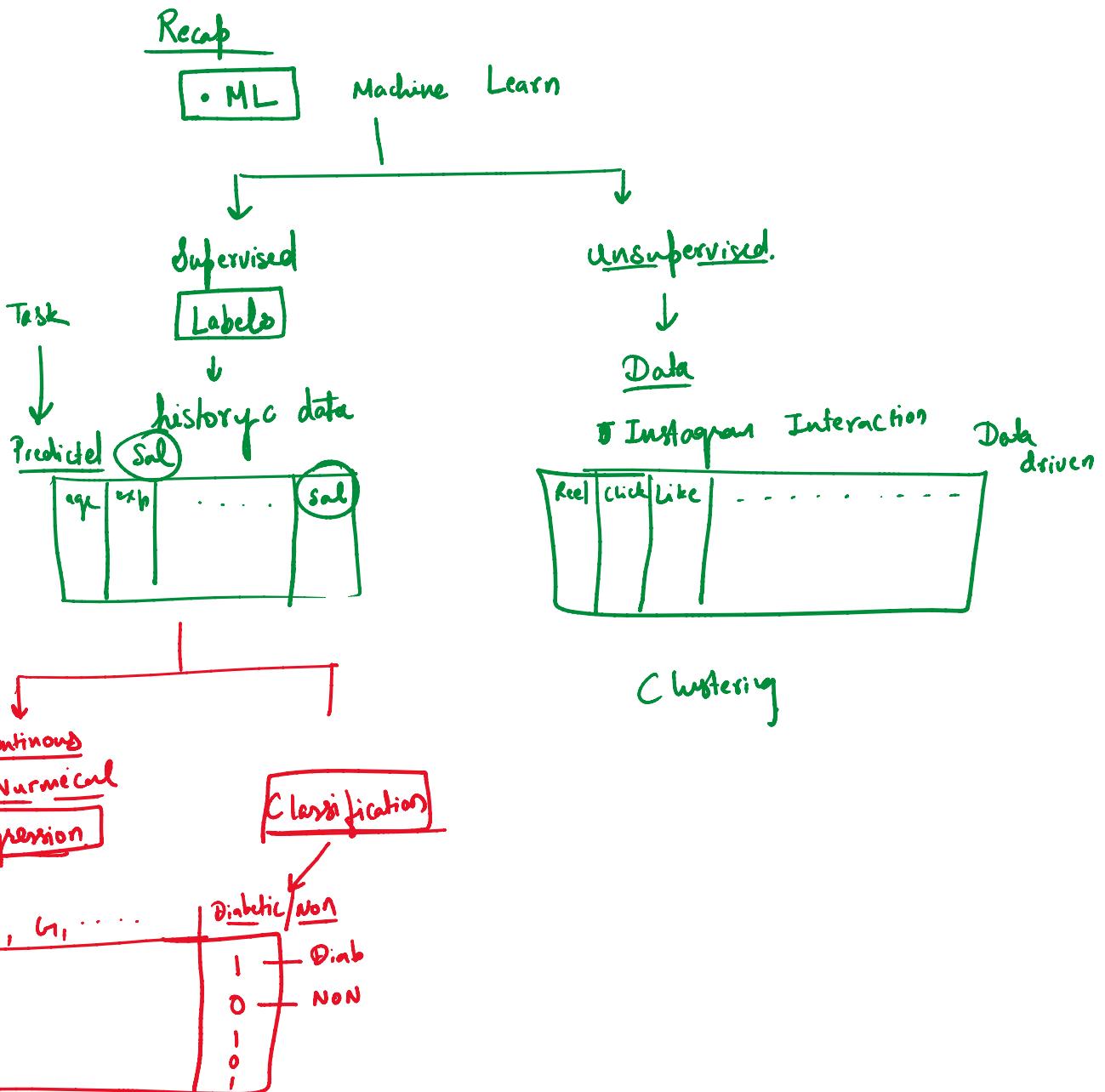
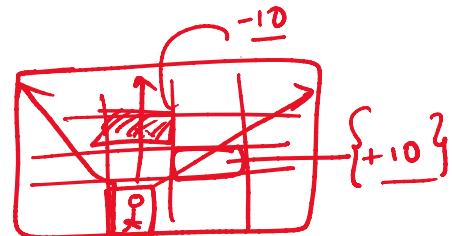
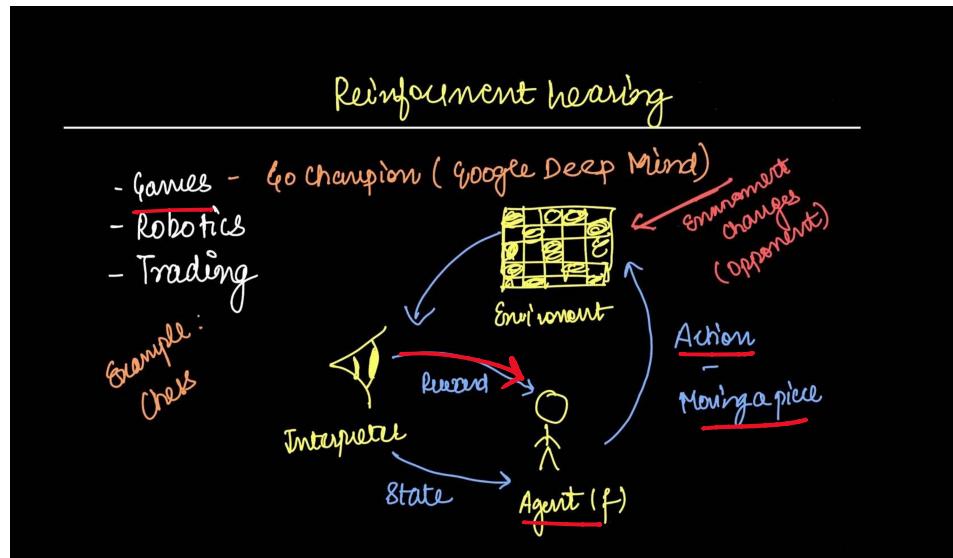


