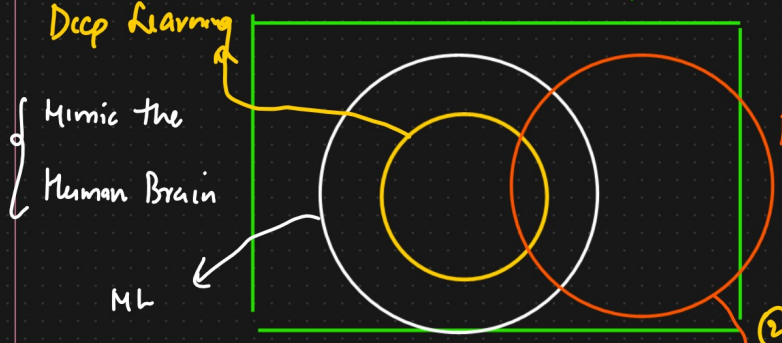
AI Vs ML Vs DL Vs DS

1) Artificial Intelligence
2) Machine Learning
3) Deep Learning
4) Data Science

AI - To create an application which can perform its own task without any human intervention

Ex: Netflix Recommendation System
→ Action Movies → Action Movies Recommendation

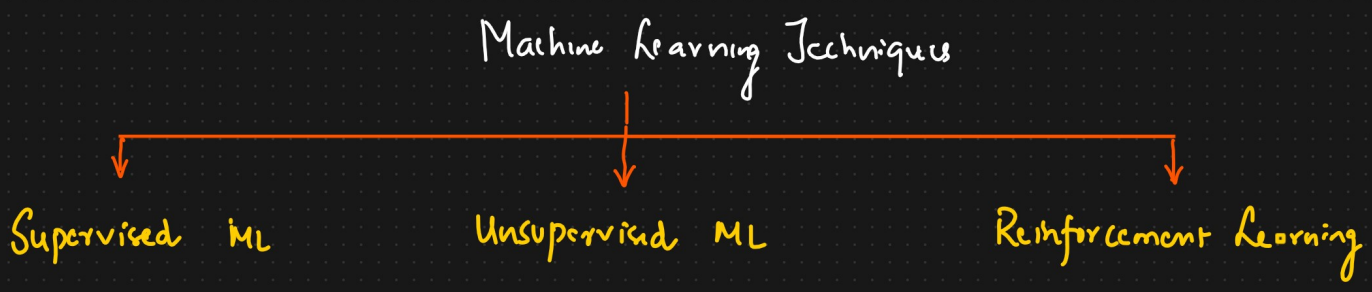
② Self Driving Car



→ Data Science

It provides stats tools to analyze, visualize, prediction, forecasting the data.

3 Types of Machine Learning.



Supervised ML Technique

- Regression ✓
- Classification ✓

Predict House price

Dataset

Size of House	# of Rooms	Price
5000	5	450K
6000	6	500K
—	—	—
—	—	—

Independent feature

Price → Dependent or o/p feature

Price → Continuous

① Dependent or o/p feature
② Continuous → Regression
③ Categorical → Classification

Classification

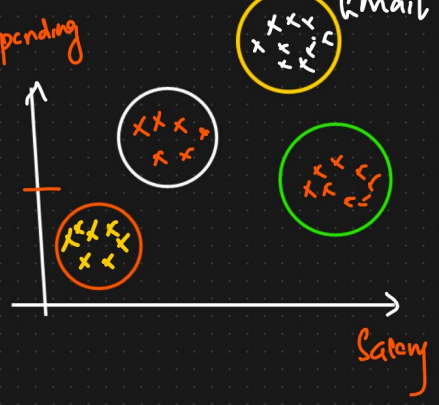
No. of study hours	No. of play hours	Pass/Fail
7	3	Pass
2	6	Fail
		May Be

