
ML applications

Sample Applications

- Web search
- Computational biology
- Finance
- E-commerce
- Space exploration
- Robotics
- Information extraction
- Social networks
- Debugging

Skills Required

Expertise in computer fundamentals

In depth knowledge of programming skills

What are the skills required to become a machine learning expert

Knowledge of probability and statistics

Data modeling and evaluation skills