Notes

① Supervised

② unsupervised

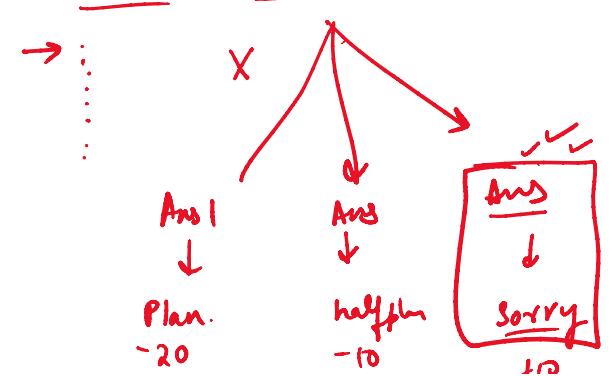
③ Reinforcement Learning.



who is PM INDIA
Ans



→ How to kill son



Plan.
-20

half plan
-10

Sorry

+10

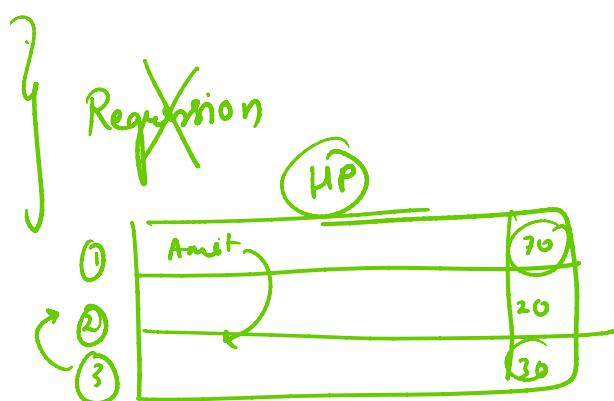
① Time Series

Time

Time Series

TIME	Sales of umbrella
JAN	300
Feb	400
March	700
April	200
May	1200
June	2500
July	3700
August	5000

Sales Prediction



{ voting.
wheater
Stock
flight }

Supervised
Label

unsupervised
Not Label

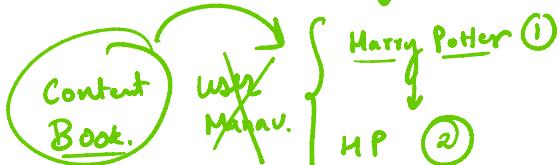
TS

RF

NLP

Recommendation

① Lib



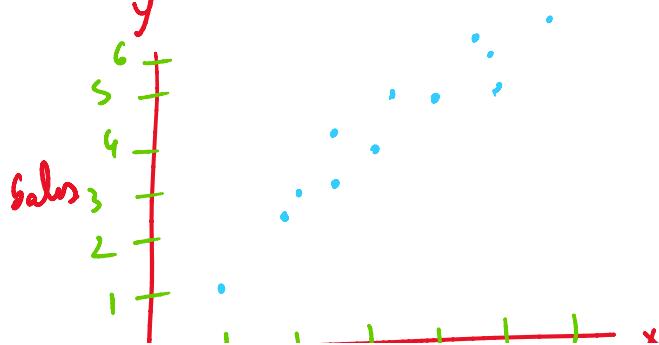
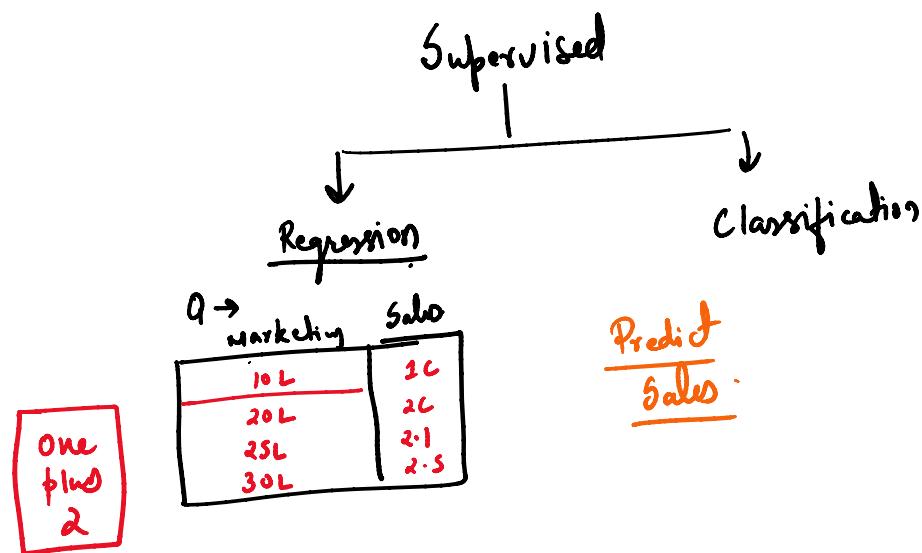
Mobile + charge

