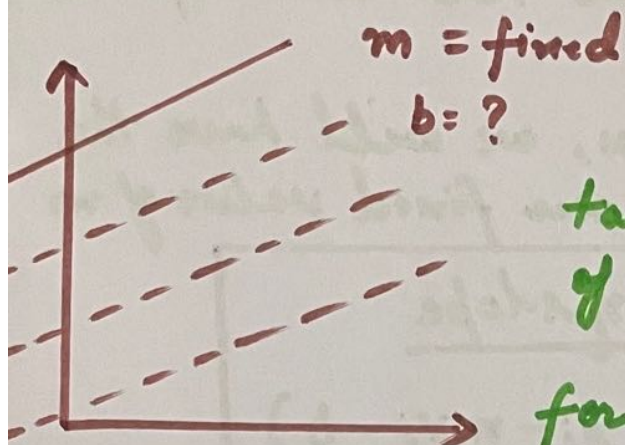


# GRADIENT DESCENT

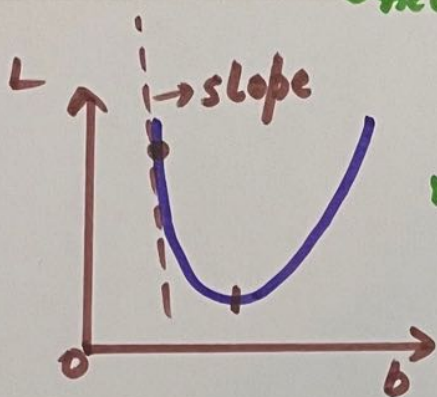
(Simple Derivation)



Fixing the value of  $m$  by taking the calculated value of  $m$ .

for  $i$  in epochs :

$$b_{\text{new}} = b_{\text{old}} - \eta \times \text{slope}$$



where,  $b_{\text{old}}$  is the previous value of intercept calculated  
 $\eta$  is known as learning rate  
slope is the slope of the point for which  $b$  value was selected.

We know,

$$E = \sum_{i=1}^n (y_i - \hat{y}_i)^2$$

To find the slope of the given point for which  $b$  value was selected.

$$\frac{dE}{db} = \frac{d}{db} \left( \sum_{i=1}^n (y_i - \hat{y}_i)^2 \right)$$

$$\text{Slope} \Rightarrow \frac{d \sum (y_i - mx_i - b)^2}{db}$$

$$\text{slope} \Rightarrow 2 \sum_{i=1}^n (y_i - mx_i - b) (-1)$$

$$\text{slope} \Rightarrow -2 \sum_{i=1}^n (y_i - mx_i - b)$$

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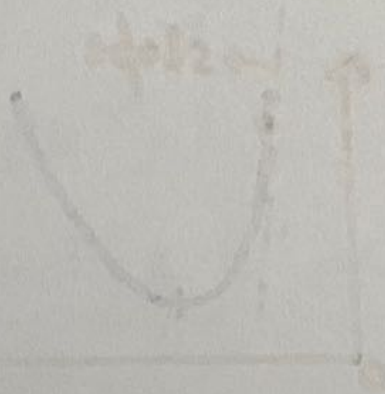


Now, we can put any value of bold & then calculate bnew everytime till our required condition is met.

When our loop terminates, we will have the value of our intercept for our fixed value of m

$$\underline{b_{\text{new}} = b_{\text{old}} - \eta \text{slope}}$$

$$\underline{\text{slope} = -2 \sum_{i=1}^n (y_i - mx_i - b)}$$



Ankur