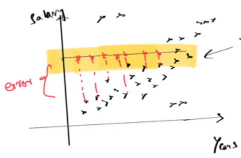
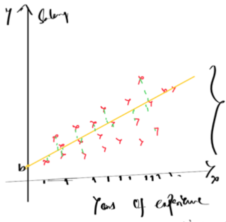
What is linear regression ?



That is an average line with some y intercept a value > 0 that me zero coefficient of x

=> What we need is to Reduce the error So the our Predicted Values can be close to the Original value

How linear Regression aproches it



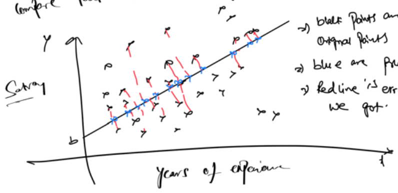
that is the Required line

the Equation for that line which intercepts y at b point is

$$\hat{y}_i = b + m x_i$$

→ So for every y b doesnt changes beause it is an intercept point

Now after getting $\hat{y}$ value we are gonna compare that to the original value



=> black Points are Original Points
=> blue are Predicted
=> Redline is error we got.

So the error

lets say y_i = Original Point

$\hat{y}_i$ = Predicted Point

$(y_i - \hat{y}_i)$ => it is the error

But in distance we do not Need -ve vals

So $(y_i - \hat{y}_i)^2$ → that is for a single y

What we need is the Cumilative mean value

that would be $= \frac{1}{n}\sum_{i=0}^{n}(y_i - \hat{y}_i)^2$

$$\text{Error }(E) = \frac{1}{n}\sum_{i=0}^{n}(y_i - \hat{y}_i)^2 \quad (\text{we know } \hat{y}_i = b + m x_i)$$

$$E = \frac{1}{n}\sum_{i=0}^{n}(y_i - (b + m x_i)^2)$$

Now we know that we have error E all we have to do is Reduce it (decreasing it) we can Reduce it based on b and m

b → Y intercept, m → x Coffecient

To get minimum m all we have to do is

$$m = m - \alpha\left(\frac{dE}{dm}\right)$$

where α = learning Rate

$\frac{dE}{dm}$ = derivative of error with Respect to m

Similar to that to get minimum b value

$$b = b - \alpha\left(\frac{dE}{db}\right)$$

α = Learning Rate

$\frac{dE}{db}$ = derivative With Respect to b

$$\frac{dE}{dm} = \left(\frac{1}{n}\sum_{i=0}^{n}(y_i - (b + m x)^2)\right)\frac{d}{dm}$$

$$= \frac{1}{n}\sum_{i=0}^{n}2(y_i - (b + m x)(-x_i))$$

$$\frac{dE}{dm} = \frac{-2}{n}\sum_{i=0}^{n}x_i(y_i - (b + m x))$$

$$\frac{dE}{db} = \frac{-1}{n}\sum_{i=0}^{n}(y_i - (m x_i + b))$$

=> Now we got all the values we need So we can Proceed with the Code