• People similar to you

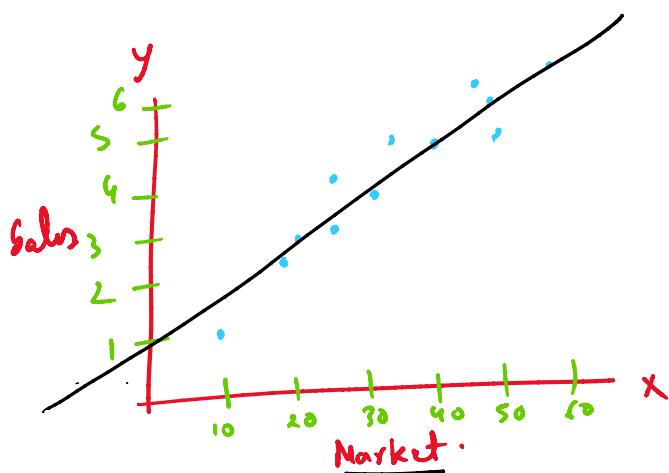
User — Palash.
↓
Pattern — similar

Agenda

- { • errors → cost function
- GD - Gradient Descent
- R^2

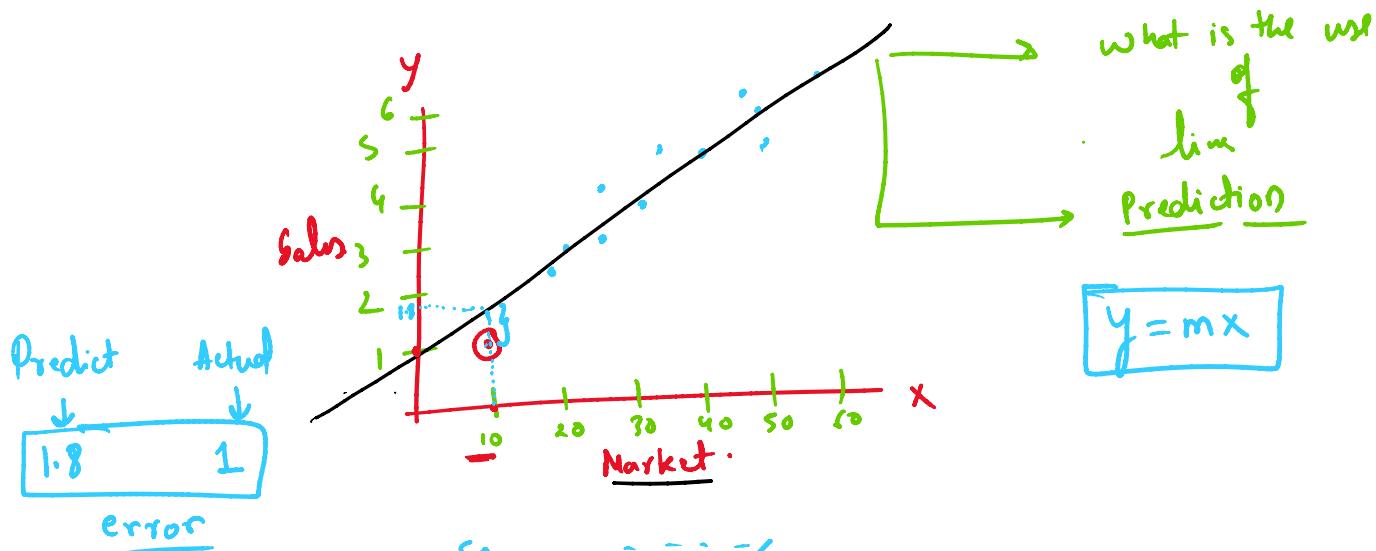


① Plotting my data

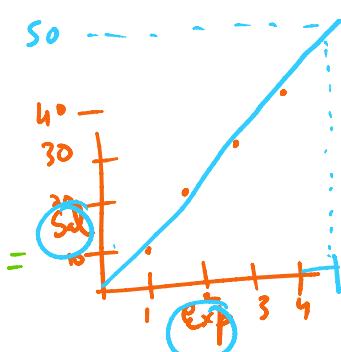


x y
 Market Sales

} pattern.
 { Draw a line that
 passes through Max point



Exp	Sal
1	10
2	20
3	30
4	40
5	50

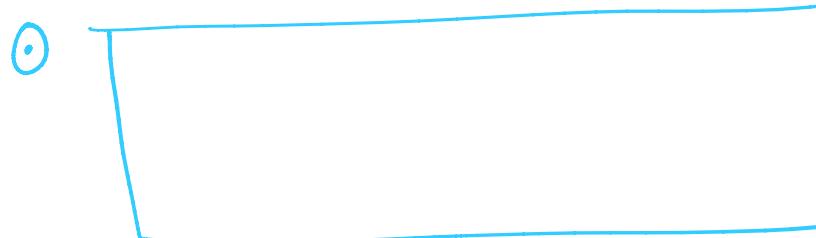


$$\begin{aligned}
 1 \times 1 &= 1 - 10 \\
 1 \times \text{Exp} & \\
 \text{Sal} &= 10k \times \text{Exp} = \text{line.} \\
 y &= m x
 \end{aligned}$$

