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# WHAT IS MACHINE LEARNING?

# Machine Learning

- "Learning is any process by which a system
- **improves performance** from **experience.**"
- Herbert Simon

- Definition by Tom Mitchell (1998):
- Machine Learning is the study of
- algorithms that
- ➔ Improve their performance P
- ➔ at some task T
- ➔ with experience E.
- A well-defined learning task is given by
- *<P, T, E>.*

# Machine Learning

■ Processing and analyzing large amounts of data manually is not possible.

■ The goal is to make predictions for the future by using past data. • Machine Learning methods have been developed to solve these problems.

■ Machine learning methods attempt to find the most suitable model for new data by using past data.

■ •Data Mining, also known as extracting useful information from the data, involves examining the data.

# Traditional Programming vs Machine Learning
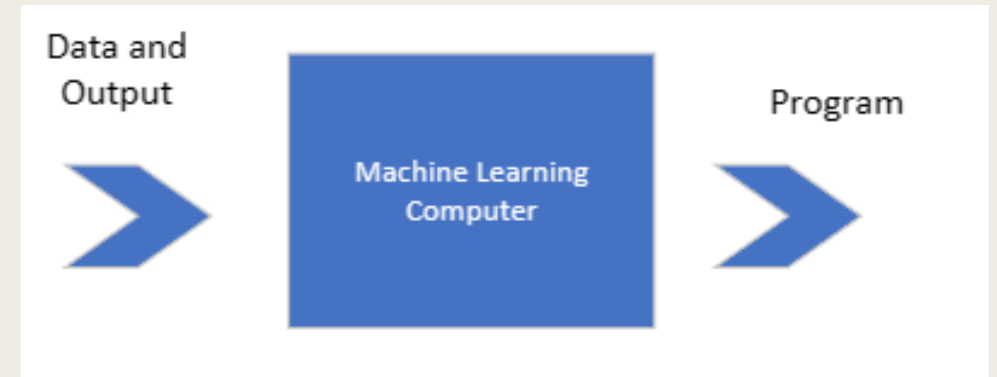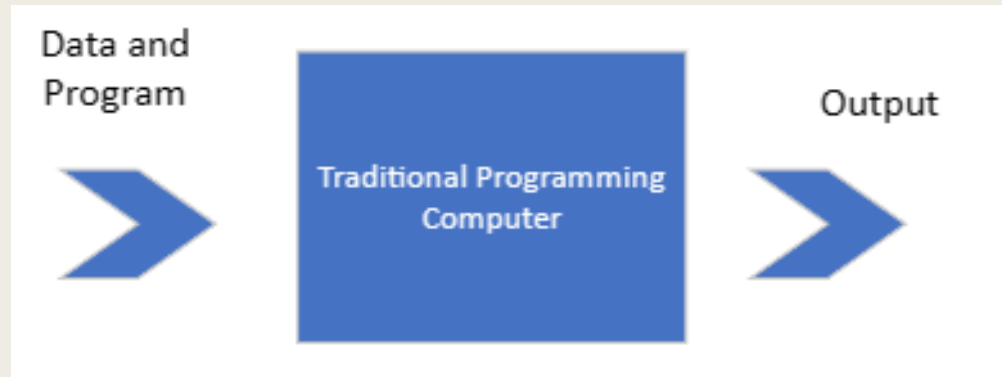
# Applications of ML
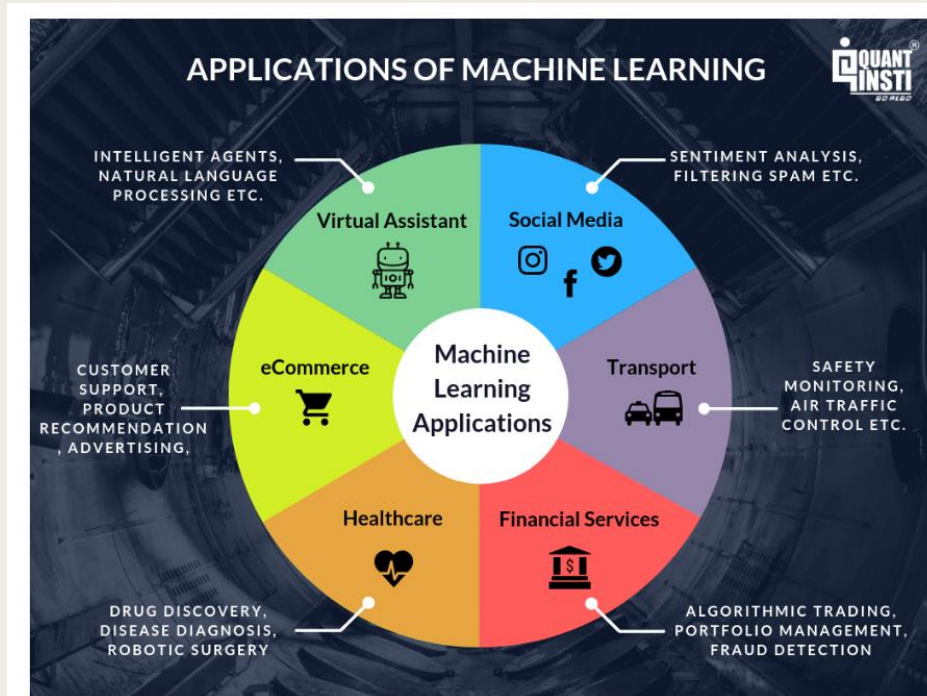


