



MACHINE LEARNING TECHNIQUES

Introduction to Machine Learning

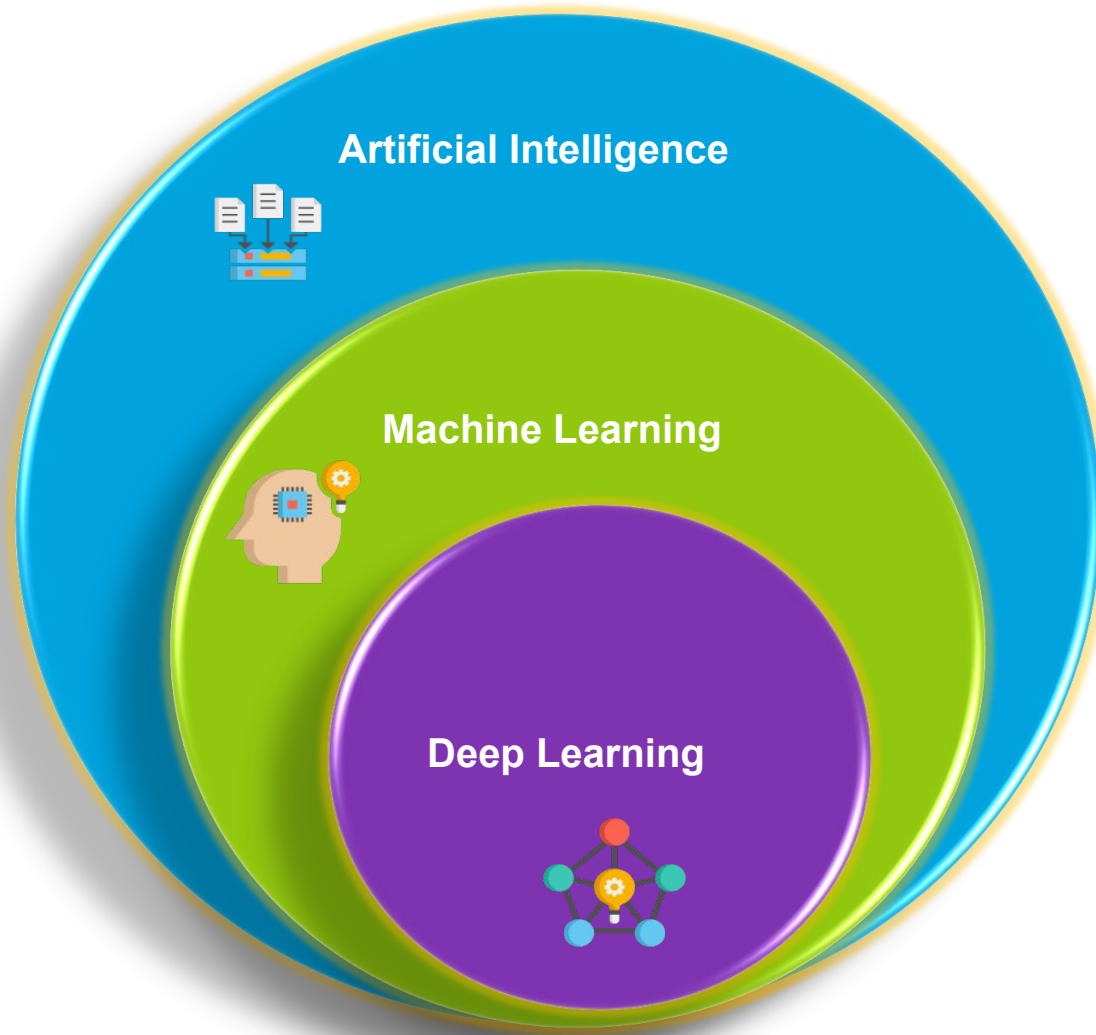


Topic 1: Introduction to Machine Learning

What these application actually does??