$\frac{1}{5} + \frac{1}{50}$

0

$$y = m x$$



Simple Linear Regression

① y column \rightarrow Target \rightarrow Sales

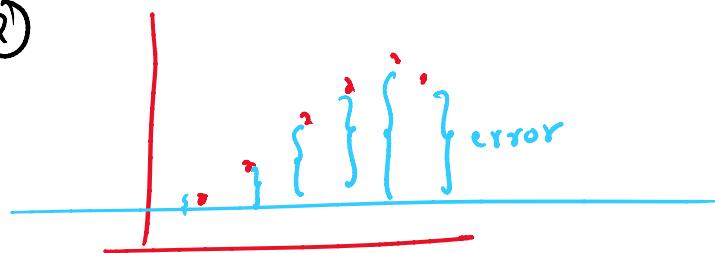
② x column \rightarrow Max power

$$\Rightarrow y = m x$$

find M

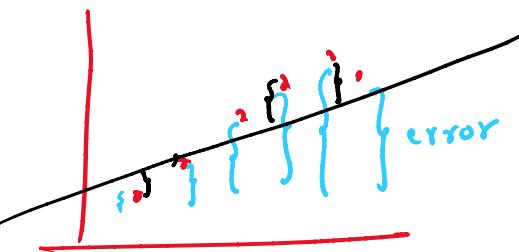
① Randomly any value M

②

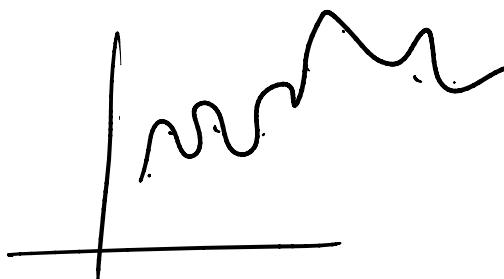


↓ Reduce error

(3)



↓ Reduce error

Target

SRNO	full_name	selling_price	year	seller_type	km_driven	fuel_type	transmission_type	mileage	engine	max_power	seats
0	Maruti SX4 Zxi BSIII	2.60 -	2007.0	Individual	110000	Petrol	Manual	15.00	1586.0	104.68	5.0
1	Hyundai i20 Sportz 1.4 CRDi	4.70 -	2012.0	Dealer	70000	Diesel	Manual	21.90	1396.0	88.76	5.0
2	Maruti Swift VDI BSIV	5.25 -	2015.0	Individual	70000	Diesel	Manual	25.20	1248.0	74.00	5.0
3	Honda City 1.3 EXI	1.25 -	2005.0	Individual	90000	Petrol	Manual	13.00	1343.0	90.00	5.0
4	Volkswagen Polo 1.2 MPI Comfortline	4.65 -	2015.0	Dealer	41000	Petrol	Manual	16.47	1198.0	74.00	5.0

From <https://vbxhv5ycu4q-49ff2e9cd022116-0.colab.googleusercontent.com/outputframe.html?vrz=celab-external_20251120-060052_RCO_834685124>Continuous① Error - Maths.

House Price

Sym	Bed	Bath	Loc	Price
17-00	4	0	MUM	70
12-00	2	0	Rural	1
19-00	3	1	Delhi	3
20-00	2	0	MUM	14

X
Sym.17-00
12-00Y
Price70
1Y_{pred}30
7Y - Y[^]
error
A - P40
-6
1
0y = m x
Randomly

$$\begin{array}{r}
 \overline{1700} \\
 \overline{1200} \\
 \overline{1900} \\
 \overline{2000}
 \end{array}
 \quad
 \begin{array}{r}
 \overline{20} \\
 \overline{1} \\
 \overline{3} \\
 \overline{14}
 \end{array}
 \quad
 \begin{array}{r}
 \overline{30} \\
 \overline{7} \\
 \overline{2} \\
 \overline{50}
 \end{array}
 \quad
 \begin{array}{r}
 \cancel{\overline{10}} \quad e_1 \\
 \cancel{-6} \quad e_2 \\
 \cancel{1} \quad e_3 \\
 \cancel{-36} \quad e_4
 \end{array}
 \quad
 \text{Randomly}$$

$$e_1 + e_2 + e_3 + e_4 = -$$

$$\begin{array}{l}
 \textcircled{1} \times \overline{1700} \\
 \textcircled{1} \times \overline{1200} \\
 \textcircled{1} \times \overline{1900}
 \end{array}$$