Pass/Fail → Dependent Feature

Binary classification OR Multiclass classification

② Unsupervised ML ÷ Eg: Customer Segmentation → Clusters

Salary	Spending Score (1-10)
20000	9
45000	2
—	—
—	—
—	—



Ecommerce Company

⇓ ⇓

Email with some discount to

Supervised ML

① Linear Regression
② Ridge & Lasso
③ ElasticNet
④ Logistic Regression (Classification)
⑤ Decision Tree
⑥ RandomForest
⑦ AdaBoost
⑧ Xgboost

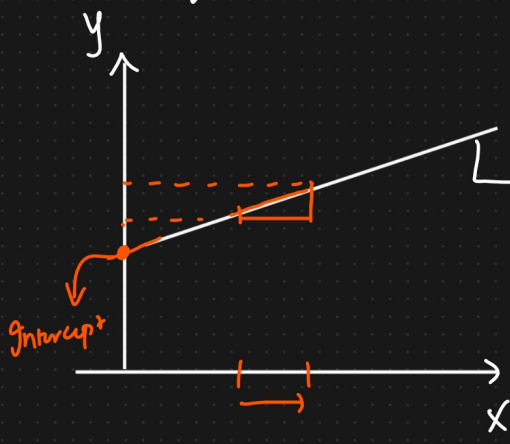
Both Classification & Regression

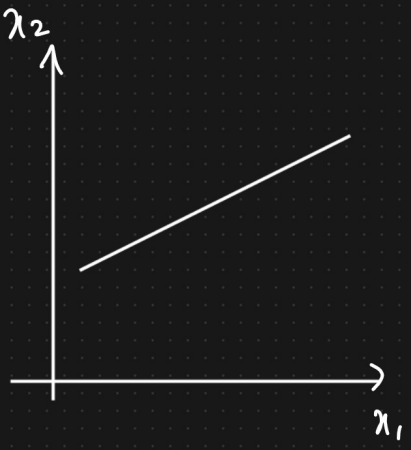
Unsupervised ML

① K Means
② Hierarchel Mean
③ DBScan clustering

Reinforcement learning

Equation of Line, 3d plane and Hyperplane (n Dimension)





$by + c = -ax$

$by = -ax - c$

$y = \boxed{\frac{-a}{b}}\, x - \boxed{\frac{c}{b}} \rightarrow c$

$\downarrow$ m

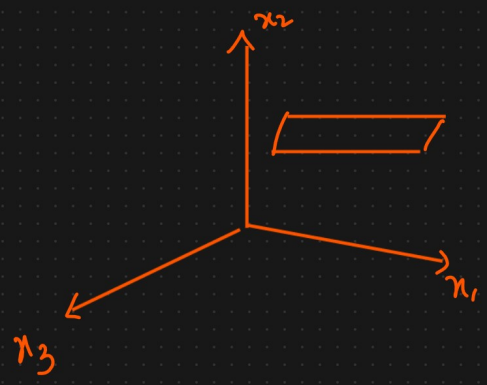
$y = mx + c \Leftarrow$

$w_1x_1 + w_2x_2 + b = 0$

$\boxed{w^T x + b = 0}$

$\Downarrow$

Eq of a straight line



$w_1x_1 + w_2x_2 + w_3x_3 + b = 0$

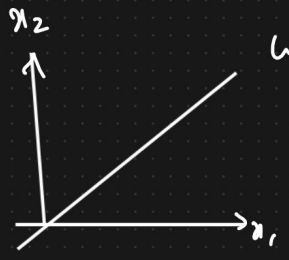
$\boxed{w^T x + b = 0}$

$w = \begin{bmatrix} w_1 \\ w_2 \\ w_3 \end{bmatrix} \cdot x = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$

n-Dimension plane

$w_1x_1 + w_2x_2 + w_3x_3 + \cdots w_nx_n + b = 0$

$\boxed{w^T x + b = 0}$



$w_1x_1 + w_2x_2 + b = 0$

$w_1x_1 + w_2x_2 = 0$

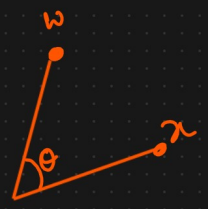
$\boxed{w^T x = 0}$

Equation of a Straight passing through an origin

$\boxed{w^T x = 0}$

Equation of a plane = Π_n : $w^T x = 0$

$$\begin{bmatrix} w_1 \\ w_2 \\ w_3 \\ \vdots \\ w_n \end{bmatrix} \quad \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ \vdots \\ x_n \end{bmatrix}$$

