

Introduction to Artificial Intelligence and Machine Learning

Mr. Mehul A. Jadhav
Department of Computer Studies (MCA)
Vivekanand College, Kolhapur

10 July 2025

Agenda

- 1 Definition and Scope
- 2 Types of Machine Learning
- 3 Applications of AI
- 4 Key Concepts in ML
- 5 Steps to Build a Machine Learning Model
- 6 Algorithms
- 7 Conclusion

What is Artificial Intelligence (AI)?

Artificial Intelligence (AI) is the simulation of human intelligence processes by machines, including learning, reasoning, and problem-solving.

Scope of AI:

- Automating repetitive tasks
- Enhancing decision-making
- Enabling intelligent systems (e.g., virtual assistants)

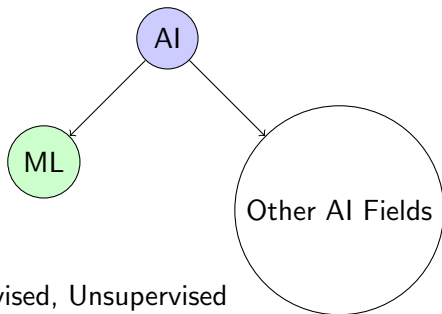
What is Machine Learning (ML)?

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

Significance of ML:

- Predictive analytics
- Pattern recognition
- Personalization (e.g., recommendation systems)

AI and ML in Modern Technology



e.g., Supervised, Unsupervised

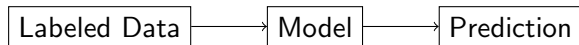
e.g., Expert Systems

Supervised Learning

Concept: Models are trained on labeled data to predict outcomes.

Examples:

- Email spam detection
- Image classification (e.g., cat vs. dog)

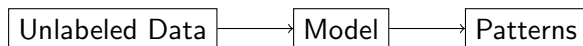


Unsupervised Learning

Concept: Models find patterns in unlabeled data.

Examples:

- Customer segmentation
- Anomaly detection

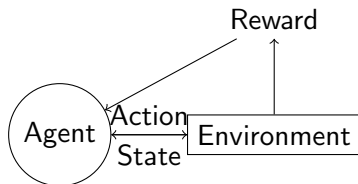


Reinforcement Learning

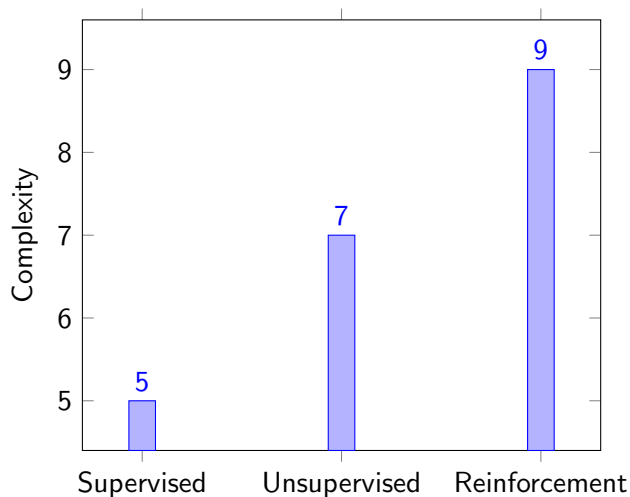
Concept: Agents learn by interacting with an environment, maximizing rewards.

Examples:

- Game playing (e.g., AlphaGo)
- Robotics



Comparison of ML Types

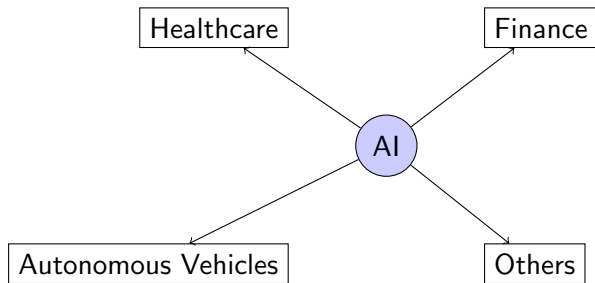


Real-World Applications of AI

AI is transforming various domains:

- **Healthcare:** Disease diagnosis, medical imaging analysis
- **Finance:** Fraud detection, algorithmic trading
- **Autonomous Vehicles:** Self-driving cars, navigation systems
- **Others:** Virtual assistants, recommendation systems

AI Application Domains

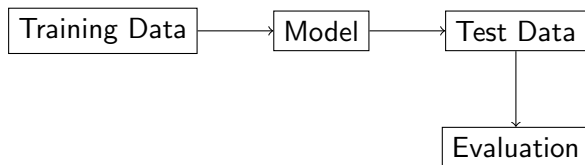


Key Concepts in Machine Learning

- **Features:** Attributes or variables used as input to ML models (e.g., pixel values in images).
- **Labels:** Target output in supervised learning (e.g., "spam" or "not spam").
- **Model:** Mathematical representation that maps inputs to outputs.

