

Machine learning

Agenda

- ① Machine learning Introduction
- ② AI vs ML vs DL vs DS
- ③ Simple linear Regression \rightarrow Mathematics

★ ① AI vs ML vs DL vs DS

AI - Netflix \leftarrow Recommendation System

Artificial Intelligence - is a Creation of application where it performs all its task without any human intervention.

like - chat box, Self driving cars, Alexa

ML - It provides stats tools to analyze, visualize, perform prediction and other task with the help of data.
ML is a Sub set of AI.

Simple Linear Regression

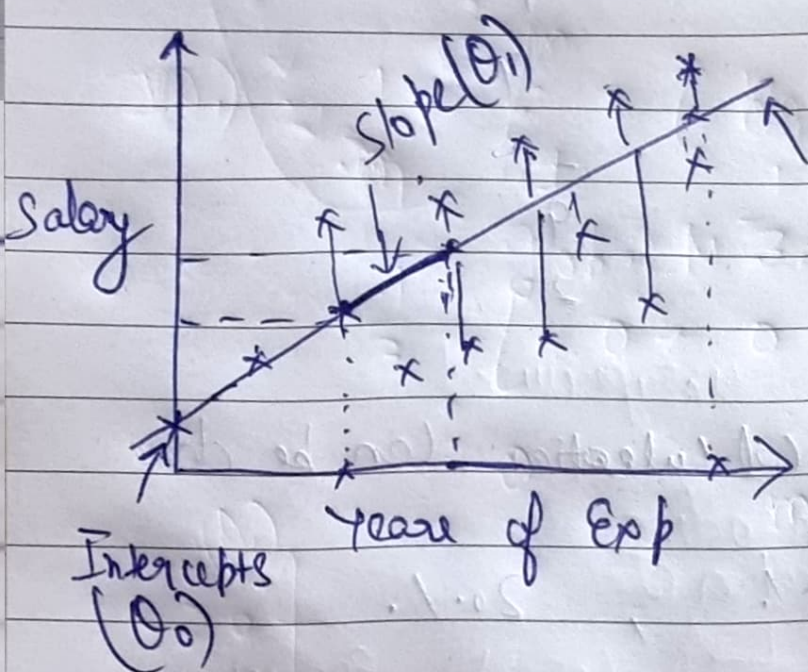
It has \rightarrow

① Independent Feature \rightarrow ② Dependent Feature

Ex - Aim - to create a model where Input is
 \rightarrow Height & have to predict \rightarrow weight

Ex - Model - year of Exp & Salary
Predict - Salary based on I/P year.

Predicted & Real data difference should be minimal.



Best fit line which will
give us predicted line.
We need to find a way
so that these points has
less distance.

Equation of Straight line = $y = mx + c$
 $y = \beta_0 + \beta_1 x$

$$h_0(x) = \theta_0 + \theta_1 x$$

\downarrow \downarrow
Intercepts slope

Flight price prediction - Regression

Algerian Forest \rightarrow Classification

Air Quality Index - Regression

Tomorrow Rain / Not \rightarrow Classification

Buy Day of the person \rightarrow Classification

\Rightarrow Age Salary Spending - Score (1-10)

24

70k

1

26

100k

9

-

-

-

21

20k

9

25

120k

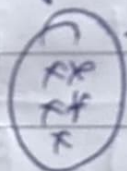
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Product discount collection can be done on above data.

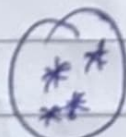
= 10% , X% , 20%.

Customer Segregation

Unsupervised
ML



Age, Salary



Age, Salary



Age, Salary

like Zomato Sending different notification to different person

Unsupervised



Clustering

Algorithms



DBscan



KMeans



Hierarchical



Spectral

Supervised

Degree

Experience

Salary

B.E

7 yr

50k K

Phd

2 yr

70 K

B.tech

4 yr

65 K

-

-

66 K

-

-

68 K

← Regression

← Continuous

when ever it is continuous
it become Regression

We not what data we
need depending upon Degree
& Experience

No. of play
hrs

No. of Study
hrs

Pass / fail.

