**DAY – 2 ARTIFICIAL INTELLIGENCE AND MACHINE** **LEARNING**

**Date : 24 June 2025**

# Types of Machine Learning

Machine Learning (ML) can be categorized into different types based on the way the system learns from data and improves its performance. The major types are:

## 1. Supervised Learning

In supervised learning, the model is trained using labeled data — that is, each input has a known output. The goal is for the model to learn a mapping between inputs and outputs so it can predict outcomes for new, unseen data.

Examples:

• Predicting house prices based on size and location.  
• Classifying emails as spam or not spam.  
• Recognizing handwritten digits.

Common Algorithms:

• Linear Regression  
• Decision Trees  
• Support Vector Machines (SVM)  
• k-Nearest Neighbors (kNN)

## 2. Unsupervised Learning

In unsupervised learning, the model works with unlabeled data, meaning it must find hidden patterns or groupings without guidance.

Examples:

• Customer segmentation in marketing.  
• Grouping similar products based on user behavior.  
• Detecting anomalies in transactions.

Common Algorithms:

• K-Means Clustering  
• Hierarchical Clustering  
• Principal Component Analysis (PCA)

## 3. Semi-Supervised Learning

This method is a mix of supervised and unsupervised learning. It uses a small amount of labeled data and a large amount of unlabeled data. The model first learns from the labeled data and then improves using the unlabeled data.

Examples:

• Speech recognition systems.  
• Medical image classification (where labeling data is costly).

## 4. Reinforcement Learning

In reinforcement learning, an agent learns to make decisions by performing actions in an environment and receiving rewards or penalties. The aim is to maximize total rewards through trial and error.

Examples:

• Self-driving cars learning to navigate safely.  
• Robots learning to perform tasks.  
• Game-playing AI (like Chess or Go).

Key Concepts:

• Agent: Learner or decision-maker.  
• Environment: Where the agent operates.  
• Action: What the agent does.  
• Reward: Feedback from the environment.

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