- Machine Learning (ML) is revolutionizing industries like healthcare, finance, and e-commerce. It powers applications such as disease prediction, fraud detection, personalized recommendations, and autonomous vehicles, showcasing its versatility and transformative impact.
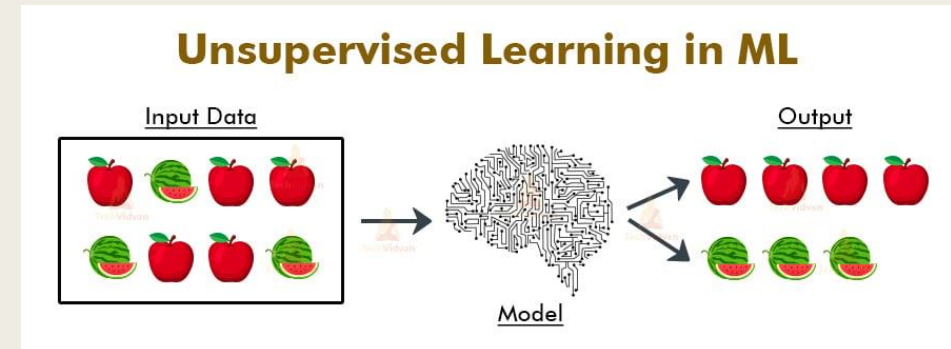
# Learning types of ML

- **Supervised Learning**

- It is based on labelled data

- Supervised learning is a machine learning approach where the algorithm is trained on labeled data, learning to map input to output by minimizing the difference between predicted and actual labels.
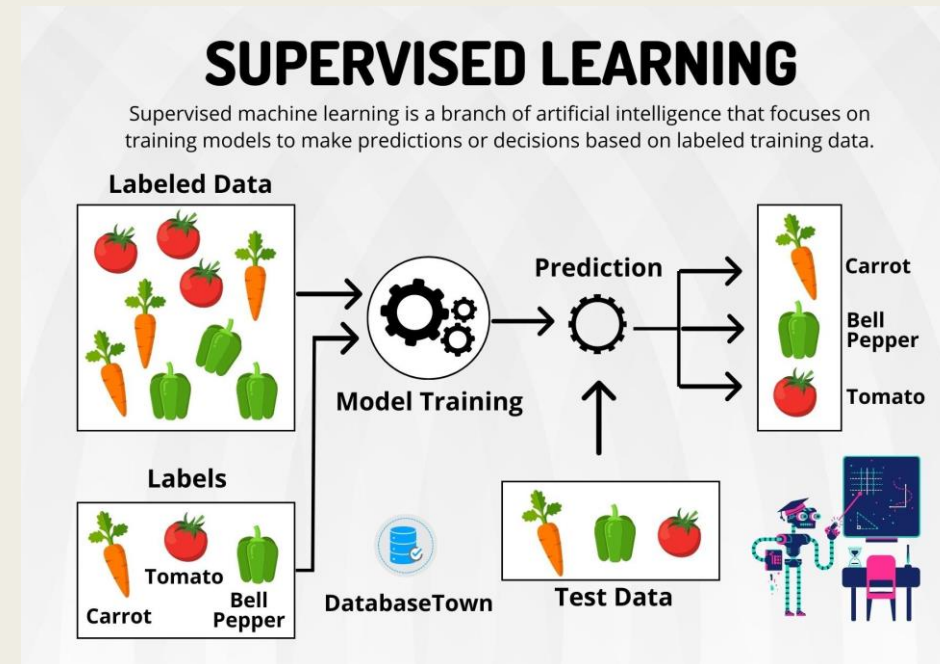
# Learning Types of ML

