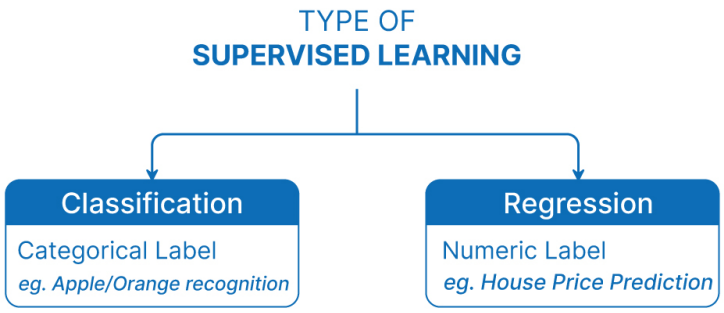
❖ Supervised learning

Supervised learning is the type of machine learning in which machines are trained using well "**labelled" training data**, and based on that data, machines predict the output. The labelled data means some input data is already **tagged** or **labelled** with the **correct output.**



1. Classification:

Classification is a type of supervised machine learning task where the goal is to **predict the category or class** that a new instance or observation belongs to, **based on training data**. The output variable in classification is **discrete** and represents different classes or labels.

In Classification, a program learns from the given dataset or observations and then classifies new observations into a number of classes or groups. Such as, Yes or No, 0 or 1, Spam or Not Spam, cat or dog, etc. Classes can be called as targets/labels or categories.

2. Regression :

Regression is a type of supervised machine learning task where the goal is to predict a **continuous numerical value** or outcome based on input features.

Regression is a type of supervised machine learning where algorithms **learn** from the data to predict continuous values such as sales, salary, weight, or temperature.

Example:

1. **Predicting the age of a person:** Given certain features or attributes of a person, such as height, weight, gender, and other relevant factors, the task is to predict the person's age in years.

2. **Predicting the price of houses based on their features:**

In real estate markets, house prices can vary continuously based on factors such as location, size, amenities, market conditions, and other features. House prices can range from a few thousand dollars for smaller properties in certain areas to millions of dollars for luxury properties in prime locations.

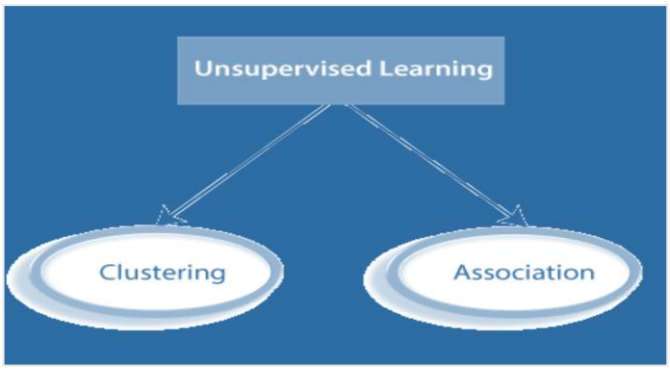
1. Predicting the salary of an employee on the basis of the year of experience.

❖ Unsupervised learning

Unsupervised learning is a type of machine learning in which models are trained using unlabeled datasets and are allowed to act on that data without any supervision. As the name suggests, unsupervised learning is a machine learning technique in which models are not supervised using a training dataset. Instead, the models themselves find the hidden patterns and insights from the given data. It can be compared to learning which takes place in the human brain while learning new things.

Example:

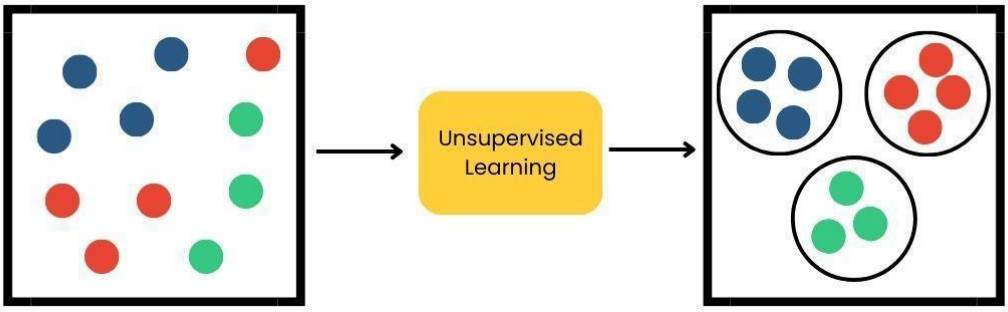
Suppose the unsupervised learning algorithm is given an input dataset containing images of different types of cats and dogs. The algorithm is never trained upon the given dataset, which means it does not have any idea about the features of the dataset. The task of the unsupervised learning algorithm is to identify the image features on their own. An unsupervised learning algorithm will perform this task by clustering the image dataset into groups according to similarities between images.



1. Clustering:

Clustering methods involve grouping untagged data based on their similarities and differences. When two instances appear in different groups, we can infer they have dissimilar properties.
Clustering is a type of unsupervised learning, meaning that we do not need labeled data for clustering algorithms; this is one of the biggest advantages of clustering over other supervised learning like Classification.

Clustering is the process of arranging a group of objects in such a manner that the objects in the same group (which is referred to as a cluster) are more similar to each other than to the objects in any other group.



2. Association Rule:

An association rule is an unsupervised learning method that is used for finding the relationships between variables in a large database. It determines the set of items that occur together in the dataset.

❖ Reinforcement Learning

Reinforcement Learning is a **feedback-based Machine learning technique** in which an agent learns to behave in an environment by performing the actions and seeing the results of actions. For each good action, the agent gets **positive feedback**, and for each bad action, the agent gets **negative feedback or penalty**. In Reinforcement Learning, the agent learns automatically using feedbacks without any labeled data, unlike supervised learning Since there is no labeled data, so the agent is bound to learn by its experience only. RL solves a specific type of problem where decision making is sequential, and the goal is long-term, such as game-playing, robotics, etc. The agent interacts with the environment and explores it by itself. The primary goal of an agent in reinforcement learning is to **improve the performance by getting the maximum positive rewards.**