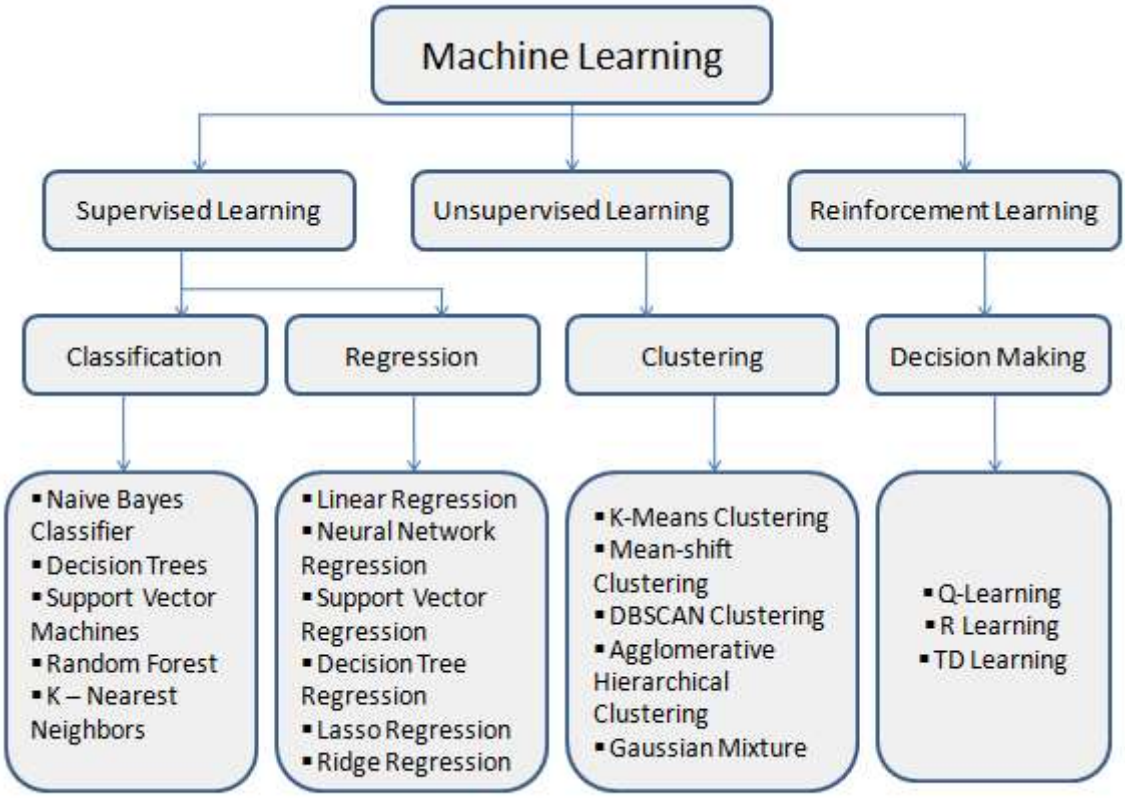
MACHINE LEARNING

Machine Learning is a subset of Artificial Intelligence. ML is the study of computer algorithms that improve automatically through experience. ML explores the study and construction of algorithms that can learn from data and make predictions on data. Based on more data, machine learning can change actions and responses which will make it more efficient, adaptable, and scalable.



TYPES OF MACHINE LEARNING

There are several types of machine learning, each with special characteristics and applications. Some of the main types of machine learning algorithms are as follows:

1. Supervised Machine Learning
2. Unsupervised Machine Learning
3. Reinforcement Learning

Criteria	Supervised ML	Unsupervised ML	Reinforcement ML
Definition	Machine Learns by using labelled data	Machine is trained using unlabelled data without any guidance.	Agent interacts with the environment by performing action. Learns by errors and rewards.
Type of data	Labelled data	Unlabelled data	No – predefined data.
Type of problems	Regression and classification	Association and Clustering	Reward and error based.
Supervision	External supervision	No supervision	No supervision
Algorithms	Linear Regression, Logistic Regression, Naïve Byes Decision trees	K – Means clustering, KNN (K-nearest neighbours) Principle Component Analysis Neural Networks	Monte Carlo, Q-Learning, SARSA
Aim	Calculate outcomes	Discover underlying patterns	Learn a series of action
Approach	Maps labelled inputs to the known outputs	Understands patterns & discover the output	Follow the trial and error method
Application	Risk Evaluation, Forecast Sales	Recommendation System, Anomaly Detection	Self-Driving Cars, Gaming, Healthcare