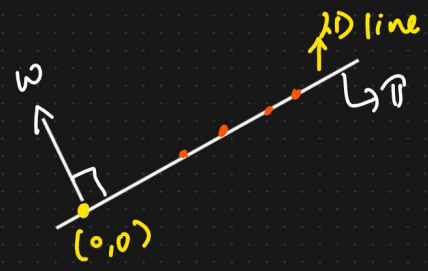


$$w^T x = 0$$

$$w \cdot x = w^T x = \|w\| \, \|x\| \cos\theta = 0$$

$\theta = 90$

$\cos\theta = 0$



$w \perp \Pi$

intercept = 0

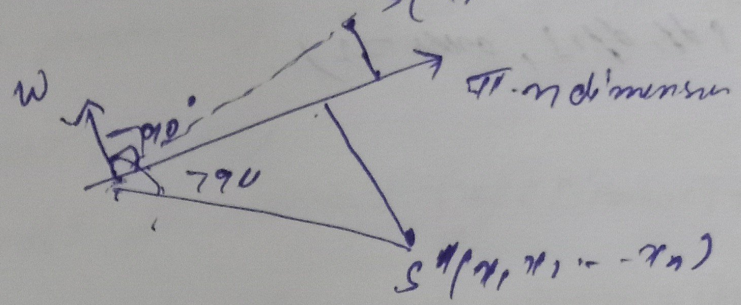
$$w^T x = 0$$

Section 26: Introduction to Machine Learning

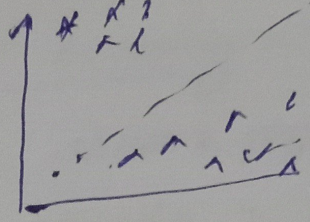
13a: Distance of a point from a plane.

$S(x_1, x_2, x_3 \cdots x_n)$

$w^T x = 0$



In logistic Regression



We need to find a line so that it split two point easily

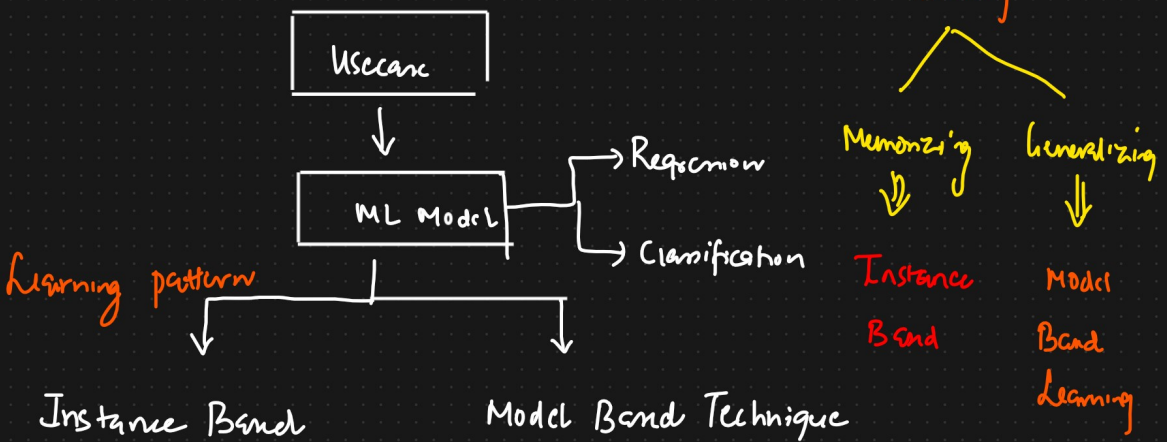
θ = between 0 and 90°

$$d = \frac{w^T s}{\|w\|} \Rightarrow w^T s = \|w\| \|s\| \cos\theta = +ve$$

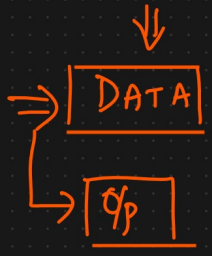
as new line drawn is less than 90°

$$\therefore d = \frac{w^T s'}{\|w\|} \Rightarrow w^T s' = \|w\| \|s'\| \cos\theta = -ve$$

