

Learning in AI

- Learning is the process of converting experience into expertise or knowledge.
- Learning can be broadly classified into three categories, as mentioned below, based on the nature of the learning data and interaction between the learner and the environment.
 - Supervised Learning
 - Unsupervised Learning
 - Semi-supervised Learning
- Similarly, there are four categories of machine learning algorithms as shown below –
 - Supervised learning algorithm
 - Unsupervised learning algorithm
 - Semi-supervised learning algorithm
 - Reinforcement learning algorithm
- However, the most commonly used ones are **supervised** and **unsupervised learning**.

Supervised Learning

- Supervised learning is commonly used in real world applications, such as face and speech recognition, products or movie recommendations, and sales forecasting.
- Supervised learning can be further classified into two types - **Regression** and **Classification**.
- **Regression** predicts a continuous-valued response, for example predicting real estate prices.
- **Classification** attempts to find the appropriate class label, such as analyzing positive/negative sentiment, male and female persons, benign and malignant tumors, secure and unsecure loans etc.

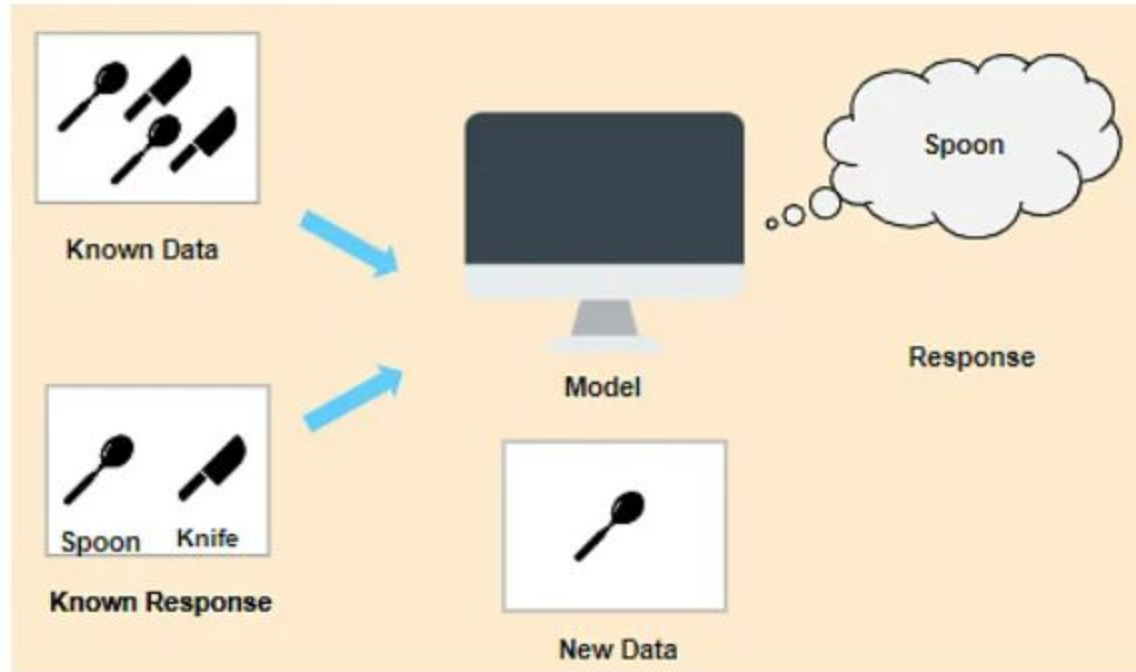
Supervised Learning

- In supervised learning, learning data comes with description, labels, targets or desired outputs and the objective is to find a general rule that maps inputs to outputs. This kind of learning data is called **labeled data**. The learned rule is then used to label new data with unknown outputs.
- For example, if we build a system to estimate the price of a plot of land or a house based on various features, such as size, location, and so on, we first need to create a database and label it. We need to teach the algorithm what features correspond to what prices. Based on this data, the algorithm will learn how to calculate the price of real estate using the values of the input features.