✓ {

$\frac{\text{abs}}{4} (e_1 + e_2 + e_3 + e_4)$ <u>M_AE</u> $ e_1 + e_2 + e_3 $ X <u>Differential</u>	$\frac{\text{Square}}{4} (e_1^2 + e_2^2 + e_3^2 + e_4^2)$ <u>MSE</u> $e_1^2 + e_2^2 + e_3^2$ $10^2 + 20^2 + 30^2 + 40^2 = 10^2$ $29 - 34$ S ↓
--	--

ERROR

Random → Prediction →

error

$$\begin{array}{c}
 \downarrow \\
 e_1^2 + e_2^2 \\
 \downarrow \\
 \text{Mean}
 \end{array}$$

MSE

MSE → (m) find the Best value
of M

$$\begin{array}{r}
 -10 \quad +10 \\
 (-10)^2 \quad (10)^2 \\
 \downarrow \\
 \frac{100 + 100}{2} \\
 \boxed{100}
 \end{array}$$

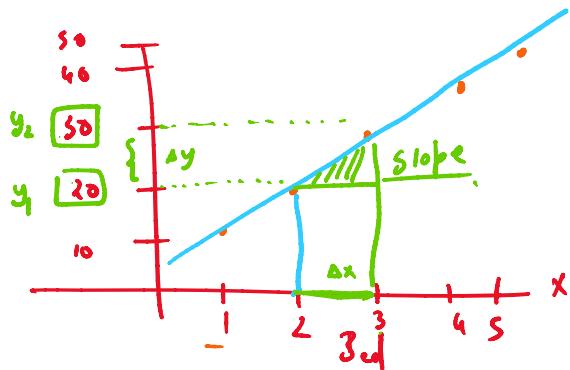
2
100

$$\left\{ \begin{array}{|c|} \hline \text{MSE} \\ \hline \end{array} \right\}$$

Squr.	y Price	y_{Pred}	$y - y$ Error $A - P$	Square	Sum.	Mean.
1700	20	30	-10	100	1600	811
1200	3	7	-6	36	36	MSE
1900	2	2	-1	1	1	
2000	14	50	-46	400	1600	