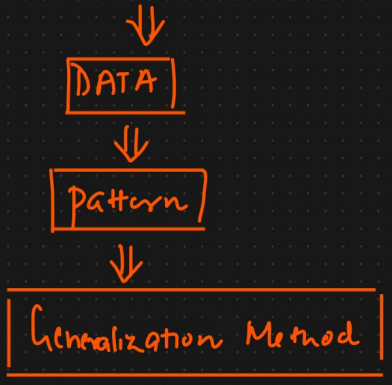
Instance Based Learning Vs Model Based Learning



Instance Based Technique

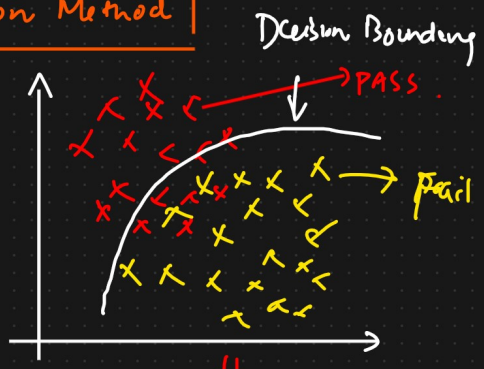


Model Based Technique



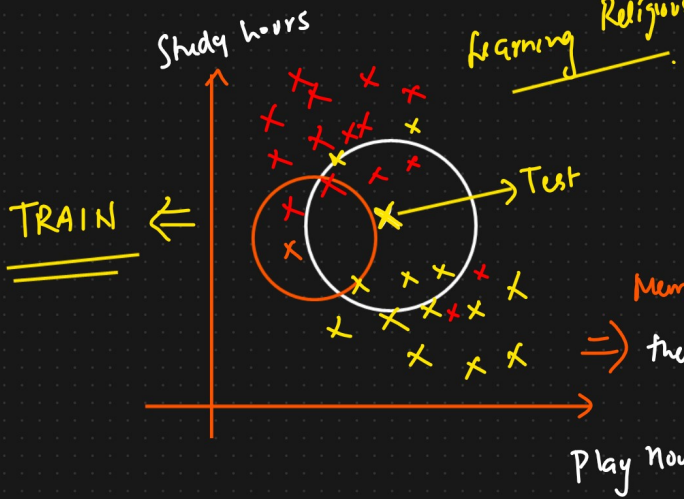
No. of play	No. of study hours	Pass / Not

{Generalized Model}



Learn pattern of the data

Generalized Format



X → PASS

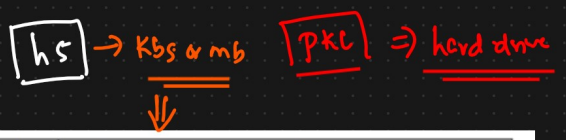
X → FAIL

Instance Based Learning

Memorizing the data.

Domain Expert

① KNN {K Nearest Neighbour}



Usual/Conventional Machine Learning	Instance Based Learning
Prepare the data for model training	Prepare the data for model training. No difference here
Train model from training data to estimate model parameters i.e. discover patterns	Do not train model. Pattern discovery postponed until scoring query received
Store the model in suitable form	There is no model to store
Generalize the rules in form of model, even before scoring instance is seen	No generalization before scoring. Only generalize for each scoring instance individually as and when seen
Predict for unseen scoring instance using model	Predict for unseen scoring instance using training data directly
Can throw away input/training data after model training	Input/training data must be kept since each query uses part or full set of training observations
Requires a known model form	May not have explicit model form
Storing models generally requires less storage	Storing training data generally requires more storage
Scoring for new instance is generally fast	Storing for new instance may be slow