- **Unsupervised Learning**

- It is based on unlabelled data

- Unsupervised learning is a machine learning approach where the algorithm works with unlabeled data, seeking patterns or structures without predefined output labels. Common tasks include clustering and dimensionality reduction.

# Learning Types of MI

- **Reinforced Learning**

- Reinforcement learning is a machine learning approach where an agent learns by interacting with an environment, receiving feedback in the form of rewards. The goal is for the agent to develop a strategy that maximizes cumulative rewards over time.
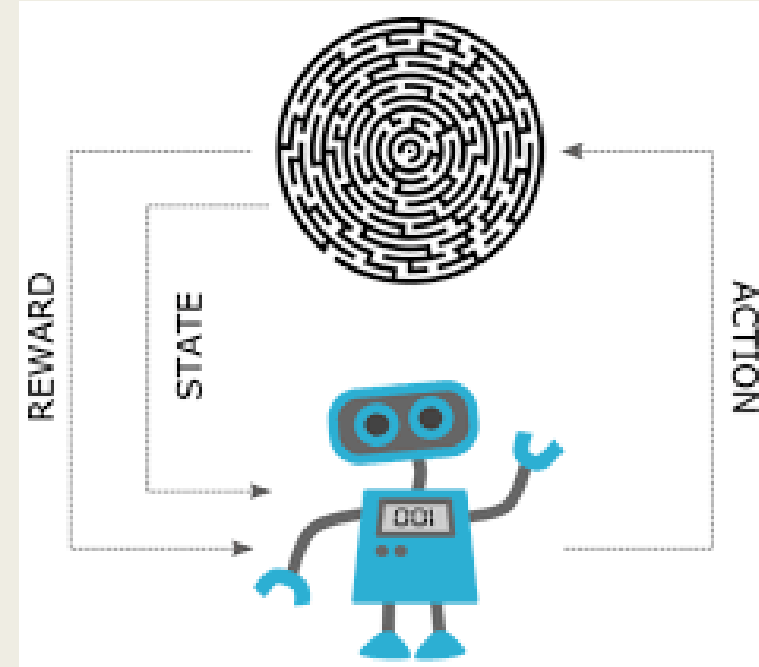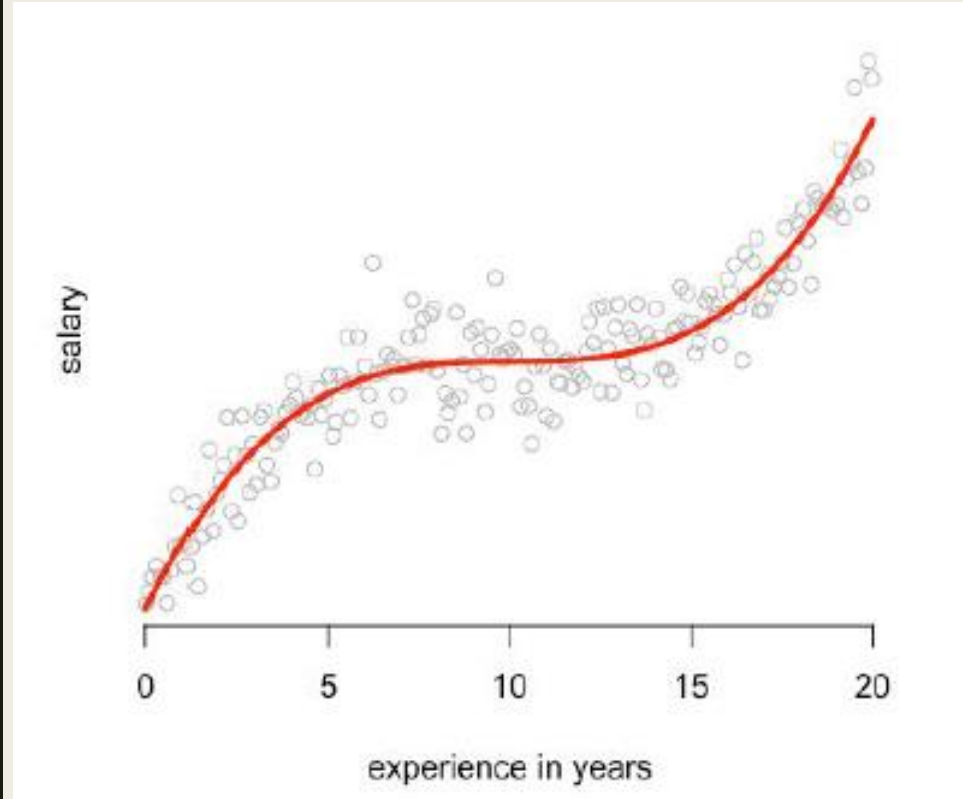
# Supervised Learning(Regression)