AI, ML, DL

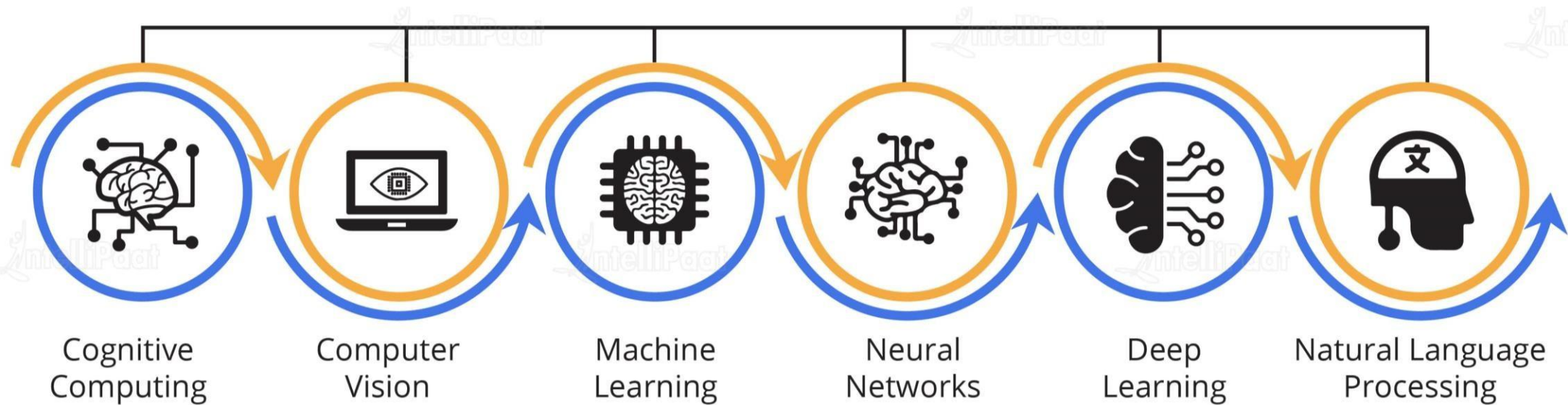


Programs with the ability to learn and reason like humans

Algorithms with the ability to learn without being explicitly programmed

Subset of Machine Learning in which artificial neural networks adapt and learn from vast amounts of data

Artificial Intelligence



AI Vs ML

- AI stands for Artificial Intelligence, where intelligence is defined as the ability to acquire and apply knowledge
- ML stands for Machine Learning, where learning is defined as the acquisition of knowledge or skills through experience or being taught.



ARTIFICIAL INTELLIGENCE

- **Artificial Intelligence (AI)** is the ability of a computer or machine to **think, decide, and act like a human**.

It focuses on making machines **smart enough to solve problems, understand language, recognize images, and make decisions**.

- 👉 AI **does not always learn** on its own.
 - 👉 Some AI systems follow **predefined rules**, while others use data.



