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. In simple words, ML teaches the systems to think and understand like humans by learning from the data.

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: Trains models on labeled data to predict or classify new, unseen data.
- Unsupervised Learning: Finds patterns or groups in unlabeled data, like clustering or dimensionality reduction.
- Reinforcement Learning: Learns through trial and error to maximize rewards, ideal for decision-making tasks.

Module 2: Supervised Learning
Supervised learning algorithms are generally categorized into two main types:
- Classification – where the goal is to predict discrete labels or categories
- Regression – where the aim is to predict continuous numerical values.There are many algorithms used in supervised learning each suited to different types of problems. Some of the most commonly used supervised learning algorithms are:
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- 1. Linear Regression
- This is one of the simplest ways to predict numbers using a straight line. It helps find the relationship between input and output.
- Introduction to Linear Regression
- Gradient Descent in Linear Regression
- Multiple Linear Regression
- 2. Logistic Regression
- Used when the output is a "yes or no" type answer. It helps in predicting categories like pass/fail or spam/not spam.
- Understanding Logistic Regression
- Cost function in Logistic Regression
- 3. Decision Trees
- A model that makes decisions by asking a series of simple questions, like a flowchart. Easy to understand and use.
- Decision Tree in Machine Learning
- Types of Decision tree algorithms
- Decision Tree – Regression (Implementation)
- Decision tree – Classification (Implementation)
- 4. Support Vector Machines (SVM)
- A bit more advanced—it tries to draw the best line (or boundary) to separate different categories of data.
- Understanding SVMs
- SVM Hyperparameter Tuning – GridSearchCV
- Non-Linear SVM
- 5. k-Nearest Neighbors (k-NN)
- This model looks at the closest data points (neighbors) to make predictions. Super simple and based on similarity.

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- Introduction to KNN
- Decision Boundaries in K-Nearest Neighbors (KNN)
- 6. Naïve Bayes
- A quick and smart way to classify things based on probability. It works well for text and spam detection.
- Introduction to Naive Bayes
- Gaussian Naive Bayes
- Multinomial Naive Bayes
- Bernoulli Naive Bayes
- Complement Naive Bayes
- 7. Random Forest (Bagging Algorithm)
- A powerful model that builds lots of decision trees and combines them for better accuracy and stability.
- Introduction to Random forest
- Random Forest Classifier
- Random Forest Regression
- Hyperparameter Tuning in Random Forest
- Introduction to Ensemble Learning
- Ensemble learning combines multiple simple models to create a stronger, smarter model. There are mainly two types of ensemble learning:
- Bagging that combines multiple models trained independently.
- Boosting that builds models sequentially each correcting the errors of the previous one.
- Module 3: Unsupervised learning
- Unsupervised learning are again divided into three main categories based on their purpose:
- Clustering
- Association Rule Mining
- Dimensionality Reduction.
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