

CONCEPTUAL INTRODUCTION TO MACHINE LEARNING

Machine Learning (ML) : is a branch of AI focused on developing algorithms that allow computers to learn from and make decisions based on data. Instead of relying on explicit programming. ML models identify patterns in data to improve their performance on tasks like prediction or classifications. The key objective is to enable machine to learn from data and make accurate decisions or predictions across various domains.

ML can be broadly classified into three types:

- Supervised Learning
- Unsupervised Learning
- Semisupervised Learning.

Supervised Learning

- Use Labeled data to train models that predict or classify output based on new inputs. The main types are:
 - classification: Assigns input to predefined categories (eg. spam detection in mails)

→ Regression: Predicts continuous values

Common Algorithms:

- Linear Regression
- Decision Tree
- Neural Network

Applications:

- Image classification
- Predictive Analytics
- Sentiment Analytics

UNSUPERVISED LEARNING

• Deals with unlabeled data, aiming to uncover hidden structures or patterns. The main tasks include:

→ clustering: grouping similar data points

→ Dimensionality Reduction: simplifying data while preserving important features

Common Algorithms:

- K-means clustering
- Principal Component Analysis (PCA)

Applications:

- Anomaly Detection
- Market Basket Analysis
- Data compression

SEMI SUPERVISED LEARNING

- Combines a small amount of labeled data with a large amount of unlabeled data, enhancing model performance when labeling data is costly or limited. It leverages the labeled data to guide the learning process on the unlabeled data.

Common Algorithms:

- Self Training
- Graph-Based Methods.

Applications:

- Text Classification
- Image Recognition
- Medical Image Analysis