Human Brain



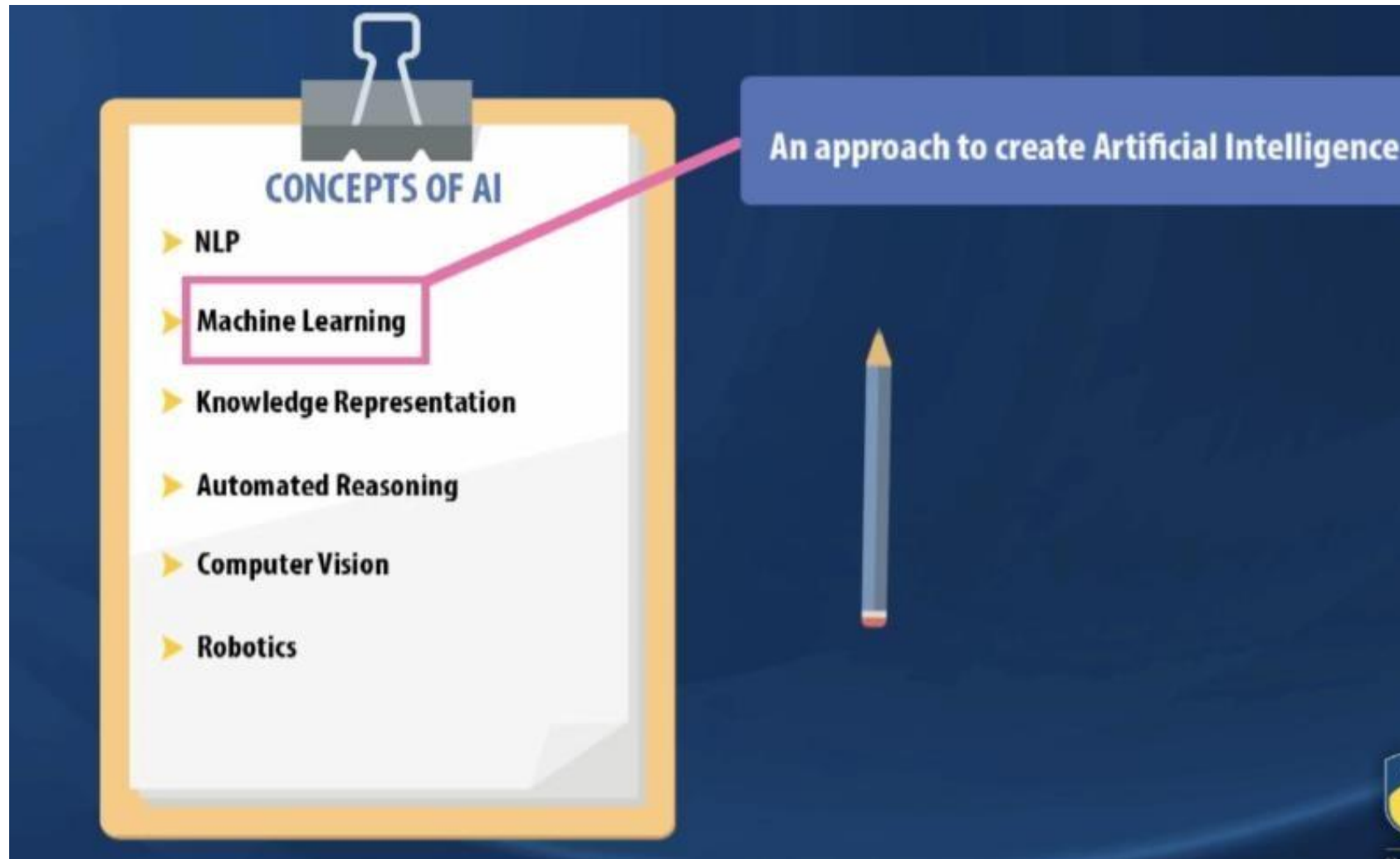
AI Model

Think of AI as a **digital brain**:

- It **sees** → using cameras (image recognition)
- It **hears** → using microphones (speech recognition)
- It **thinks** → using logic or data
- It **acts** → giving decisions or actions

Just like humans, but done by machines 

Machine Learning



Machine Learning (ML) is a part of Artificial Intelligence where **computers learn from data and improve their performance without being explicitly programmed.**

👉 Instead of telling the computer *every rule*, we **give data**, and the machine finds patterns by itself.

Example:

Think of ML like a **student**:

- First, you teach using examples 📖
- Then the student learns patterns
- Later, the student answers new questions on their own

That's exactly how Machine Learning works.