\downarrow
 $y = m x + b$

Change M — Reduce MSE

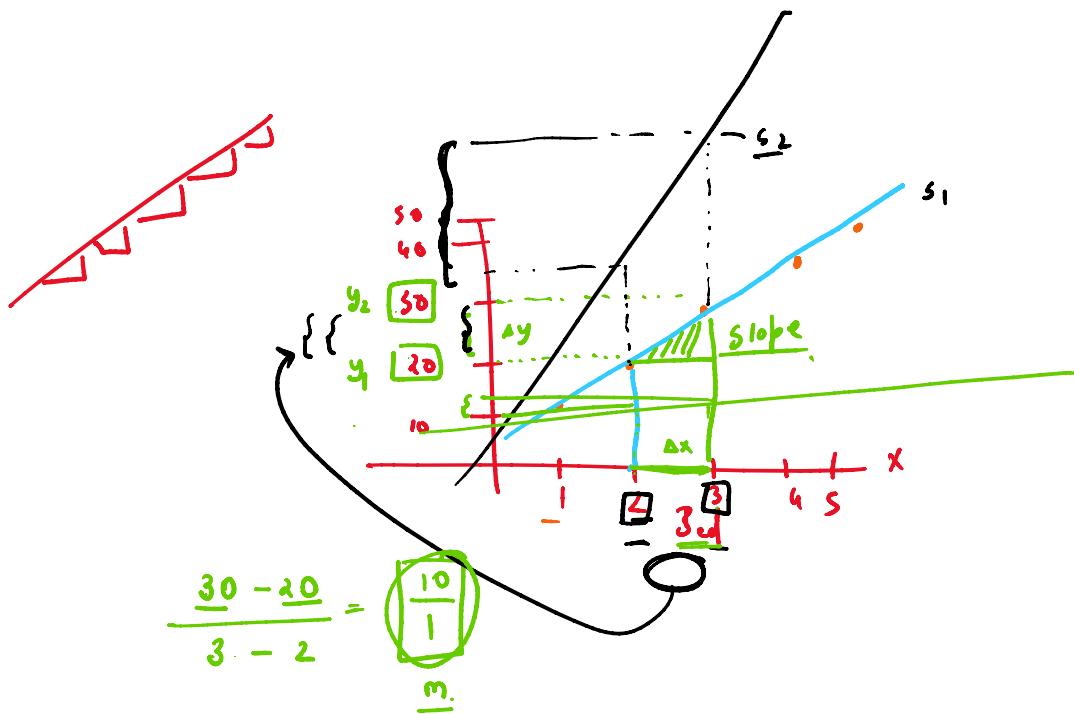


$$\frac{30 - 20}{3 - 2} = \boxed{\frac{10}{1}} \quad m.$$

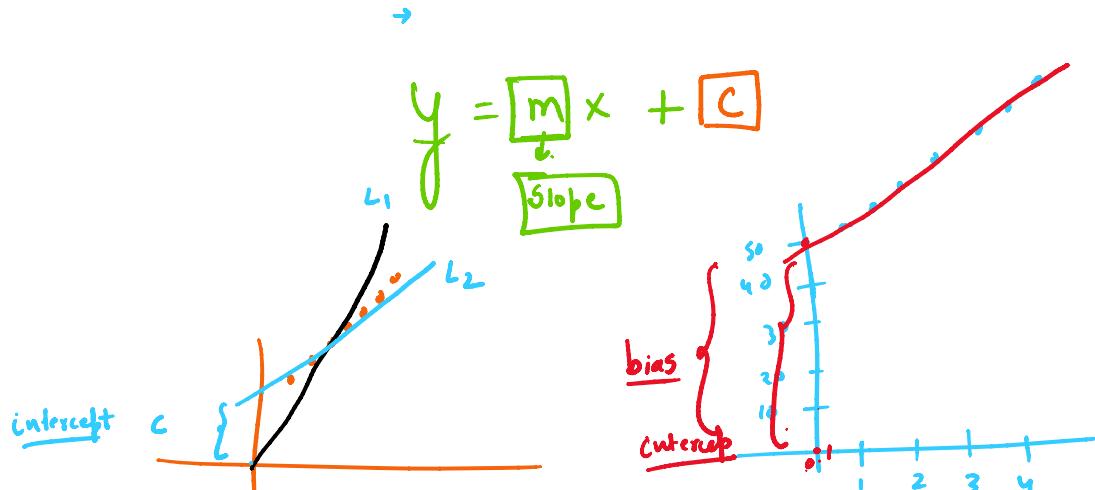
BIKK Price ↑ ↑

	10
2	20
3	30
4	40

$m \rightarrow \text{slope}$
Relation of y with x



y_1



$$y = mx + c$$

$$y = mx + c$$

origin. ↓

It cuts your y-axis

$y =$ Linear
|
Straight

$$y = \boxed{m} x + \boxed{c}$$

↑
Slope :

find the value of c

$\frac{\Delta y}{\Delta x}$ change in y / change in x

NSE \rightarrow Reduce error \rightarrow By changing value of m and c

$$m = \frac{\Delta y}{\Delta x} \quad \frac{\partial y}{\partial x}$$

$$y = mx + c$$

$$y = wx + b$$

$$y = wx + b$$



error

GD

Reduce

$$\text{MSE} = \frac{\sum (A - P)^2}{n}$$

↓

χ^2

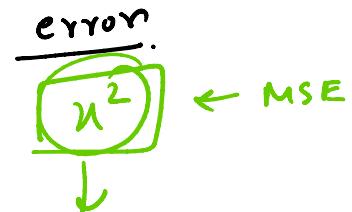
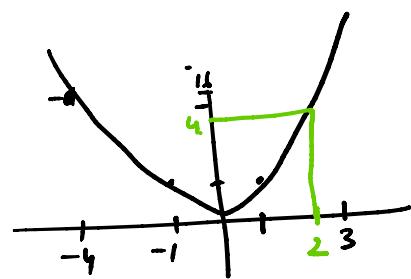
$3 - 3^2$
 $7 - 7^2$

$$\text{error} = \frac{n^2}{n} \rightarrow$$

$$n = \frac{1}{3} - \frac{\text{error}}{\text{error}} \rightarrow \frac{1}{9}$$

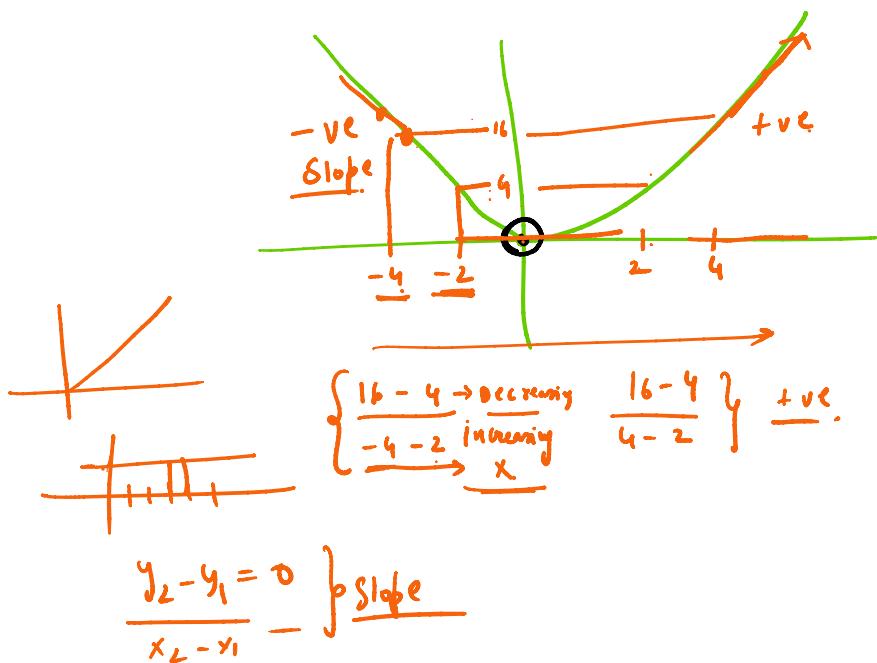
$$n = -4 - \text{error} = \frac{16}{81}$$

$$n = \frac{9}{1}$$



$x^2 \rightarrow \underline{\text{Lowest}}$

MSE $\rightarrow x^2$.