9

1

0

7

2

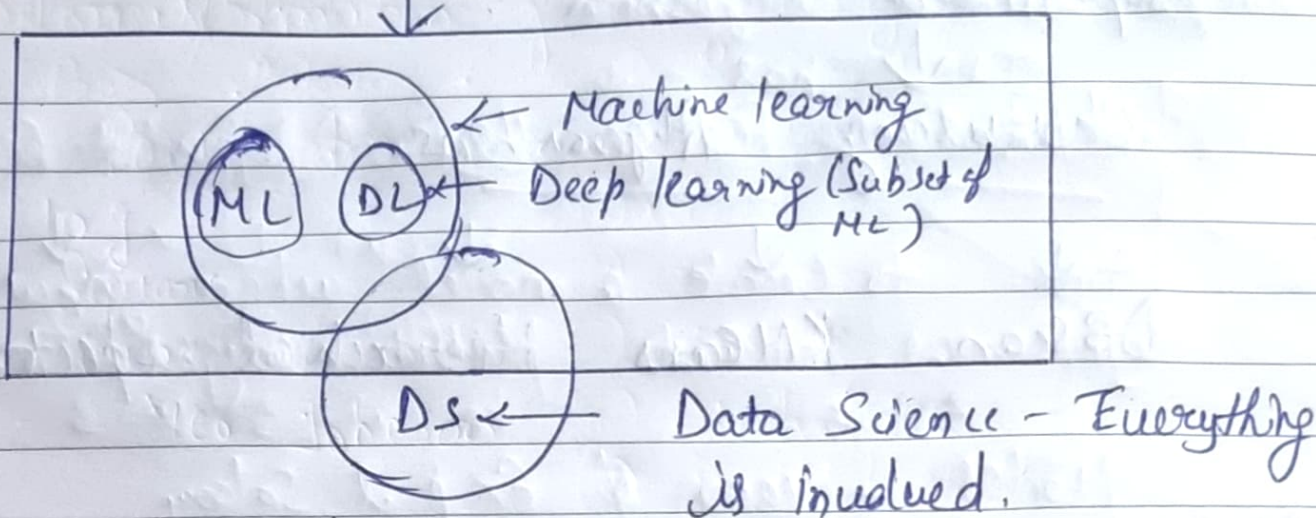
0

3

5

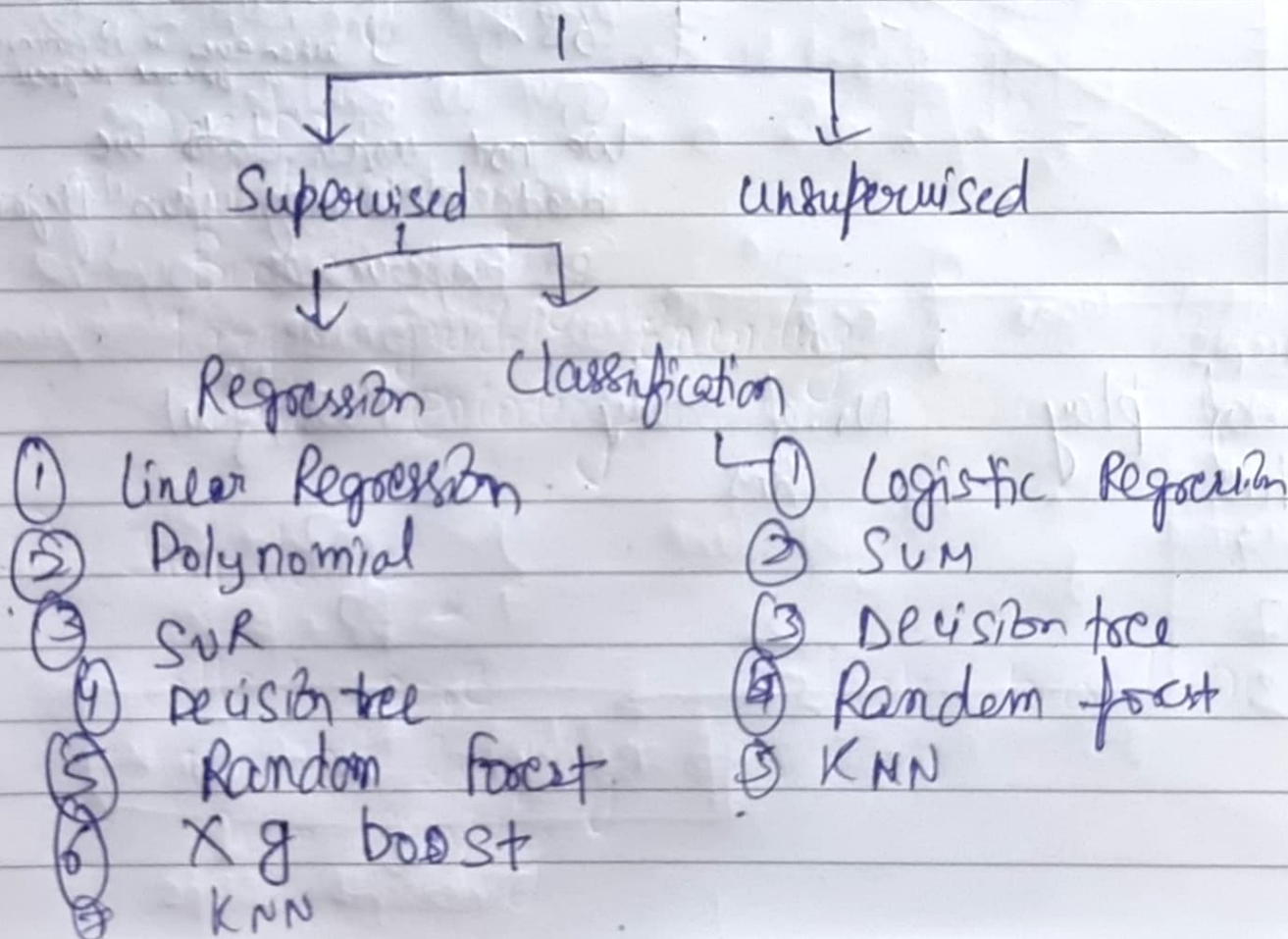
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Artificial Intelligence



Deep learning - In 1950's Scientist were trying to make a machine which do not need human intervention.

ML is DL



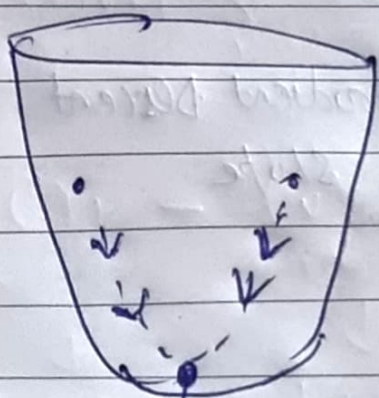
Repeat until convergence

$$Q_j = Q_j - \alpha \left[\frac{\partial J(Q_j)}{\partial Q_j} \right] \Rightarrow \text{derivative slope}$$