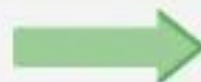
Input

- Stock Data
- Customer Transaction Data
- Streaming Data
- Email text



Machine Learning Techniques

- Regression
- Clustering
- Association Rule
- Classification



Output

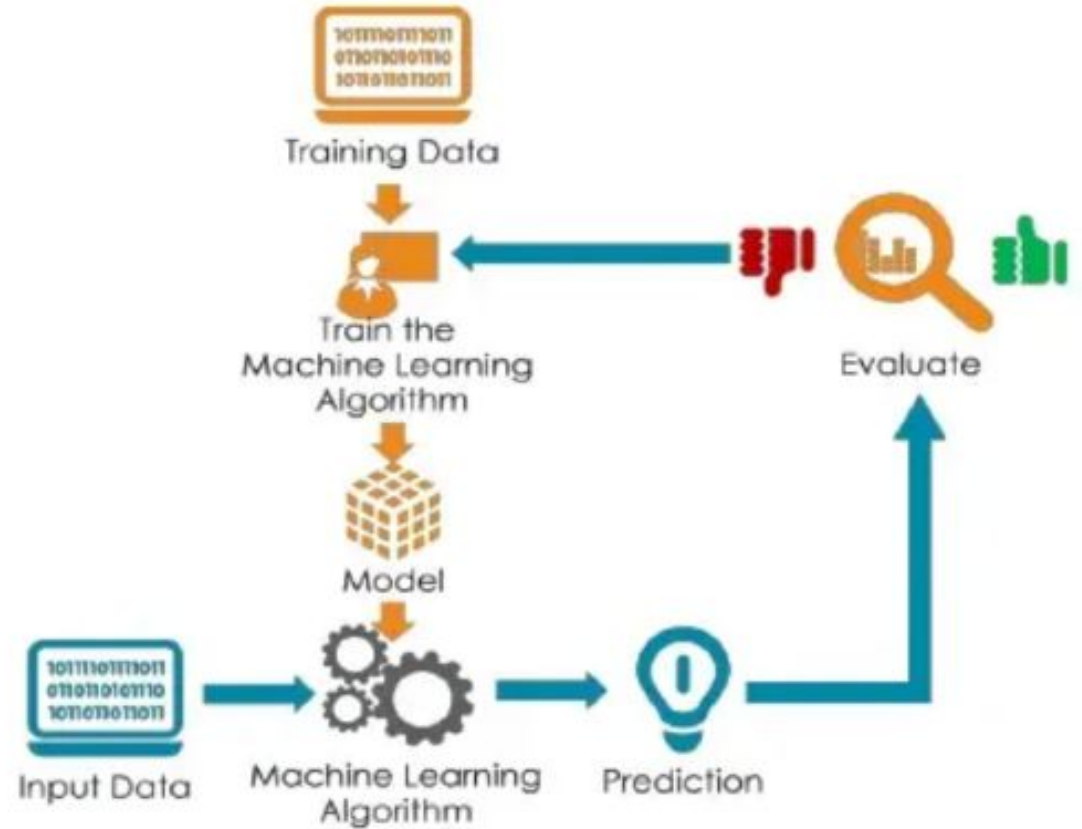
- Stock Price Prediction
- Market Segmentation
- Recommendations Systems
- Spam Detection

Machine Learning Process

Data Collection: Gathering relevant data that represents the problem domain and covers the range of possible scenarios.

Data Preprocessing: Cleaning and transforming the data to remove noise, handle missing values, and normalize or scale features.

Model Selection: Choosing an appropriate machine learning algorithm or model based on the problem type, data characteristics, and desired outcomes.