Given (x1,y1), (x2,y2), ..., (xn,yn)

Learn a function f(x) to predict y given x

If y is real valued then this problem called as regression.

If y is categorical → classification

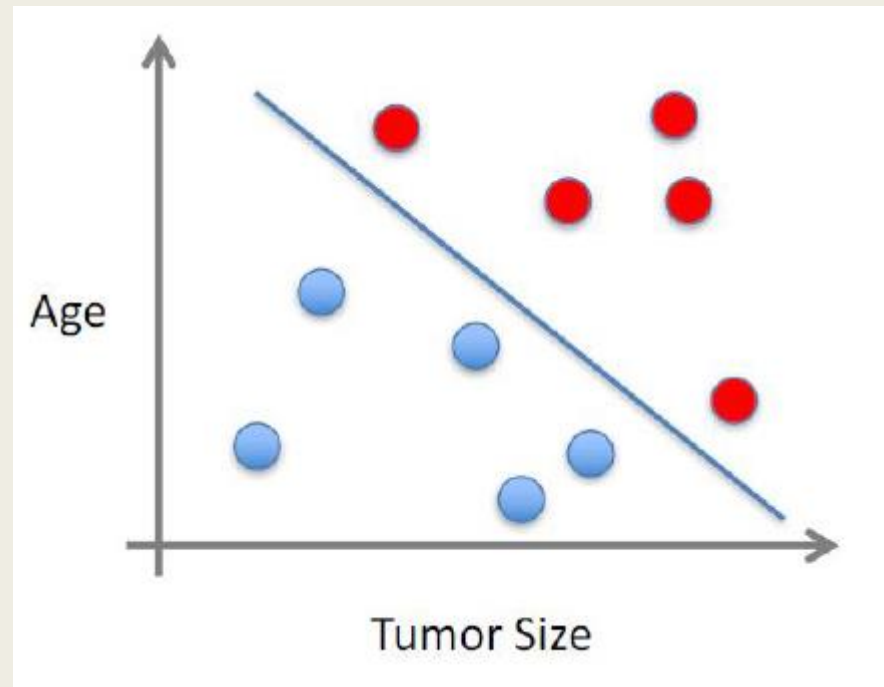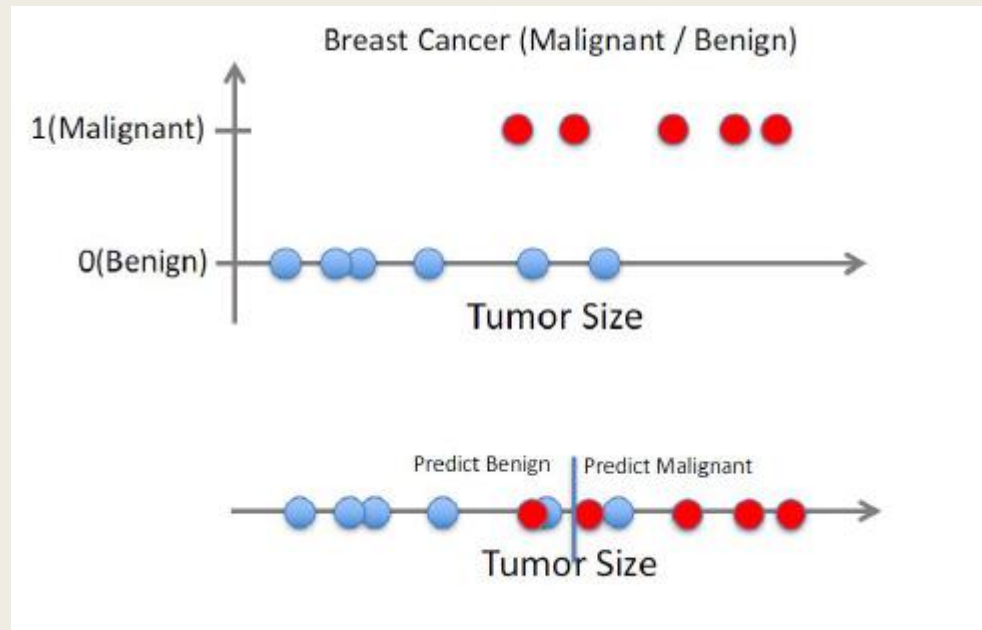This is the difference between Supervised and Unsupervised Learning Altgorithms!

