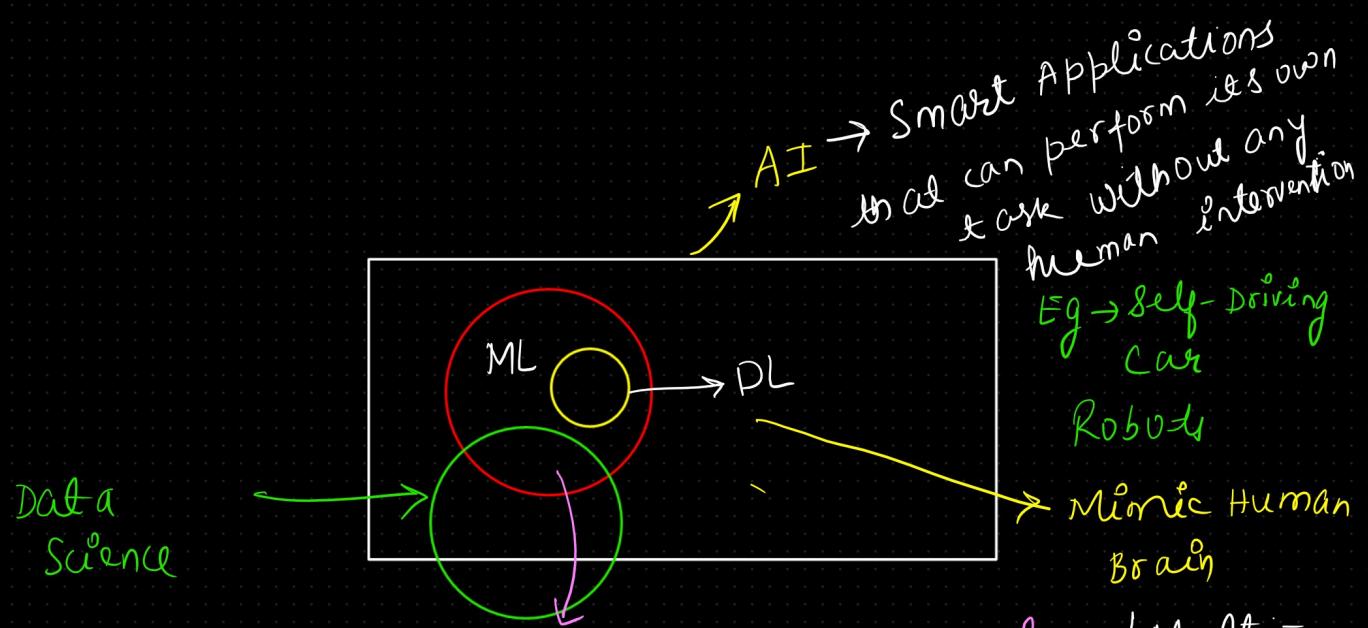


# Machine Learning (ML)

## Introduction To Machine Learning

Machine learning is a subset of artificial intelligence that focuses on the development of algorithms and models that allow computers to learn from data and make predictions or decisions without being explicitly programmed for each task.

AI vs ML vs DL vs DS



DL -  
↓

Image Recognition

↓

Facebook

↓

Tag

Chatbot

↓

Recommendation

[ Recommendation system ]

Youtube → Watch history

Netflix → Action movie

↓  
Data science → Recommend

Flipkart → iPhone → Buy Now → Recommendation

## Maths

- ① stats and Prob
- ② Linear Algebra
- ③ Calculus

## Types of Machine Learning

- ① Supervised Machine Learning
- ② Unsupervised ML
- ③ Reinforcement Learning (RL)

## I) Supervised ML

Model → Predict → Output feature



Classification vs Regression

Output feature → Categorical  
↓  
A  
B  
C

Continuous  
1.6  
7.9  
6.5

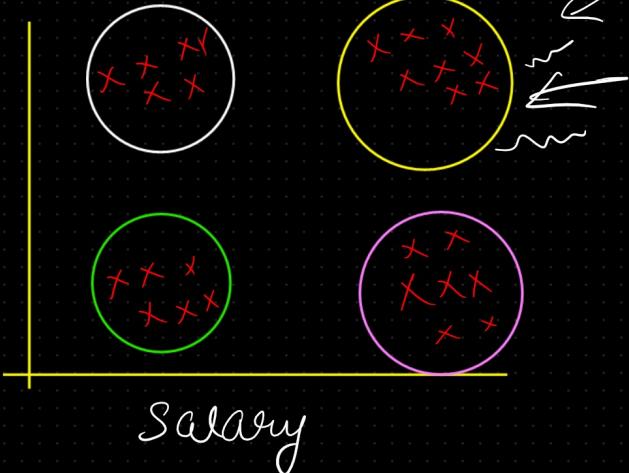
eg: Exam → Pass  
Fail

eg: House Price  
Prediction

## II) Unsupervised Machine Learning

→ Customer segmentation

Expenditure



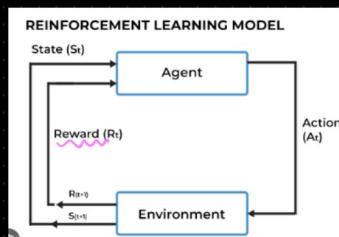
Mall  $\rightarrow$  Walkers  $\Rightarrow$  Target the audience