}

$$Q_j = Q_j$$

$$Q_j = Q_j - \alpha (-ve)$$



$$Q_j = Q_j + \alpha$$

$$Q_j = Q_j - \alpha (+ve \text{ Slope})$$

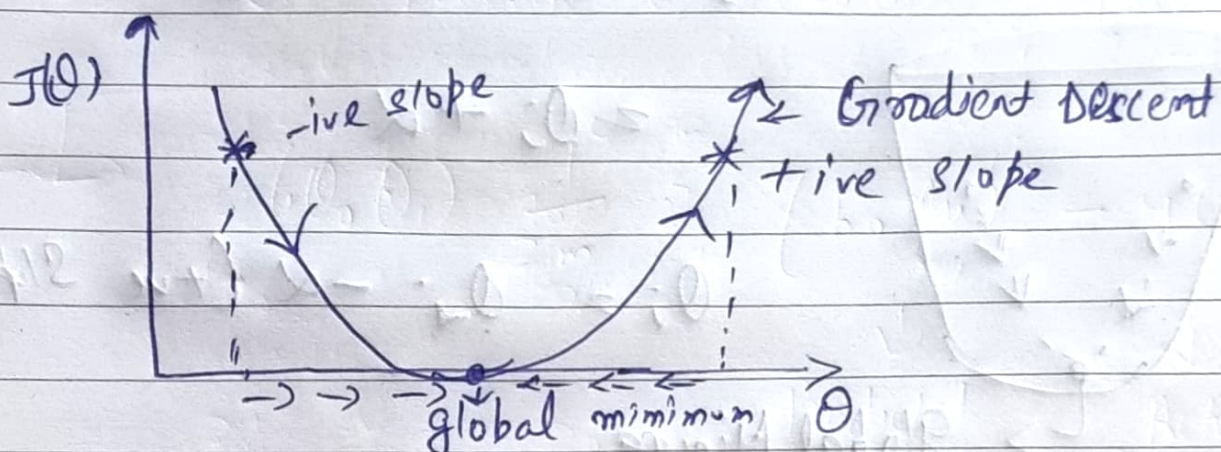
→ Global Minima

$$J(0.1) = \frac{1}{2} [(0.5-1)^2 + (1-2)^2 + (1.5-3)^2]$$

$$= \frac{1}{2} [0.25 + 1 + 2.25]$$

$$= \frac{3.5}{2} = 1.75$$

Convergence Algorithm (Optimize the change of θ)



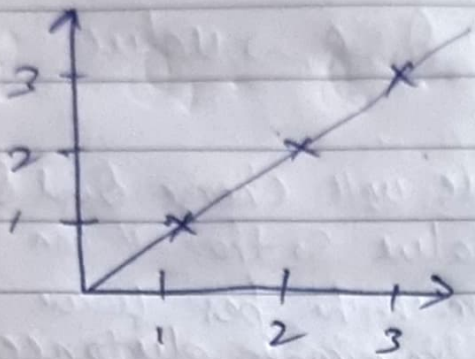
Gradient descent - is an optimization algorithm used for minimizing the cost function in various ML algorithms. It is basically used for updating the parameters of the learning model.

We need to increase the θ_j to make it near to global minimum. In case of negative (-ive) slope.

Vice Versa $\downarrow \downarrow \downarrow$

We need to decrease θ_j to make close it to global minimum in case of +ive slope.

