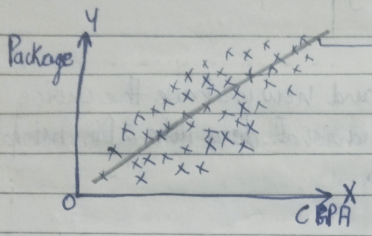
Date.....

Linear Regression



Equation of Best Fit Line is :-

$y = mx + b$

where :- m = Coefficient / Scope
b = Intercept
x = Input Veriable [CGPA]
y = Output Veriable [Package].

Types of Linear Regression :-

- Simple Linear Regression.
- Multiple Linear Regression
- Polynomial Linear Regression

Simple Linear Regression

$y = mx + b$ To Calculate this "m" and "b". There are 2 ways :-

- Closed Form Solutions
  - Direct Formula
  - For Lower Dimensional Data
  - OLS [Ordinary Least Squares]
    In SKlearn internally OLS is implemented in SKlearn. LinearRegression ....
- Non-Closed Form Solutions
  - For Higher Dimensional Data
  - Gradient Descent
    In sklearn. SGD Regressor Linear Regression is implemented through Gradient Descent....

Date.....

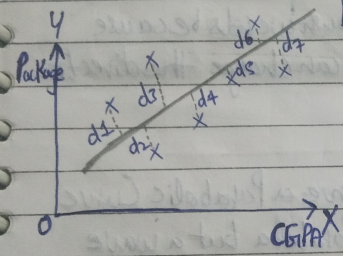
The Direct Formula to Calculate "m" and "b" are :-

$$b = \bar{Y} - m\bar{X}$$

where :- $\bar{Y}$ = Package Mean
$\bar{X}$ = CGPA Mean

$$m = \frac{\sum_{i=1}^{n} (X_i - \bar{X})(Y_i - \bar{Y})}{\sum_{i=1}^{n} (X_i - \bar{X})^2}$$

where :- $\bar{X}$ = Mean of CGPA...
$\bar{Y}$ = Mean of Package...
X_i = Current Line CGPA...
Y_i = Current Line Package...



Best fit line

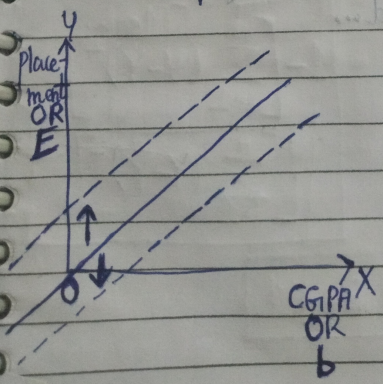
Error Function $\Rightarrow \sum_{i=1}^{n} (d_i)^2$

The Error Function is more expressed as :-

Error Function $\Rightarrow \sum_{i=1}^{n} (Y_i - \hat{Y}_i)^2$

Error Function $\Rightarrow$ This Error Function is self explationary and it is highly important because we want to have that "m" and "b" values whose Error Value Function should be minimum....

⊙ Relationship between "E" and "b".



Assuming that the m=0

- So, as the m=0, we cannot change the slope direction But we can move the slope upwards or downwards...

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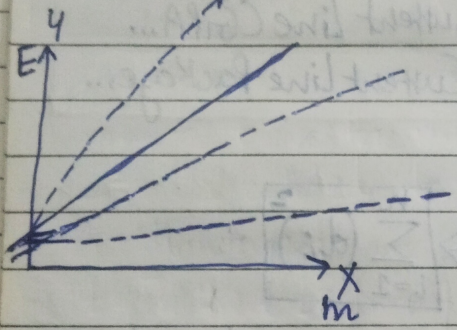
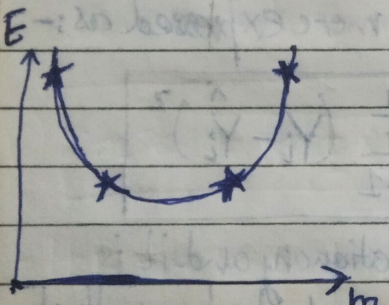
"You can observe a Parabolic Curve not excately Parabola but a wave type slope forming..." ⇒ (1)

Relationship between "E" and "m"



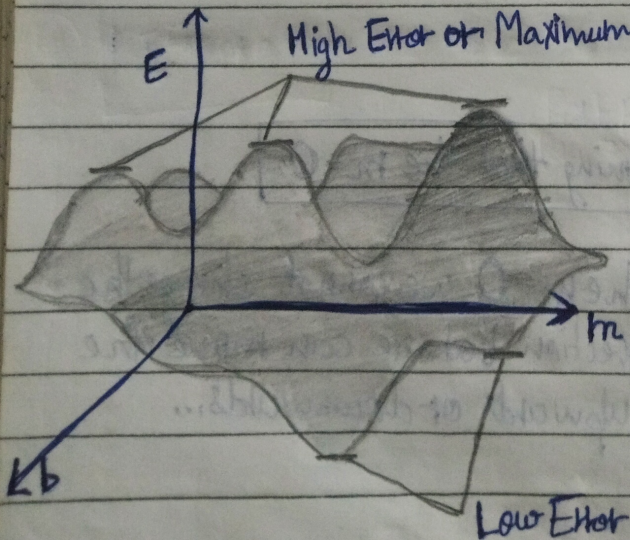
Assuming that the b=0

- Now as the slope cannot move upwards or downwards because b=0 but we can change the direction of the slope..



"You can observe a Parabolic Curve not excately Parabola but a wave like slope forming..." ⇒ (2)

Combining (1) and (2)



- We want these Minimum Error so that the best fit line is achieved...