Supervised Learning

- There are many **supervised learning algorithms** such as Logistic Regression, Neural networks, Support Vector Machines (SVMs), and Naive Bayes classifiers.
- Common **examples** of supervised learning include classifying e-mails into spam and not-spam categories, labeling webpages based on their content, and voice recognition.

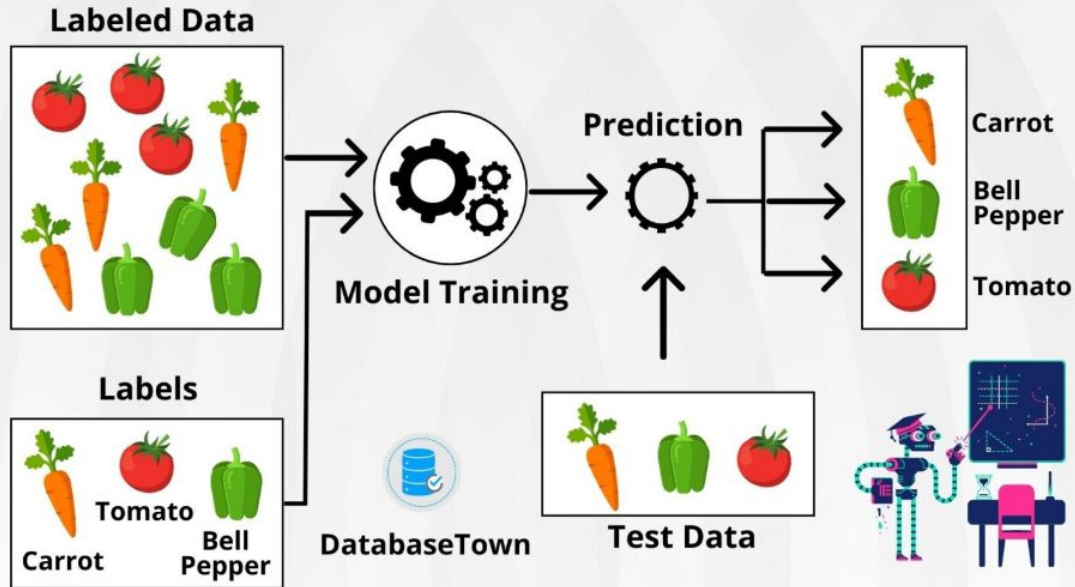
Supervised Learning



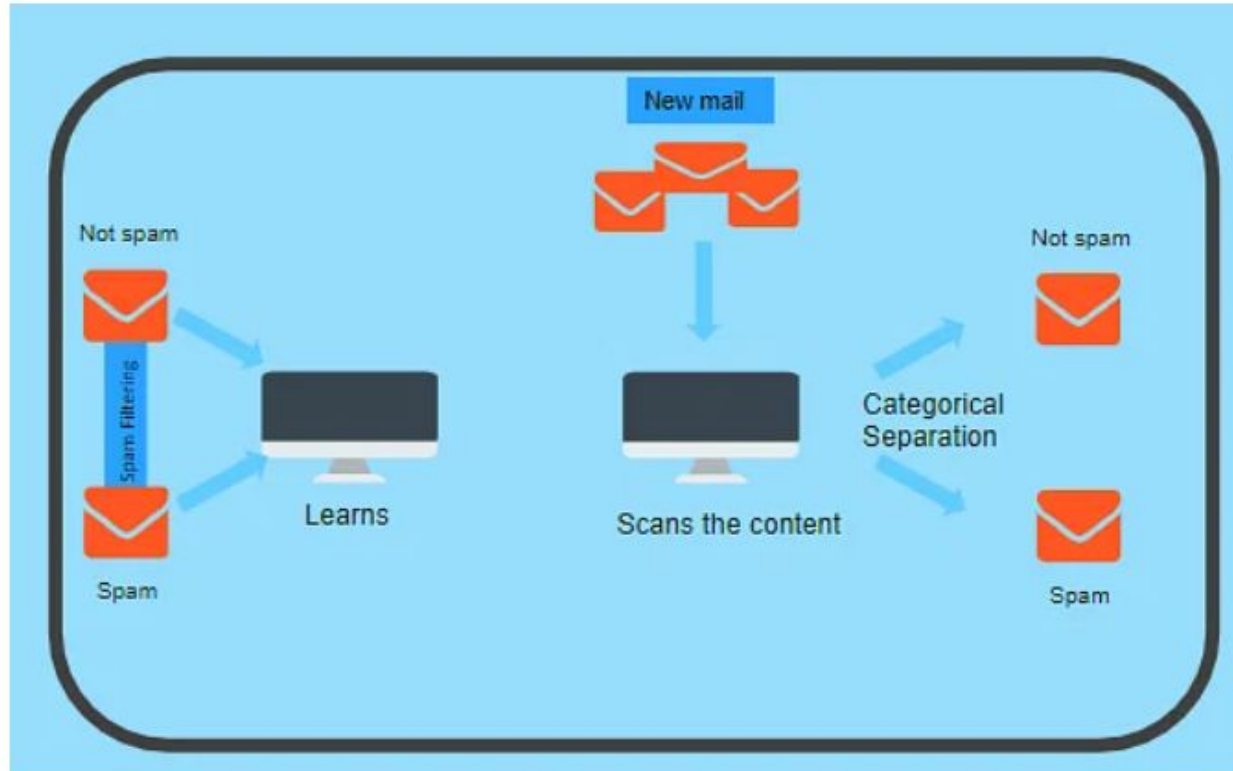
Supervised Learning

SUPERVISED LEARNING

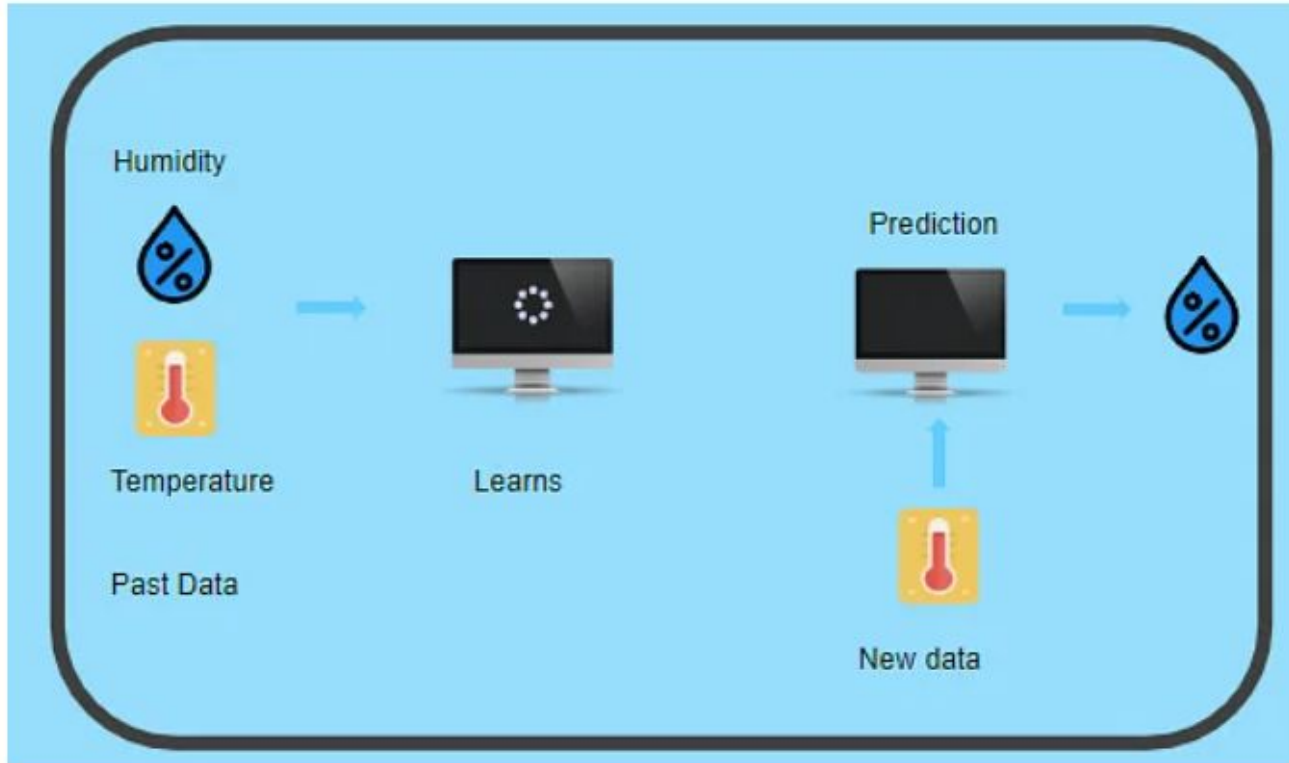
Supervised machine learning is a branch of artificial intelligence that focuses on training models to make predictions or decisions based on labeled training data.