# Unsupervised Learning(Classification)

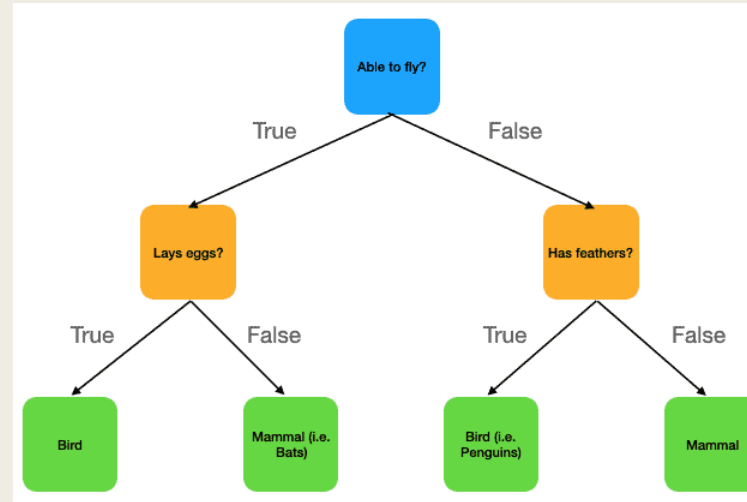Given (x1,y1), (x2,y2), ..., (xn,yn)

Learn a function f(x) to predict y given x
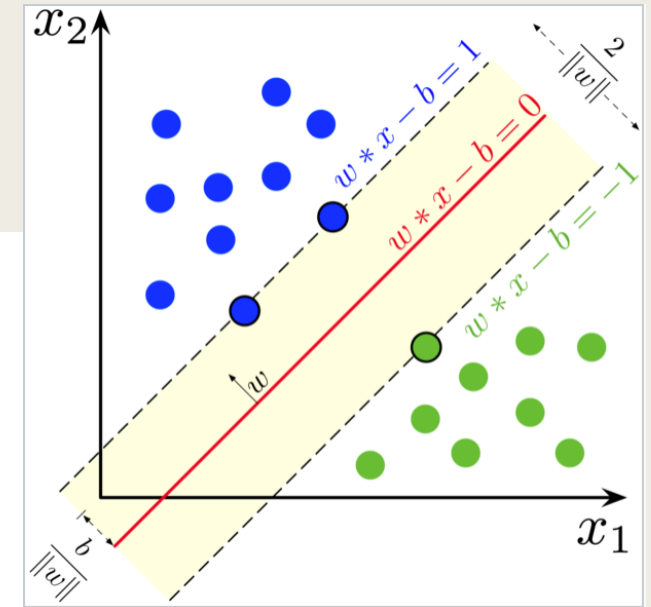
Now y is categorical!
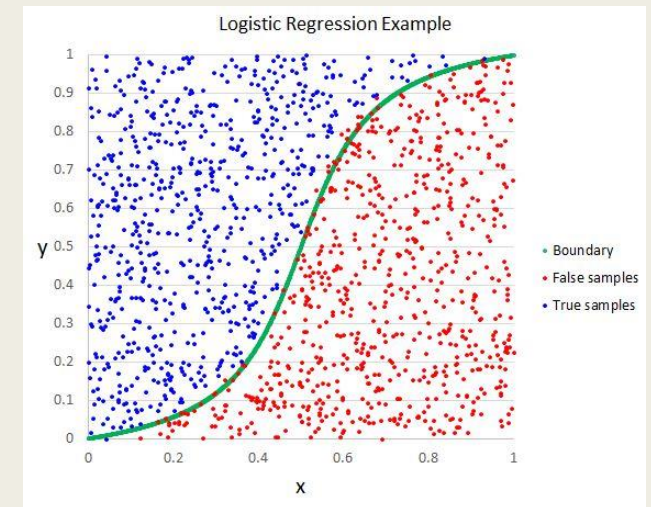
# Classification Methods