MSE $\rightarrow \underline{\text{Lowest}}$
 $x^2 \rightarrow \underline{\text{Lowest}}$

$x^2 -$

$$n = -4 = 81$$

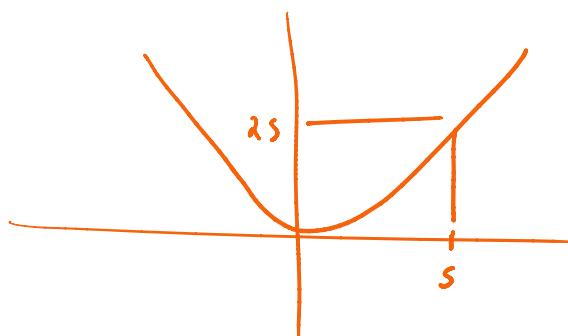
$$n = -2 = 4$$

$$n = 2 = 4$$

$$n = 0 = n^2$$

GD update Rule

① Start with Random value of x



x^2
 $x \rightarrow n^2$
 $s \rightarrow 25$
↓
Reduce.

② update x

$$x = \underline{\text{old}_x} - \underline{\text{slope}}$$

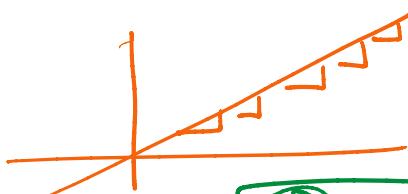
$\frac{-}{-} \frac{-}{-}$ [slope of x^2] \rightarrow derivative

$$x = \underline{old_x} - \underline{\text{Derivative}}$$

$$= 5 -$$

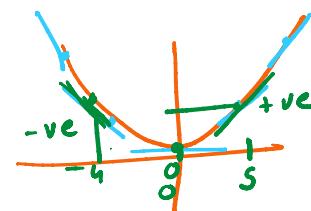
slope of x^2

→ derivative



$$\boxed{x^2 - 2x}$$

$$\text{slope} = 2x$$



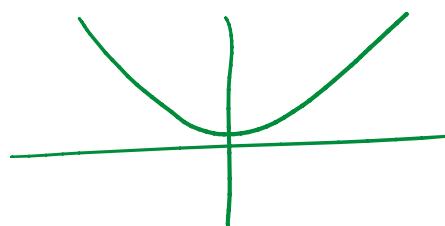
$$\frac{2 \times 5 = 10}{}$$

$$2 \times 0 = 0$$

$$2 \times -4 = -8$$

f

Derivative = Slope



$$\boxed{\text{slope} = x^2 = 2x}$$

Randomly value of x .

$$x = \underline{old_x} - \text{Derivative of } x^2$$

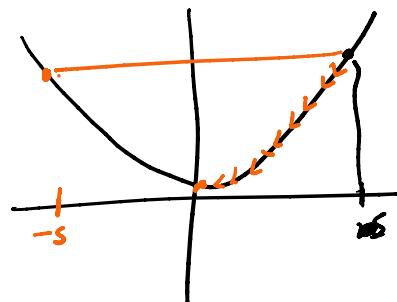
$$\downarrow s$$

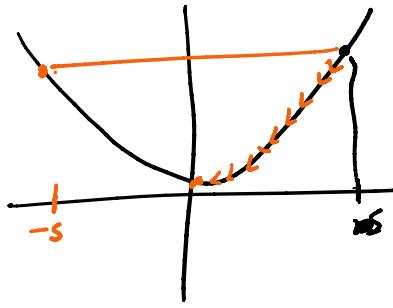
$$= s - 2x$$

$$= s - 2 \times s$$

$$= s - 10$$

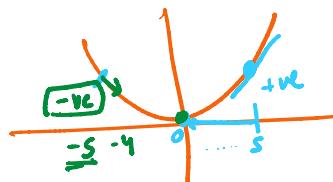
$$\boxed{x = -s}$$





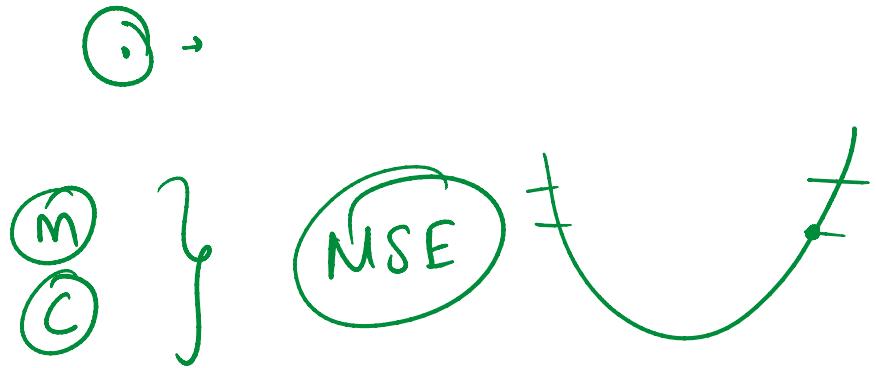
$$x = x - 0.1 \times 2u.$$

$$\begin{aligned}
 \text{new}_x &= \text{old}_x - 0.1 \times \text{Derivative of } u^2 \\
 &= s - 0.1 \times 2x \\
 &= s - 0.1 \times 2s \\
 &= s - 0.1 \times 10 \\
 &= s - \cancel{0.1} \\
 &= \cancel{-4}.
 \end{aligned}$$