Supervised Learning: Classification



Supervised Learning: Regression



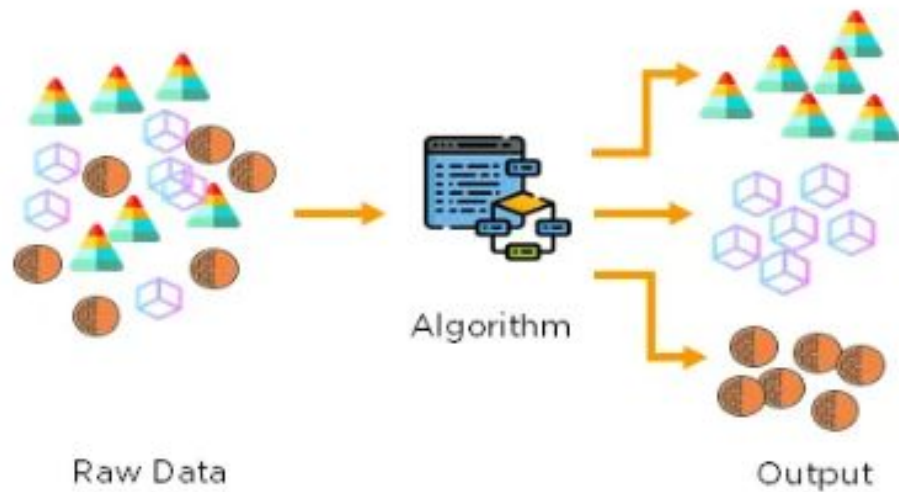
Unsupervised Learning

- Unsupervised learning is used to detect anomalies, outliers, such as fraud or defective equipment, or to group customers with similar behaviors for a sales campaign. It is the opposite of supervised learning. There is no labeled data here.
- When learning data contains only some indications without any description or labels, it is up to the coder or to the algorithm to find the structure of the underlying data, to discover hidden patterns, or to determine how to describe the data. This kind of learning data is called **unlabeled data**.