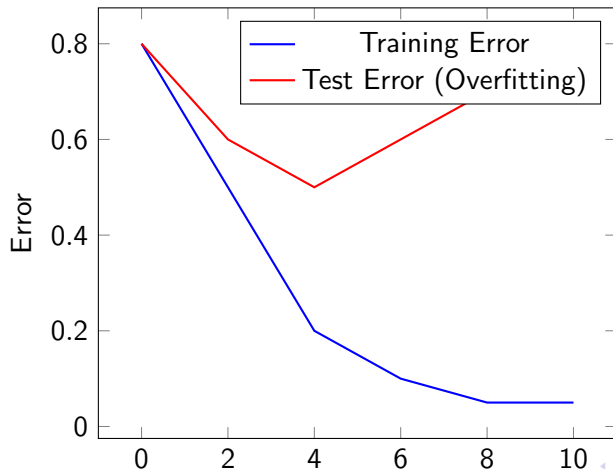
Training and Testing

- **Training:** Process of feeding data to a model to learn patterns.
- **Testing:** Evaluating model performance on unseen data.



Overfitting, Underfitting, and Generalization

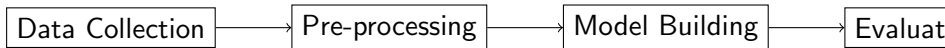
- **Overfitting:** Model learns training data too well, fails on new data.
- **Underfitting:** Model fails to learn patterns in training data.
- **Generalization:** Ability of a model to perform well on unseen data.



Steps to Build an ML Model

- ➊ **Data Collection:** Gather relevant data for the problem.
- ➋ **Pre-processing:** Clean and prepare data (e.g., handle missing values).
- ➌ **Model Building:** Select and train a model.
- ➍ **Evaluation:** Assess model performance (e.g., accuracy, precision).
- ➎ **Deployment:** Implement the model in a real-world environment.

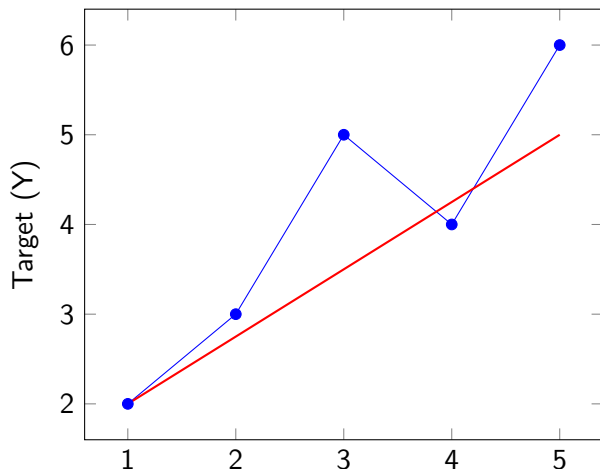
ML Pipeline



Linear Regression

Introduction: Predicts continuous output using a linear relationship.

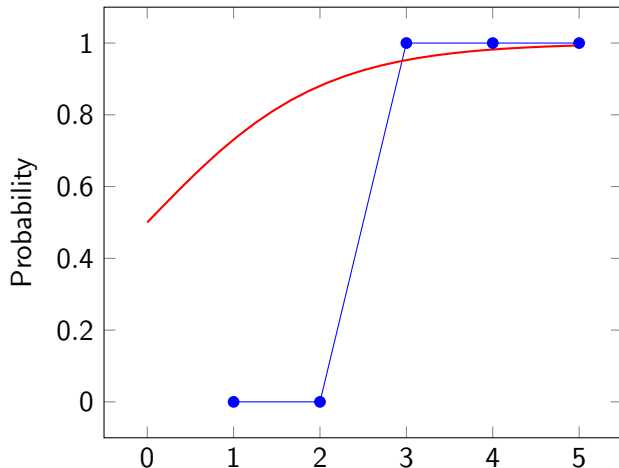
Application: House price prediction, sales forecasting.



Logistic Regression

Introduction: Predicts categorical outcomes (e.g., binary classification).

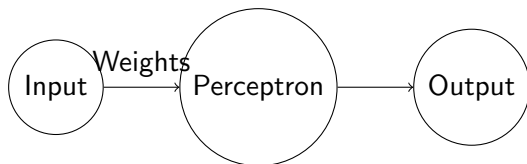
Application: Spam detection, disease prediction.



Perceptron

Introduction: Basic building block of neural networks, models linear decision boundaries.

Application: Simple binary classification tasks.



Conclusion

AI and ML are pivotal in modern technology, enabling intelligent systems across domains.

Understanding ML types, concepts, and algorithms is crucial for building effective models.

- GeeksforGeeks: Introduction to Machine Learning
- Coursera: Machine Learning by Andrew Ng
- Towards Data Science: AI and ML Applications