$$\begin{aligned}
 x_{\text{new}} &= \text{old}_x - \frac{0.1 \times \text{Slope.}}{\text{+ve.}} \\
 &\quad - \frac{0.1}{+ve}
 \end{aligned}$$

$$\begin{aligned}
 &-s - 0.1 \times 2x \\
 &-s - (0.1 \times 2(-s)) \\
 &-s - (0.1 \times -10) \\
 &-s - (-1) \\
 &= -s + 1 \\
 &= -4.
 \end{aligned}$$



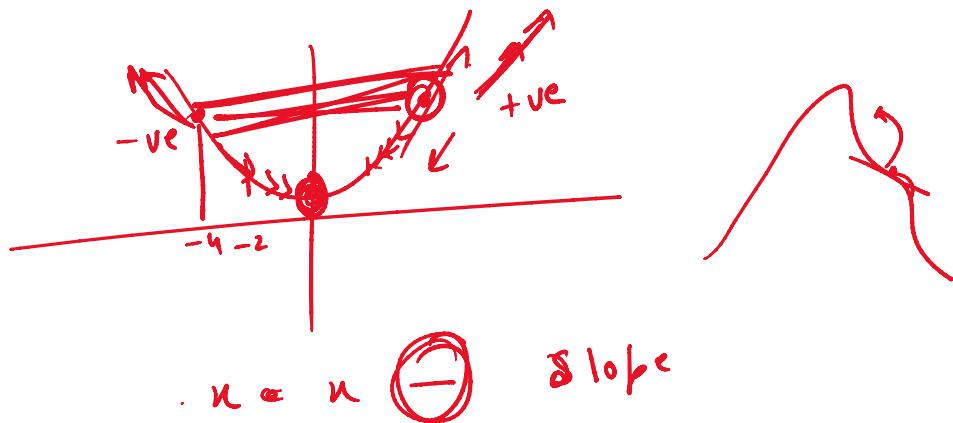
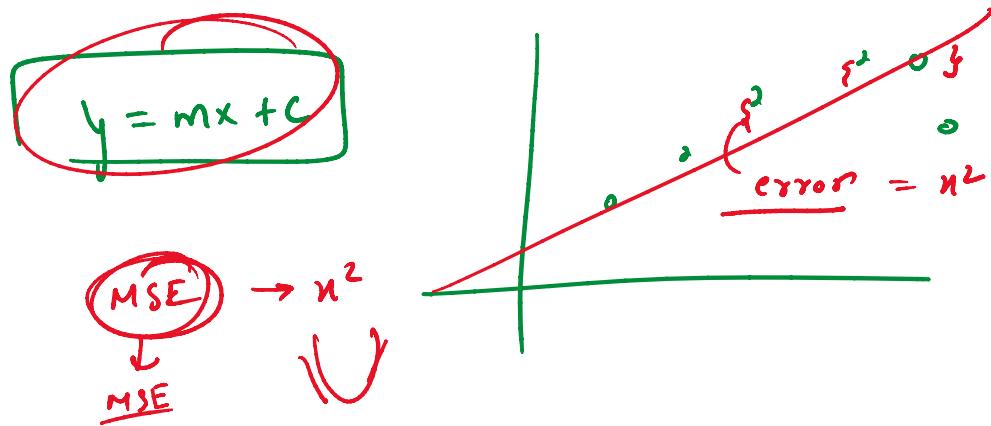
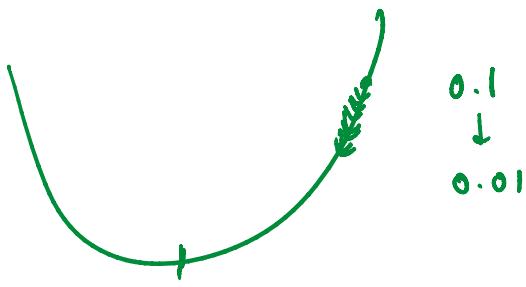
$$\begin{aligned} m &= M - 0.1 \times \text{Slope of MSE} \\ c &= C - 0.1 \times \text{Slope of MSE} \end{aligned}$$

MSE GD

Code

$$0 \rightarrow \{ \text{GD} - 70\% - \underline{30\%} \}$$

$$\begin{aligned} \text{MAE} &= \frac{|A - P|}{|S|} \\ &= \frac{7 + 13}{3} = \frac{5 + 7 + 3}{3} \end{aligned}$$



$$\frac{\sum (y - (mx + c))^2}{n}$$

M. = m - slope x 0.1
C = c - slope x 0.1

MSE $\frac{(y - g)^2}{n^2}$

$n - n^2$