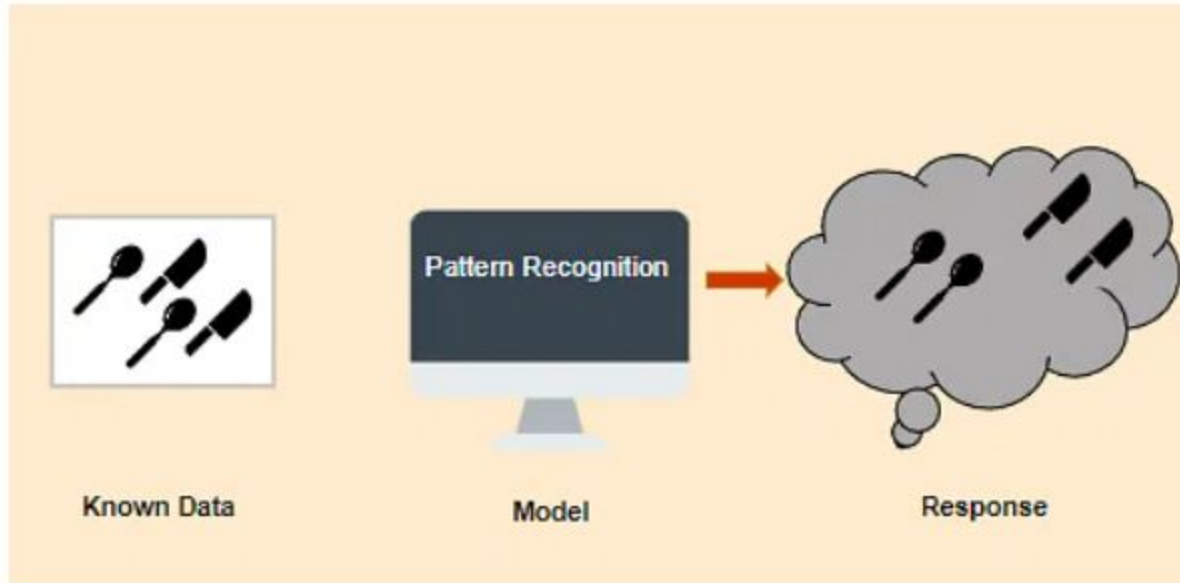
Unsupervised Learning

- Suppose that we have a number of data points, and we want to classify them into several groups. We may not exactly know what the criteria of classification would be. So, an unsupervised learning algorithm tries to classify the given dataset into a certain number of groups in an optimum way.
- Unsupervised learning algorithms are extremely powerful tools for analyzing data and for identifying patterns and trends. They are most commonly used for clustering similar input into logical groups. Unsupervised learning algorithms include Kmeans, Random Forests, Hierarchical clustering and so on.

