Introduction to Machine Learning

Definition

Machine Learning (ML) is a subset of Artificial Intelligence (AI) that enables computers to learn from data and improve performance without being explicitly programmed.

Goal of Machine Learning

To develop algorithms that can automatically detect patterns and make decisions or predictions based on data.

Types of Machine Learning

- Supervised Learning: Learns from labeled data (e.g., email spam detection).
- Unsupervised Learning: Learns from unlabeled data (e.g., customer segmentation).
- Reinforcement Learning: Learns through rewards/penalties (e.g., game-playing bots).

Common Algorithms

- Linear Regression
- Logistic Regression
- Decision Trees
- Random Forest
- Support Vector Machines (SVM)
- K-Means Clustering
- Neural Networks & Deep Learning

Applications of Machine Learning

- Healthcare: Disease prediction
- Finance: Fraud detection
- Marketing: Customer recommendations
- Automotive: Self-driving cars
- Agriculture: Crop yield prediction

Steps in a Machine Learning Process

1. Problem Definition
2. Data Collection
3. Data Cleaning & Preprocessing
4. Model Selection
5. Training the Model
6. Evaluation & Tuning
7. Deployment

Challenges in Machine Learning

- Need for large, high-quality datasets
- Model overfitting or underfitting
- Bias in data and predictions
- Interpretability and transparency

Tools & Languages Used

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- Languages: Python, R, Java
- Libraries: scikit-learn, TensorFlow, Keras, PyTorch