1.SUPERVISED MACHINE LEARNING

- In supervised learning, the machine is trained on a set of labeled data, which means that the input data is paired with the desired output.
- The machine then learns to predict the output for new input data.
- Supervised learning is often used for tasks such as classification, regression, and object detection.
- Many online platforms, such as Netflix and Amazon, use supervised learning algorithms to make recommendations to users based on their past activity. The algorithms are trained on a dataset of user behavior (e.g. which movies or products a user has watched or purchased) and use this information to suggest similar movies or products to the user.(reccomendation system)
- Predicting the price of building, depending on factors given.

2.UNSUPERVISED MACHINE LEARNING

- Unsupervised learning is a type of machine learning that learns from unlabeled data. This means that the data does not have any pre-existing labels or categories, which means that the input data is not paired with the desired output
- The goal of unsupervised learning is to discover patterns and relationships in the data without any explicit guidance.
- Unsupervised learning is often used for tasks such as clustering, dimensionality reduction, and anomaly detection.

- Google News uses unsupervised learning to categorize articles on the same story from various online news outlets. For example, the results of a presidential election could be categorized under their label for “US” news.
- Unsupervised learning algorithms are used for visual perception tasks, such as object recognition.
- Classifying customers based on information provided like age,income,spending score,into distinct segments based on their similarities.

3.REINFORCEMENT MACHINE LEARNING

- Reinforcement machine learning algorithm is a learning method that interacts with the environment by producing actions and discovering errors.
- Trial, error, and delay are the most relevant characteristics of reinforcement learning.
- In this technique, the model keeps on increasing its performance using Reward Feedback to learn the behavior or pattern.
- The autonomous driving tasks is of reinforcement learning .
- The use of reinforcement learning can train robots that have the ability to grasp various objects even those unseen during training. This can, for example, be used in building products in an assembly line.
- Marketing and advertising platforms can use reinforcement learning to associate similar companies, products, and services to prioritize for certain customers.

CLASSIFICATION -REGRESSION-CLUSTERING

CLASSIFICATION

- Classification involves assigning input data into predefined categories or labels. It is a supervised learning task, meaning the model is trained on labeled data.
- Common applications include email spam detection, image recognition, and medical diagnosis, where the output is a discrete label such as "spam" or "not spam."
- Predicting the type of a given plant based on its features (e.g. flower color, leaf shape, etc.).
- Predicting whether a given image contains a cat or a dog.
- Here are some classification algorithms:

  Logistic Regression

  Support Vector Machine

Random Forest

Decision Tree

K-Nearest Neighbors (KNN)

Naive Bayes

REGRESSION

- Regression, on the other hand, deals with predicting continuous values. It is also a supervised learning task but differs from classification in that the outputs are continuous rather than discrete.
- Typical applications of regression include predicting house prices, sales forecasting, and estimating stock market trends, where the output is a real number such as a price or temperature.
- Predicting the demand for a product based on historical sales data.
- Forecasting the stock price of a company based on financial data.
- Determining how much a customer is willing to pay for a particular product based on age.
- Here are some regression algorithms:

  Linear Regression

  Polynomial Regression

  Ridge Regression

  Lasso Regression

  Decision tree

  Random Forest

CLUSTERING

- Clustering is an unsupervised learning technique used to group similar data points into clusters based on inherent similarities without predefined labels. It helps in discovering underlying patterns or structures within the data.
- Applications include customer segmentation in marketing, grouping similar documents, and anomaly detection.
- Search engines also work on the clustering technique. The search result appears based on the closest object to the search query.
- Here are some clustering algorithms:

  K-Means Clustering algorithm

Mean-shift algorithm

DBSCAN Algorithm

Principal Component Analysis

Independent Component Analysis