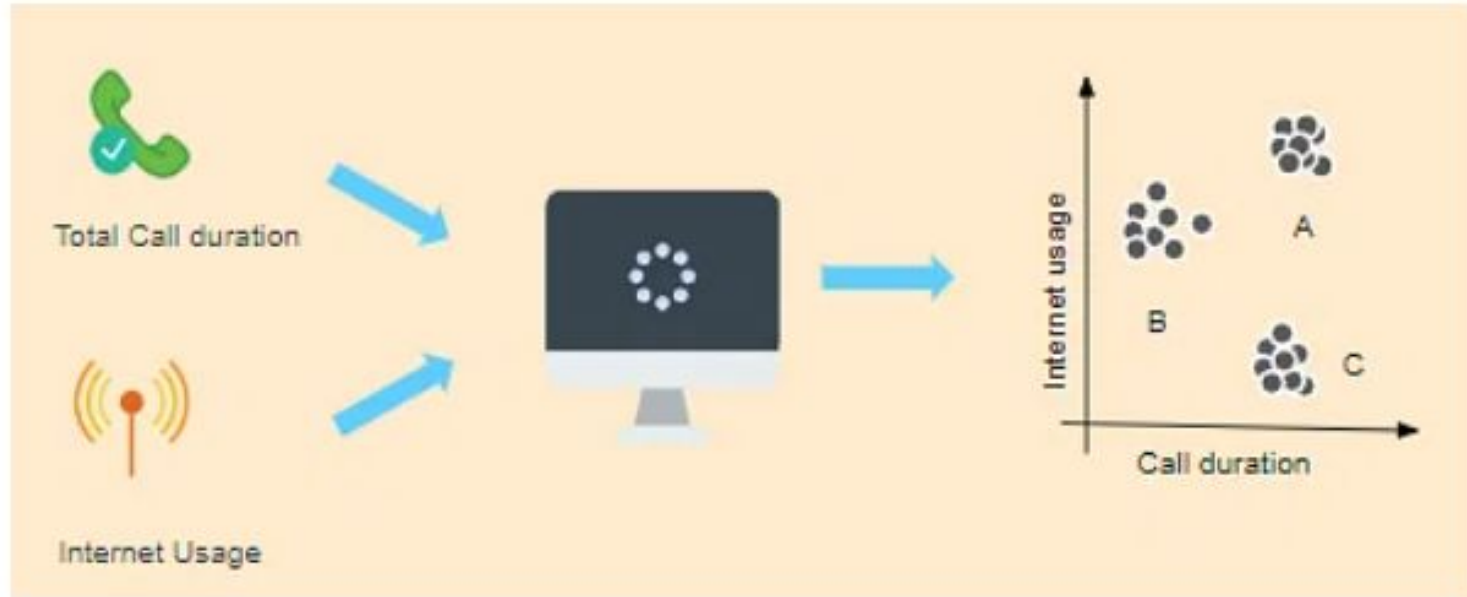
Unsupervised Learning



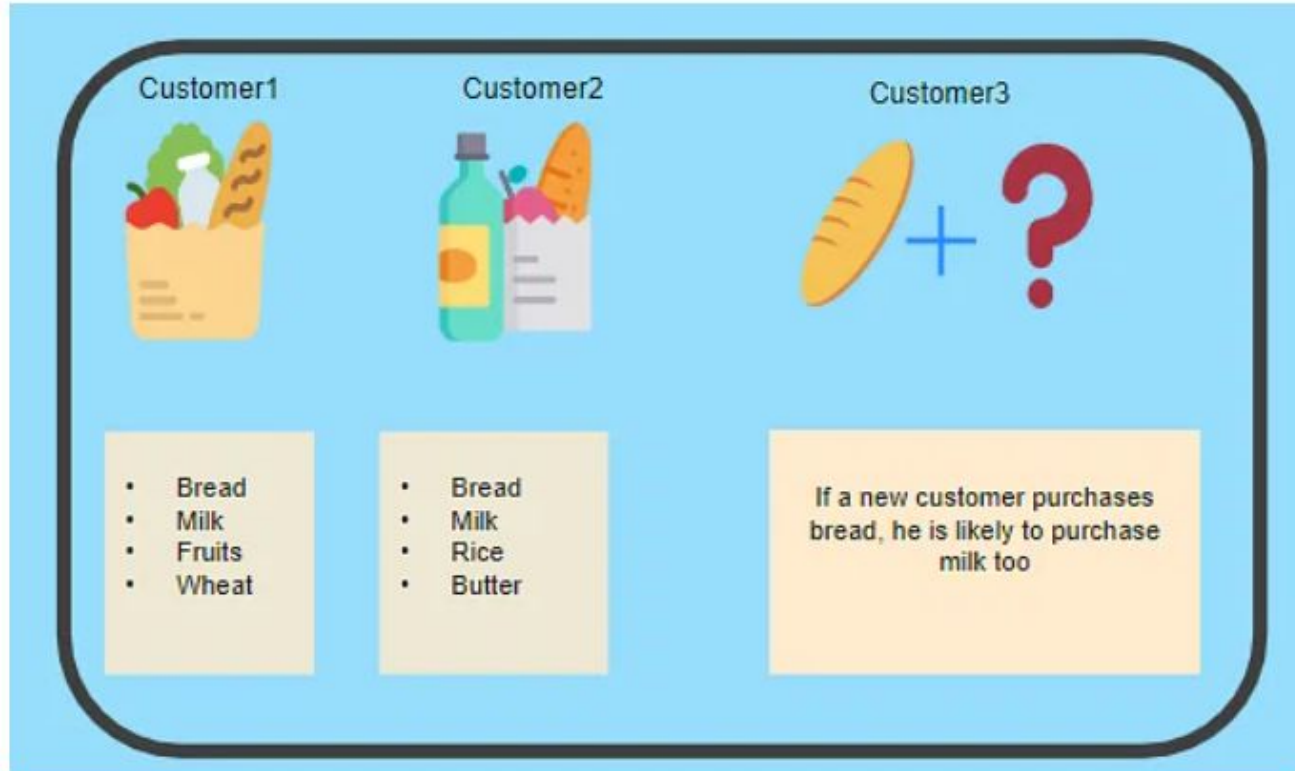
Unsupervised Learning



Unsupervised Learning: Clustering



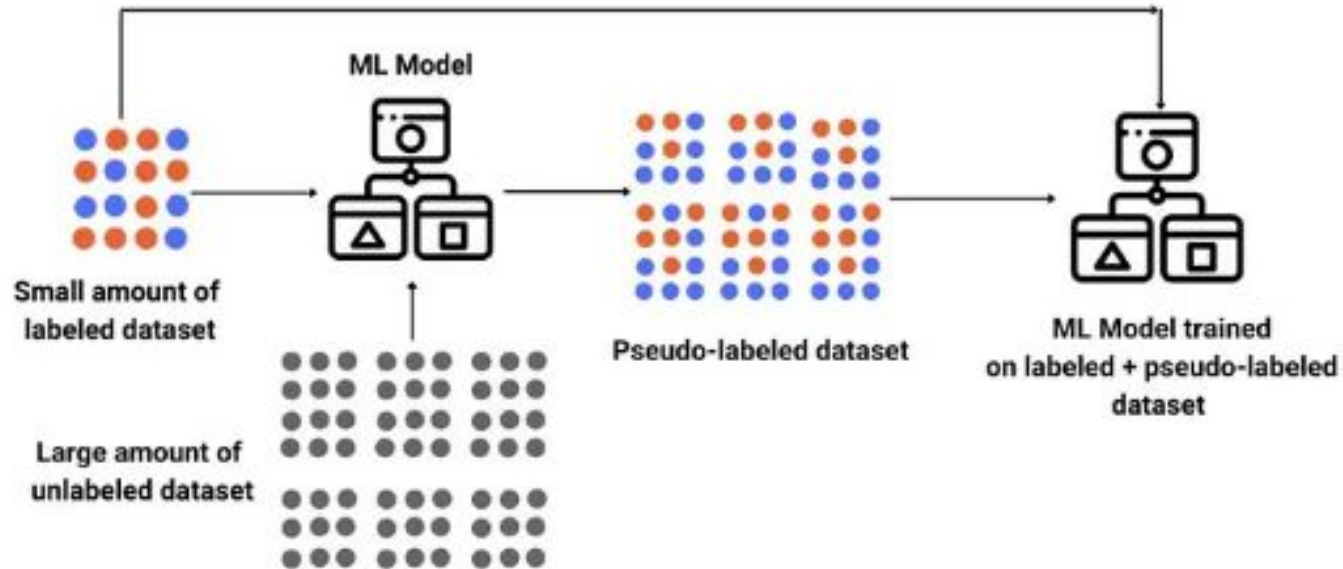
Unsupervised Learning: Association



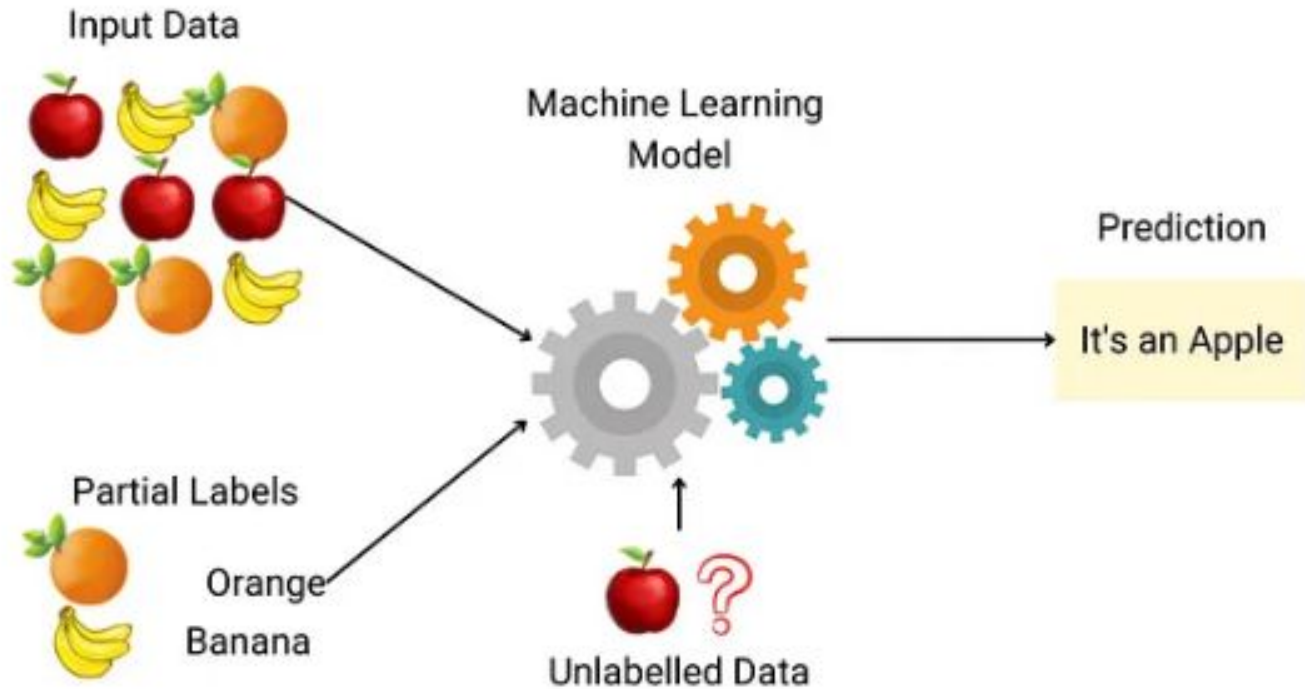
Semi-Supervised Learning

- If some learning samples are labeled, but some other are not