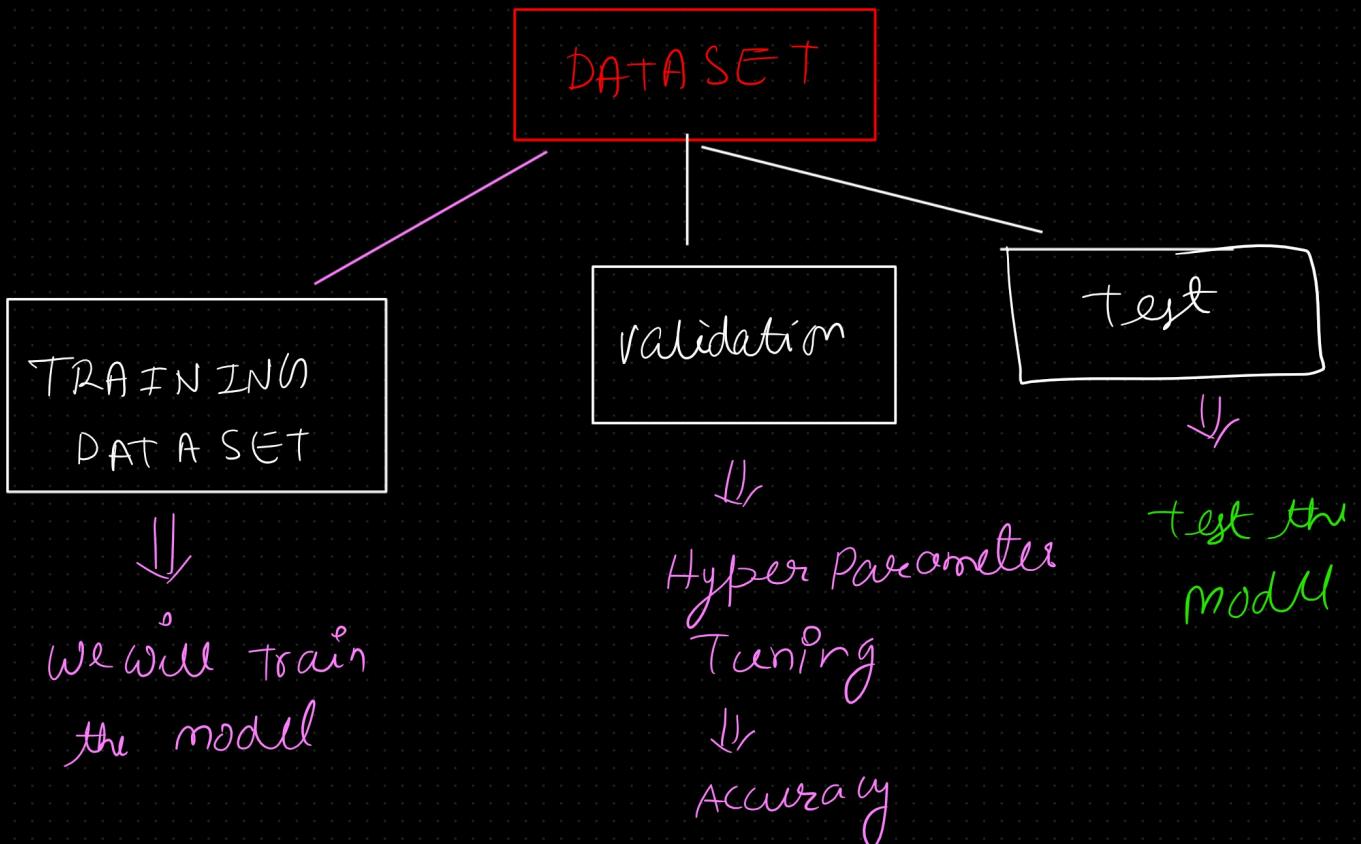
Supervised Learning: In supervised learning, the algorithm is trained on labeled data, meaning the input data is paired with the correct output. The algorithm learns to map the input data to the correct output by minimizing the error between its predictions and the true labels. Common tasks in supervised learning include classification (where the output

Unsupervised Learning: In unsupervised learning, the algorithm is trained on unlabeled data, meaning there are no predefined output labels. The algorithm learns to find patterns or structures in the data without explicit guidance. Common tasks in unsupervised learning include clustering (grouping similar data points together) and dimensionality

### 3) Reinforcement Learning (RL)

Reinforcement learning (RL) is a machine learning technique that allows an agent to learn how to make decisions by interacting with its environment. The agent receives feedback in the form of rewards or penalties based on its actions. This allows the agent to learn the optimal behavior to achieve its goals over time





① Model Performance  $\rightarrow$  Accuracy  $\uparrow\uparrow \rightarrow$  High

② Overfitting vs under fitting  $\swarrow$   $\searrow$  worst

TRAIN  $\rightarrow$  Model is trained  $\rightarrow$  Acc  $\rightarrow \uparrow\uparrow$  } overfitting

TEST  $\rightarrow$  model is Test  $\rightarrow$  Acc  $\downarrow\downarrow$   
 $\left. \begin{array}{l} \text{Low Bias} \\ \text{High Variance} \end{array} \right\}$

Underfitting

TRAIN  $\rightarrow$  Acc  $\downarrow\downarrow \sim 50\%$   $\rightarrow$  High Bias

TEST  $\rightarrow$  Acc  $\downarrow\downarrow \sim 50\%$   $\rightarrow$  High Variance

Aim  $\rightarrow$  ML  $\rightarrow$  Generalised model

$\nearrow$  TRAIN  $\rightarrow$  Acc  $\uparrow \uparrow$  low Bias  
Test  $\rightarrow$  Acc  $\uparrow \downarrow$  low Variance

## Bias vs Unbiased

Bias can help simplify learning but might lead to errors, while unbiased models aim for accuracy but can be complex and prone to overfitting. Finding the right balance is key for optimal performance.