- Instance-based methods:
- 1) Nearest neighbor
- Probabilistic models:
- 1) Naïve Bayes
- 2) Logistic Regression
- Linear Models:
- 1) Perceptron
- 2) Support Vector Machine
- Decision Models:
- 1) Decision Trees
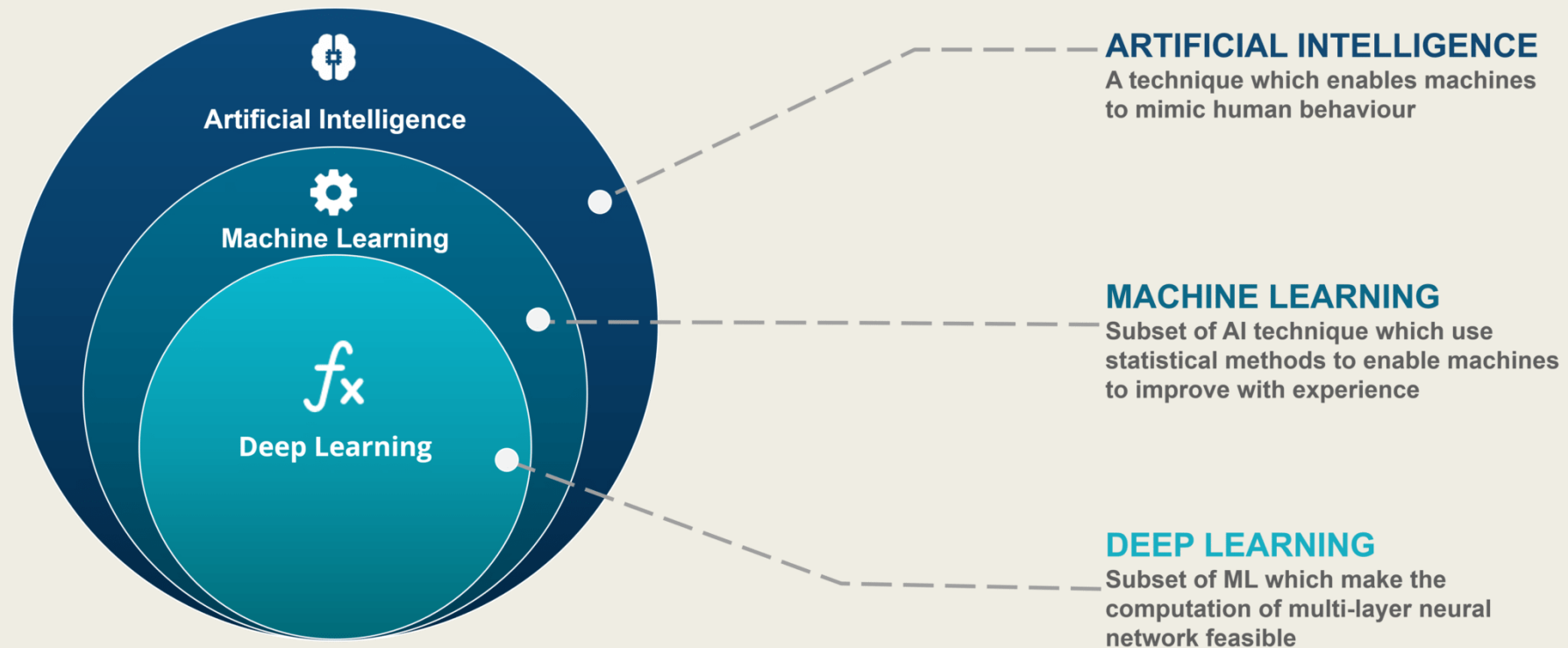- 2) Boosted Decision Trees
- 3) Random Forest