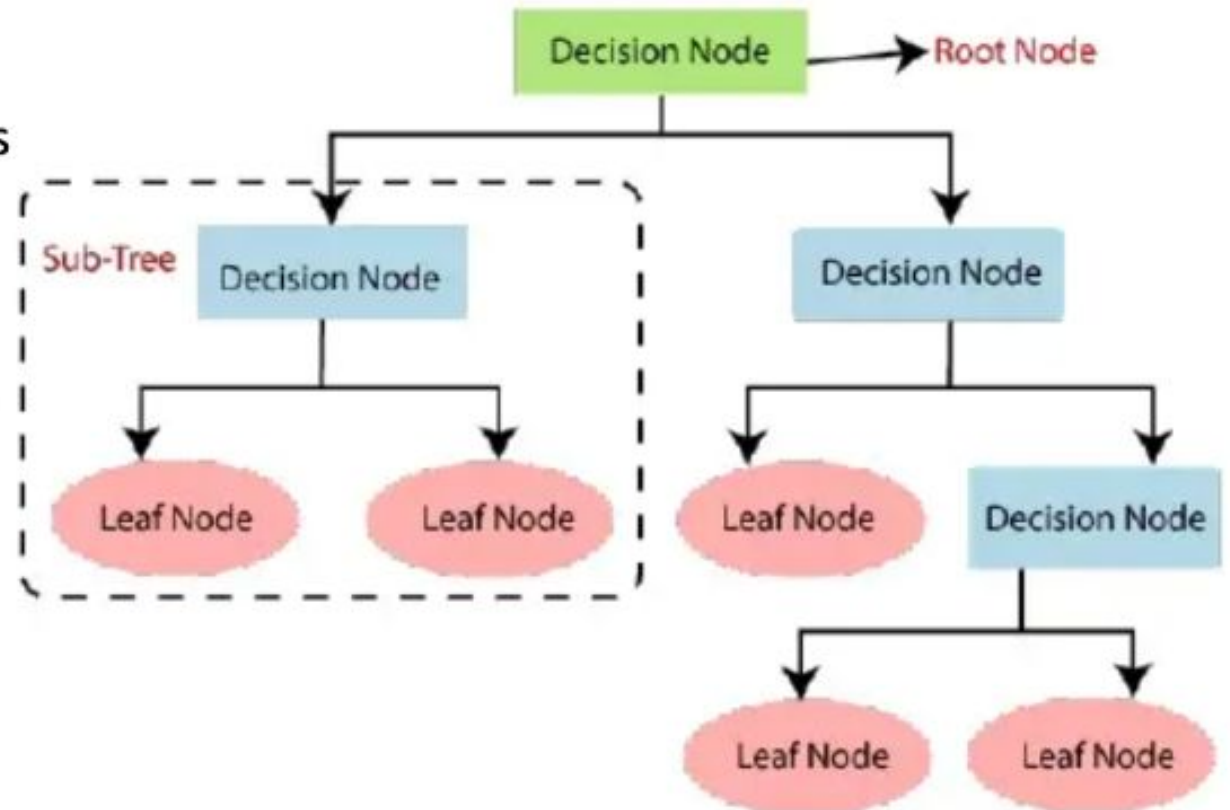


Machine Learning Algorithms

Linear Regression: A supervised learning algorithm used for predicting continuous values based on linear relationships between input features and output labels.

Decision Trees: These algorithms create a tree-like model of decisions and their possible consequences, enabling classification and regression tasks.

Support Vector Machines (SVM): SVM is a powerful algorithm for both classification and regression tasks, capable of handling high-dimensional data and non-linear relationships.





TYPES OF MACHINE LEARNING



Machine Learning teaches systems to learn patterns and make decisions like humans by analyzing and learning from data.

- There are several types of machine learning, each with special characteristics and applications. Some of the main types of machine learning algorithms are as follows:
 1. Supervised Machine Learning
 2. Unsupervised Machine Learning
 3. Reinforcement Learning

Types of Machine Learning

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graph TD; A[Types of Machine Learning] --> B[Supervised Learning]; A --> C[Unsupervised Learning]; A --> D[Reinforcement Learning]; B --> E[Classification]; B --> F[Regression]; C --> G[Clustering]; C --> H[Dimension Reduction]; C --> I[Associate Rule Learning];
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Supervised Learning

