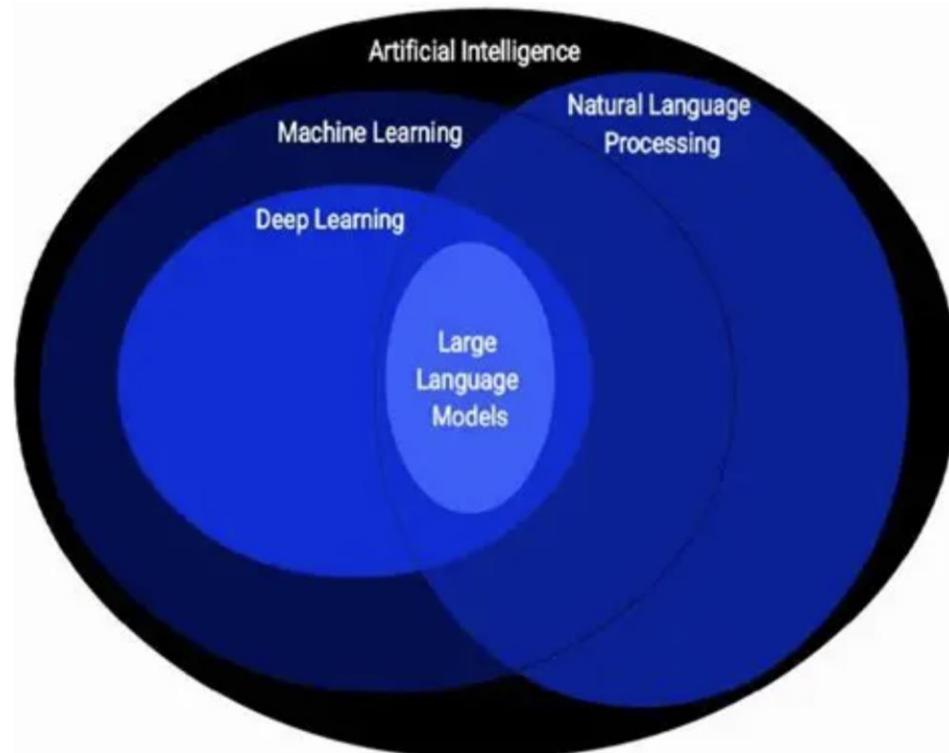


# 1. ARTIFICIAL INTELLIGENCE HIERARCHY

Artificial Intelligence focuses on building systems capable of tasks that typically require human intelligence such as learning, reasoning and decision-making.

- Artificial Intelligence (AI): Broad field of intelligent systems.
- Machine Learning (ML): Systems learn from data instead of explicit rules.
- Deep Learning (DL): Uses multi-layer neural networks to model complex patterns.
- Large Language Models (LLM): Process and understand language. They learn patterns, grammar and context from vast amounts of text data, enabling them to perform tasks.



# 2. ML VS TRADITIONAL PROGRAMMING

**Traditional Programming:**

Humans write explicit rules (IF-THEN statements) to process inputs and produce outputs.

**Machine Learning:** The system learns rules from data. You provide examples(data + answers) and the model figures out the logic.

**Example: Spam Filter**

- Traditional: Rules like "if email contains free money, mark as spam."
- ML: Train on of labelled emails to learn what spam looks like.

- **What:** ML = Algorithms that learn from data to make predictions or decisions.
- **Why:** Handles complexity, adapts to new data, scales to large datasets.
- **Where:** Finance Healthcare credit scoring, fraud detection diagnostics, medical imaging
- **When:** When rules are too complex, data is large or constantly changing.
- **How:** Supervised Learning (with labels) Unsupervised Learning (no labels)  
Reinforcement Learning (trial & error) Regression, Classification, Clustering, Deep Learning

# 3. THE 5 W'S OF MACHINE LEARNING

# 4. ML APPROACHES

## 1. Supervised Learning:

- Regression Predict continuous values (e.g. house prices)
- Classification Predict categories (e.g. disease vs no disease)

## 2. Unsupervised Learning:

- Clustering Group similar data (e.g. customer segments)

## 3. Reinforcement Learning:

- Learns by trial and error using rewards (e.g. robotics, game AI)

## 4. Deep Learning:

- Neural Networks CNNs Layers of artificial neurons Great for image recognition (e.g. tumor detection)
- RNNs Good for sequences (e.g. speech, time series)

# 5. REAL-WORLD EXAMPLES

## Finance:

- Credit scoring using XGBoost (classification)
- Fraud detection using anomaly detection

## Healthcare:

- Tumor detection in MRI scans using CNNs
- Predictive diagnostics using classification models