Introduction

Machine Learning is a branch of AI that focuses on building systems capable of learning from data. It eliminates the need for explicitly programming rules by enabling models to improve as they process more information.

Types of Machine Learning

1. **Supervised Learning**: The algorithm learns from labeled data to make predictions.
2. **Unsupervised Learning**: Models identify hidden patterns in data without labeled outcomes.
3. **Reinforcement Learning**: Algorithms learn optimal actions through trial and error in dynamic environments.

Key Algorithms

- **Linear Regression**: Predicts a continuous target variable.
- **Decision Trees**: Breaks down decisions into tree-like structures.
- **Support Vector Machines (SVMs)**: Finds the optimal boundary to classify data points.
- **Neural Networks**: Mimics the structure of the human brain to process complex patterns.

Applications of ML

1. **Retail**: Personalization engines recommend products based on user behavior.
2. **Finance**: Risk assessment and anomaly detection.
3. **Healthcare**: Early disease detection and medical imaging analysis.

Challenges in ML

- **Data Quality**: Incomplete or inconsistent data can degrade model performance.
- **Overfitting**: Models that perform too well on training data may fail on unseen data.
- **Interpretability**: Black-box models, like deep neural networks, are difficult to interpret.