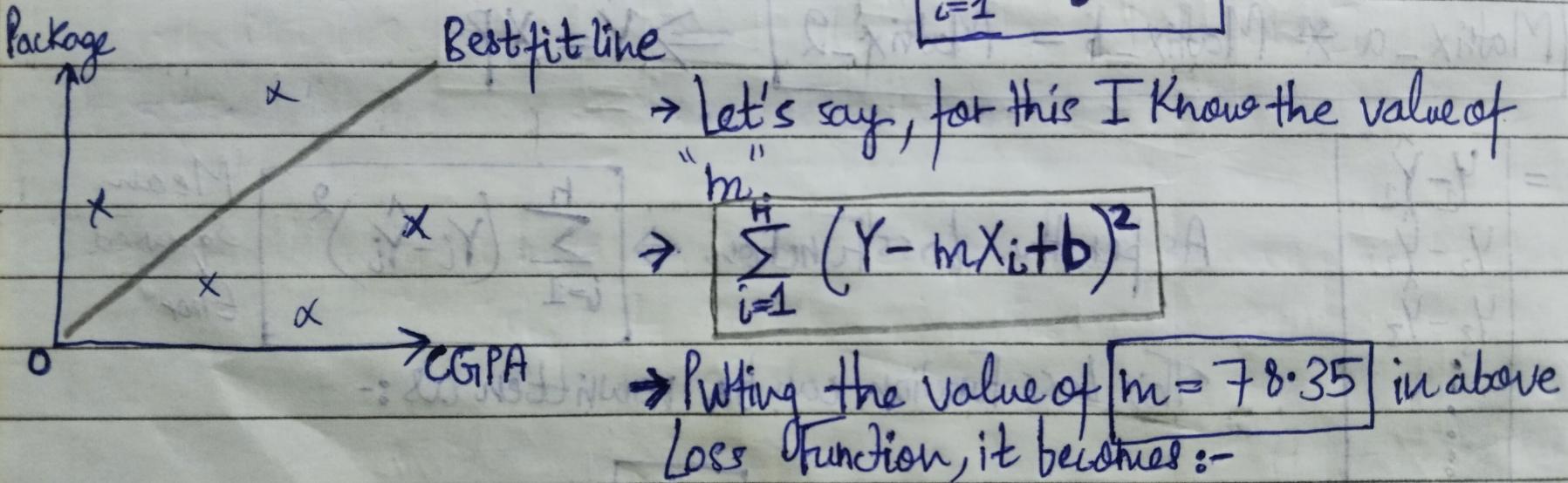


Gradient Descent....

Batch Gradient Descent [2 Dimensions]

- In Gradient Descent, we calculate or finds the best possible line or regression line without the use of Direct Formula "OLS".

- As, We Know, that the Loss Function = $\sum_{i=1}^n (Y_i - \hat{Y}_i)^2$



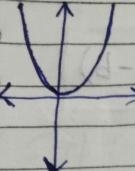
$$\Rightarrow \sum_{i=1}^n (Y - 78.35X_i + b)^2$$

Constant

Spiral

Date.....

→ So the relationship is Square between the L and b. $L = b^2$



Square function

$$L = b^2$$

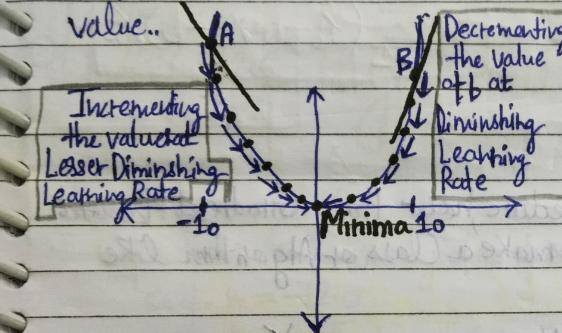
$$L = b \downarrow$$

[At Minima]



∴ It helps the Algorithm

- In this function, we have to find the minima of the function, such that it decreases the overall Loss Function value and provides the minimum value..



Step 1 → Selects the any random point from your data..

Step 2 → Calculate the slope of that point. [Using derivation].

Step 3 → Subtract that slope value with the value of the point.

Step 4 → If the value thus obtained

+ Let's say the Point "A" value = -10

+ Assuming that the slope value is coming out is = -50.

$$+ b_{\text{new}} = -10 - (-50)$$

$$= -10 + 50 = 40 \quad \text{Increment}$$

if Positive

if Negative

* But, we can observe that this Increment the chaotic change will even skips the value of "b_{new}".

Decrement the value of "b_{new}"..

* Q When we get to know that when we have to stop???

Ans When the $b_{\text{new}} - b_{\text{old}} \leq 0.0001$ → This depicts no change...

$$b_{\text{new}} = b_{\text{old}} - \eta \text{ Slope}$$

Formula to calculate the Gradient Descent $\Rightarrow b_{\text{new}} = b_{\text{old}} - \eta \text{ Slope}$

where :- η = Learning Rate.
Slope = Value of Slope!

Spiral

- To Calculate the Slope = $-2 \sum_{i=1}^n (Y_i - mX_i - b)$ of the value of "b"
- Formula to calculate the Slope of a Value = $-2 \sum_{i=1}^n (Y_i - mX_i - b)$ of "b"

To Calculate the slope of the = $-2 \sum_{i=1}^n (Y_i - mX_i - b) X_i$ Value of "m"

Formula of a value of a point of "m" = $-2 \sum_{i=1}^n (Y_i - mX_i - b) X_i$

Q Write a complete step by step Procedure how this Gradient Descent works? Write your own Algorithm to make a Class or Algorithm like Gradient Descent?

Ans Assumptions to be made :-

Note:- "iq" Column is removed

from the data because this is for the 2 Dimensional

Gradient Descent...

X	Y	
CGPA	iq	Package (LPA)
—	—	—
—	—	—
—	—	—

df = Data [Data Frame]

Step 1:- Assign any random values to "m" and "b".

Step 2:- Identify a best learning rate because this learning rate is a crucial aspect to get the minima..

"If learning Rate is too Higher Value.."

In that case, you will skip your minima point and moves at very higher value of the slope...

"If learning rate is too smaller value.."

In that case, you will move too much slowly and this requires more number of epochs... Spiral

Date.....

Step 3:- Now, run your loop as per the "epochs" provided. And at every iteration update your "b" and "m" values and the slope values.

Step 4:- Finally, you will see that your best minima "m" and "b" you will achieved. then put that in the equation as:-

$$Y_{\text{Predicted}} = (Y_i - mX_i - b)^2$$