→ Classification

→ Regression

Unsupervised Learning

→ Clustering

→ Dimension Reduction

→ Associate Rule Learning

Reinforcement Learning

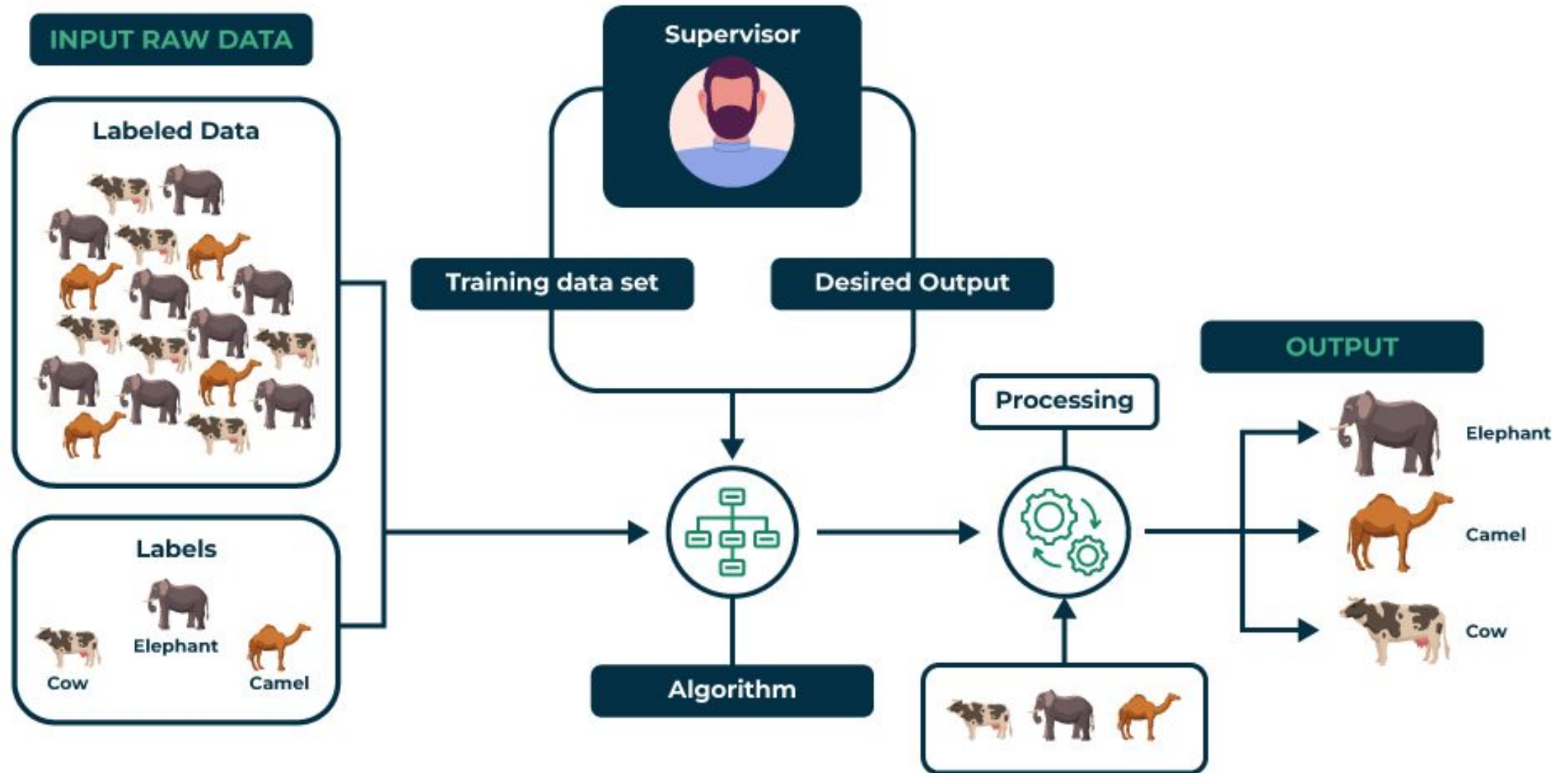
Types of ML Machine Learning is of 3 types :

- Supervised Learning – Train Me
- Unsupervised Learning – I am self sufficient in learning
- Reinforcement Learning – My life My rules(Hit & Trial)

Supervised Machine Learning

- **Supervised Learning** is a type of machine learning in which a model is trained using a **labeled dataset**. A labeled dataset contains both **input features** and their corresponding **output labels**.
- In supervised learning, algorithms learn to map inputs to the correct outputs by identifying patterns in the data.
- Both the **training dataset** and the **validation (or testing) dataset** are labeled, which helps evaluate the model's accuracy and performance.