labeled, then it is semi-supervised learning. It makes use of a large amount of **unlabeled data for training** and a small amount of **labeled data for testing**. Semi-supervised learning is applied in cases where it is expensive to acquire a fully labeled dataset while more practical to label a small subset.

Semi-Supervised Learning



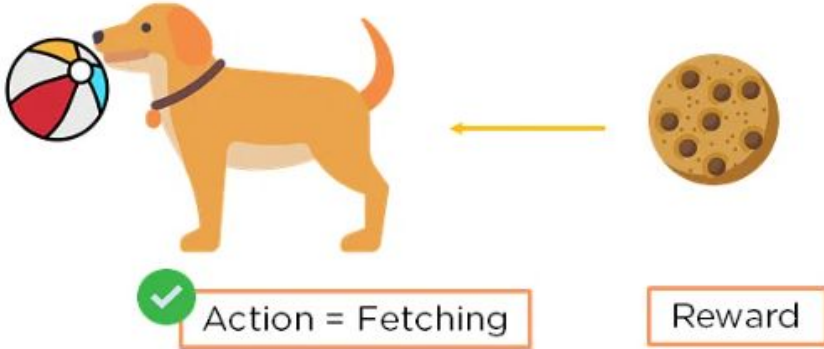
Semi-Supervised Learning



Reinforcement Learning

Here learning data gives feedback so that the system adjusts to dynamic conditions in order to achieve a certain objective. The system evaluates its performance based on the feedback responses and reacts accordingly. The best known instances include self-driving cars

Reinforcement Learning



Action: Climbing on the sofa
Reward: None