

ARTIFICIAL INTELLIGENCE (AI)

What is AI and ML?

- **Artificial Intelligence (AI)** is a branch of computer science that focuses on building systems capable of performing tasks that typically require human intelligence. THESE TASKS INCLUDE REASONING, DECISION-MAKING, PROBLEM-SOLVING, UNDERSTANDING NATURAL LANGUAGE, AND EVEN VISUAL PERCEPTION. AI aims to replicate or simulate human cognitive abilities in machines, allowing them to work independently or assist humans in a wide range of activities. **Machine Learning (ML)**, a subset of AI, involves training computers to learn from data and improve their performance over time without being explicitly programmed. Instead of relying on hard-coded rules, **ML algorithms identify patterns and make predictions or decisions based on historical data.** For example, ML is used in recommendation *systems (like Netflix or Amazon)*, *spam detection in emails*, and *facial recognition in smartphones*.

Machine learning :

- I. Machine learning is broadly classified into four types: **supervised learning**, **unsupervised learning**, **semi-supervised learning**, and **reinforcement learning**. In supervised learning, the algorithm is trained using labeled data—meaning the input is paired with the correct output—and is often used for tasks like classification (e.g., spam vs. non-spam) and regression (e.g., predicting housing prices). Unsupervised learning, in contrast, deals with unlabeled data and aims to uncover hidden patterns or groupings in the data, such as customer segmentation or market basket analysis. Semi-supervised learning combines a small amount of labeled data with a large amount of unlabeled data to improve learning efficiency. Reinforcement learning involves an agent that learns to make decisions by interacting with an environment, receiving rewards or penalties based on its actions; ~~this is commonly used in robotics and game playing.~~

Application of AI and ML:

- A. **AI and ML have found wide applications across industries.** In **healthcare**, they assist in diagnosing diseases, predicting patient outcomes, and personalizing treatments. In **automotive**, AI powers self-driving cars and traffic management systems. In **finance**, ML algorithms detect fraud, assess credit risks, and drive algorithmic trading. Businesses use AI for targeted marketing, customer behavior analysis, and chatbots for customer service. In **security**, facial recognition and anomaly detection systems are powered by ML models. Other areas, such as education, entertainment, agriculture, and environmental science, are also increasingly leveraging AI for enhanced efficiency and insight.

Development of AI-ML:

1. To support the development and deployment of AI-ML systems, a variety of tools and frameworks are widely used. **TensorFlow** and **PyTorch** are popular deep learning libraries used to build and train neural networks. **Scikit-learn** is a go-to library for traditional ML algorithms like decision trees, support vector machines, and clustering methods. **Keras** offers a simplified API for building deep learning models on top of TensorFlow.

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