Supervised Learning



Unsupervised Machine Learning

- Unsupervised Learning works with **unlabeled data**, meaning there are no predefined output labels. The algorithm automatically discovers **hidden patterns, structures, and relationships** within the data.
- It is primarily used for **clustering, dimensionality reduction, and data visualization**, helping to explore and understand complex datasets.

Unsupervised Learning

INPUT RAW DATA



Interpretation



- Unknown Output
- No Training Data Set

Algorithm

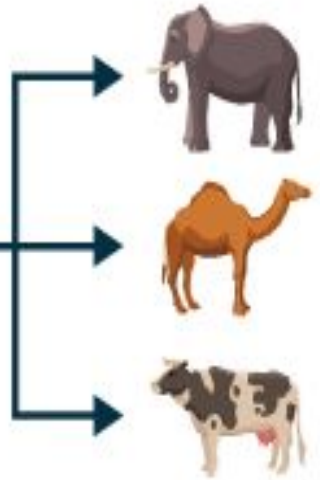


Processing



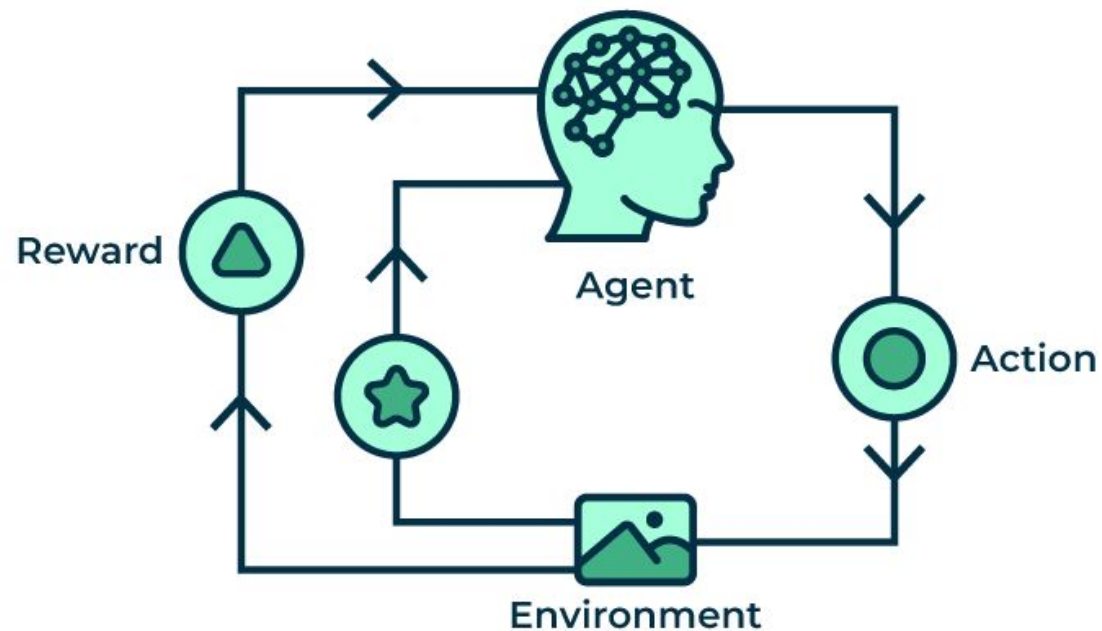
MODEL TRAINING

OUTPUT



Reinforcement Learning

Reinforcement Learning trains an **agent** to make a sequence of decisions through **trial and error**. The agent interacts with an **environment**, receives feedback in the form of **rewards or penalties**, and learns to take **optimal actions over time** to maximize cumulative rewards.



Software Programming Perspective



Traditional Programming



Machine Learning

CONCLUSION

- Machine learning is programming computers to optimize a performance criterion using example data or past experience.
- Machine learning is about predicting the future based on the past.