$$\theta_1 = 1$$

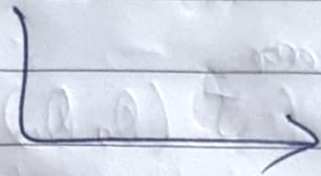


$$h_0(u) = \theta_1 u$$

$$h_0(u) = 1 \quad u = 1$$

$$h_0(u) = 2 \quad u = 2$$

$$h_0(u) = 3 \quad u = 3$$



~~u~~ 4

1 1

2 2

3 3

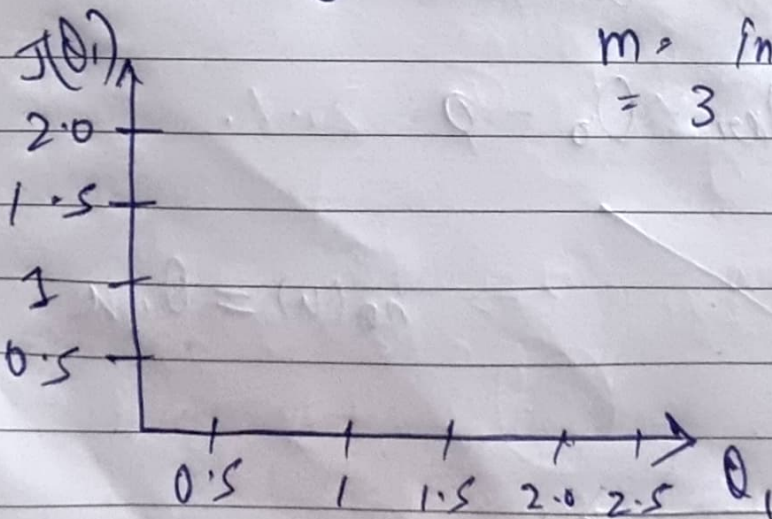


$$J(\theta_1) = \frac{1}{m} \sum_{i=1}^m (h_0(u)^i - y(i))^2$$

$$= \frac{1}{3} [(1-1)^2 + (2-2)^2 + (3-3)^2]$$

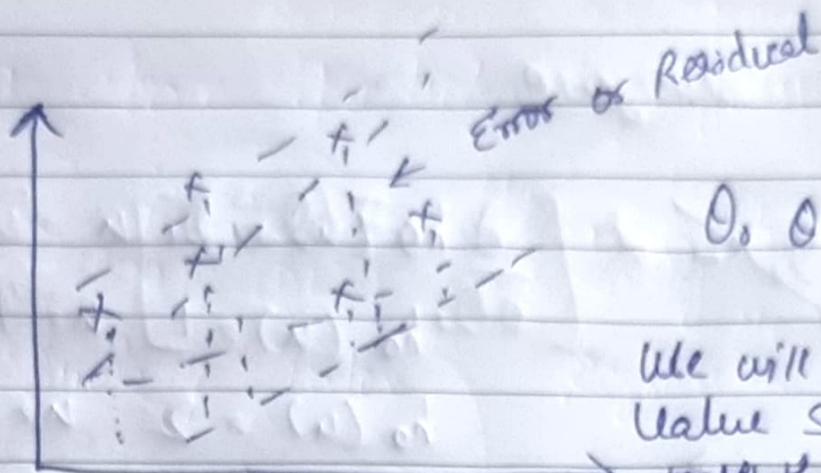
$$= \frac{1}{3} [0 + 0 + 0]$$

$$= 0$$



m indicates no. of data points
 $= 3$

Ex-



$\theta_0, \theta_1 \rightarrow$ value

We will change θ_0 & θ_1 value so that it can match the best value & minimal distance.

To minimize the errors

\hookrightarrow Cost Function $J(\theta_0, \theta_1) = \sum_{i=1}^m (h_0(u)^{(i)} - y^{(i)})^2$

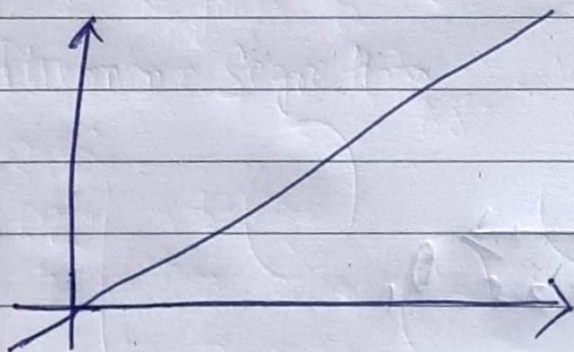
$\hookrightarrow J(\theta_0, \theta_1) = \frac{1}{2m} \sum_{i=1}^m (h_0(u)^{(i)} - y^{(i)})^2$

\downarrow
Predicted data

\downarrow
Actual data
(Observed values)

\downarrow
Mean Squared Error

Let us consider $\theta_0 = 0$



$\Rightarrow h_0(u) = \theta_1 u$