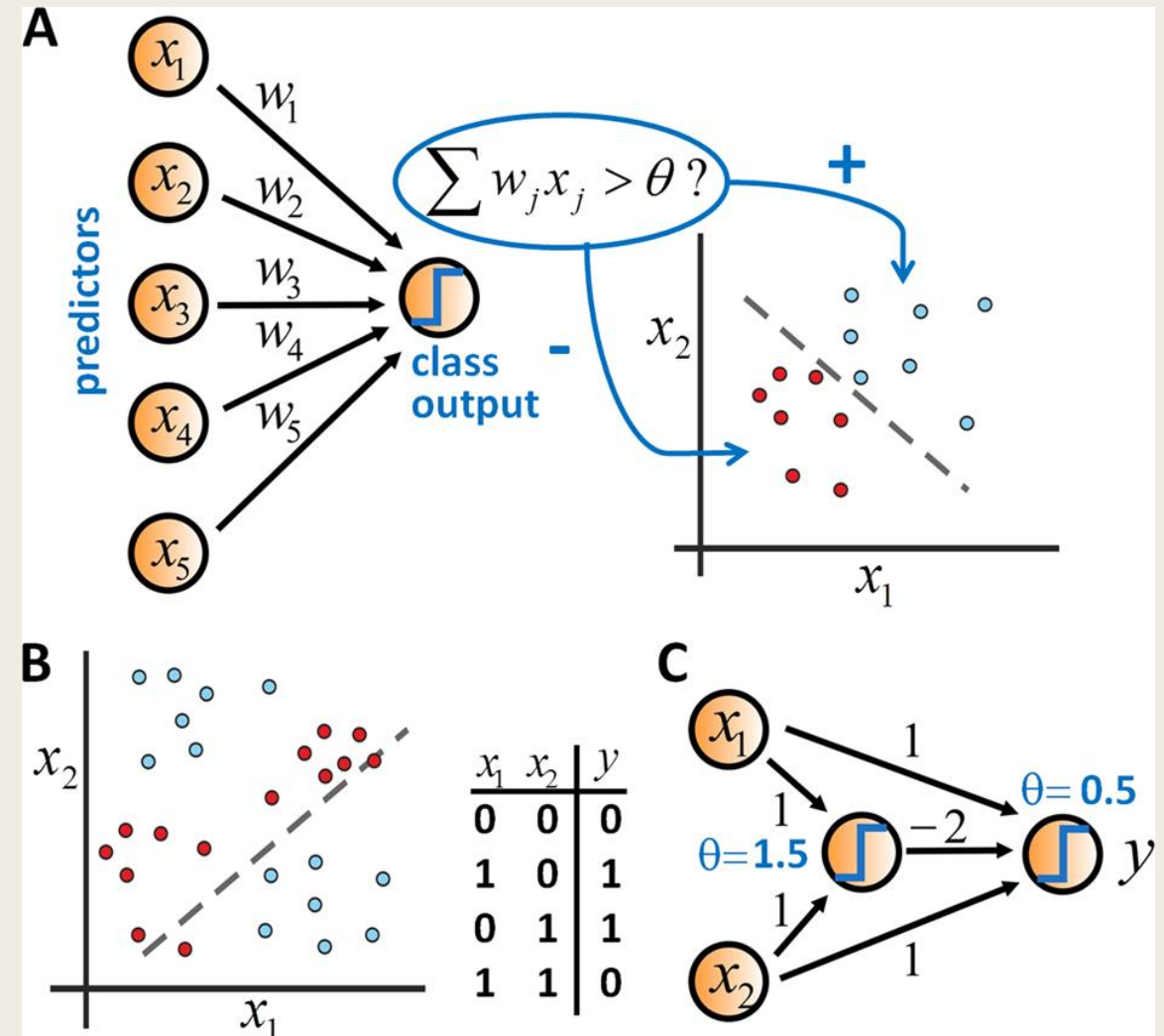Decision Tree



Support Vector Machine

# Relationship between AI-ML-DL
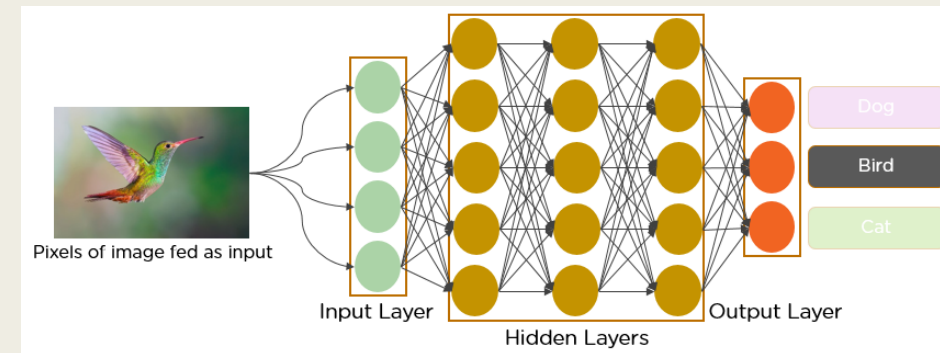
# Let's look at Neural Network Algorithms

- **Deep N.N**

- Deep Neural Networks (DNNs) are multi-layered artificial neural networks that automatically learn complex patterns from data.

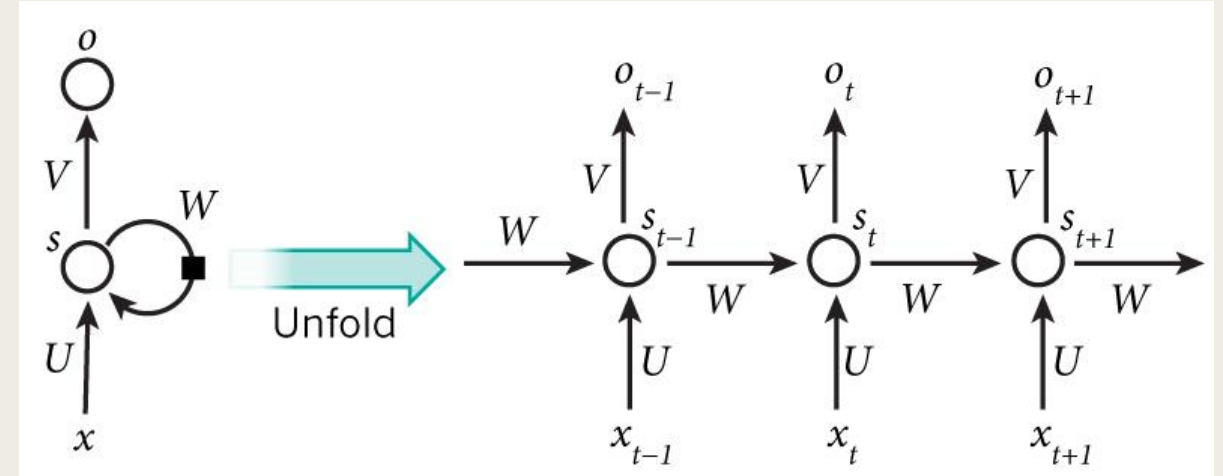- We use it for Classification and Prediction

# Let's look at Neural Network Algorithms

- **Convolutional N.N**

- Convolutional Neural Networks (CNNs) are a type of deep neural network designed for processing and analyzing visual data, such as images. They use convolutional layers to automatically and adaptively learn spatial hierarchies of features from the input.



Pixels of image fed as input

Input Layer

Hidden Layers

Output Layer

Dog

Bird

Cat

# Let's look at Neural Network Algorithms

■ **Recurrent N.N**

■ Recurrent Neural Networks (RNNs) are a type of neural network architecture designed to work with sequential data. Unlike traditional neural networks, RNNs have connections that form directed cycles, allowing them to maintain a memory of previous inputs.

■ Natural Language Proccessing and Time Series Pred. are areas of the RNN

# Deep Learning Tools