

Task 7: – Machine Learning

1.What is Machine Learning?

Machine learning is a branch of Artificial Intelligence that focuses on developing models and algorithms that let computers learn from data without being explicitly programmed for every task.. Instead of following fixed rules, machine learning models analyze patterns in historical data and use those patterns to make predictions or decisions on new, unseen data. It is widely used in real-world applications such as recommendation systems, fraud detection, image and speech recognition, and predictive analytics, helping organizations automate tasks and gain insights from large amounts of data.

2.What are the main types of Machine Learning?

Machine Learning is mainly divided into three core types: Supervised, Unsupervised and Reinforcement Learning along with two additional types, Semi-Supervised and Self-Supervised Learning.

- **Supervised Learning** uses labeled data, meaning the input data is paired with correct output values. The model learns by mapping inputs to known outputs and improves its accuracy by minimizing errors during training. It is commonly used for tasks such as classification and regression, including spam detection, disease prediction, and house price estimation.
- **Unsupervised Learning** works with unlabeled data and focuses on identifying hidden patterns or structures within the data. Instead of predicting a specific outcome, the model groups similar data points or reduces complexity. Typical applications include customer segmentation, clustering, market basket analysis, and dimensionality reduction.
- **Reinforcement Learning** is based on learning through interaction with an environment using a reward and penalty system. An agent takes actions, receives feedback in the form of rewards or punishments, and learns to maximize long-term rewards over time. This type of learning is widely used in robotics, game playing, autonomous vehicles, and real-time decision-making systems.
- **Self-Supervised Learning:** Self-supervised learning is often considered as a subset of unsupervised learning, but it has grown into its own field due to its success in training large-scale models. It generates its own labels from the data, without any manual labeling.
- **Semi-Supervised Learning:** This approach combines a small amount of labeled data with a large amount of unlabeled data. It's useful when labeling data is expensive or time-consuming.

3. What is the difference between Classification and Regression?

Supervised learning algorithms are generally categorized into **two main types**:

Classification is a type of supervised learning used when the output variable is categorical. The model learns from labelled data and predicts discrete class labels such as spam or not spam, pass or fail, and yes or no. The main objective of classification is to assign input data points to the correct category based on learned patterns.

Regression is a type of supervised learning used when the output variable is continuous. The model predicts numerical values such as house prices, salary, temperature, or sales. The main objective of regression is to understand and model the relationship between input variables and a continuous output value.

4 What is a feature in Machine Learning?

A **feature** in Machine Learning is an individual, measurable property or characteristic of the data used as input to a model. Features represent the information that helps the model learn patterns and make predictions, such as age, salary, temperature, number of purchases, or pixel values in an image. The quality and relevance of features directly affect a model's performance, which is why selecting, creating, and transforming features (feature engineering) is an important step in building effective machine learning models.

5 What is a label or target variable?

A **label** or **target variable** is the output value that a machine learning model is trained to predict. It represents the correct answer in supervised learning and is provided along with the input features during training. For example, in a house price prediction model, the house price is the target variable, while in a spam detection system, the label indicates whether an email is spam or not. The model learns the relationship between features and the target variable in order to make accurate predictions on new data.