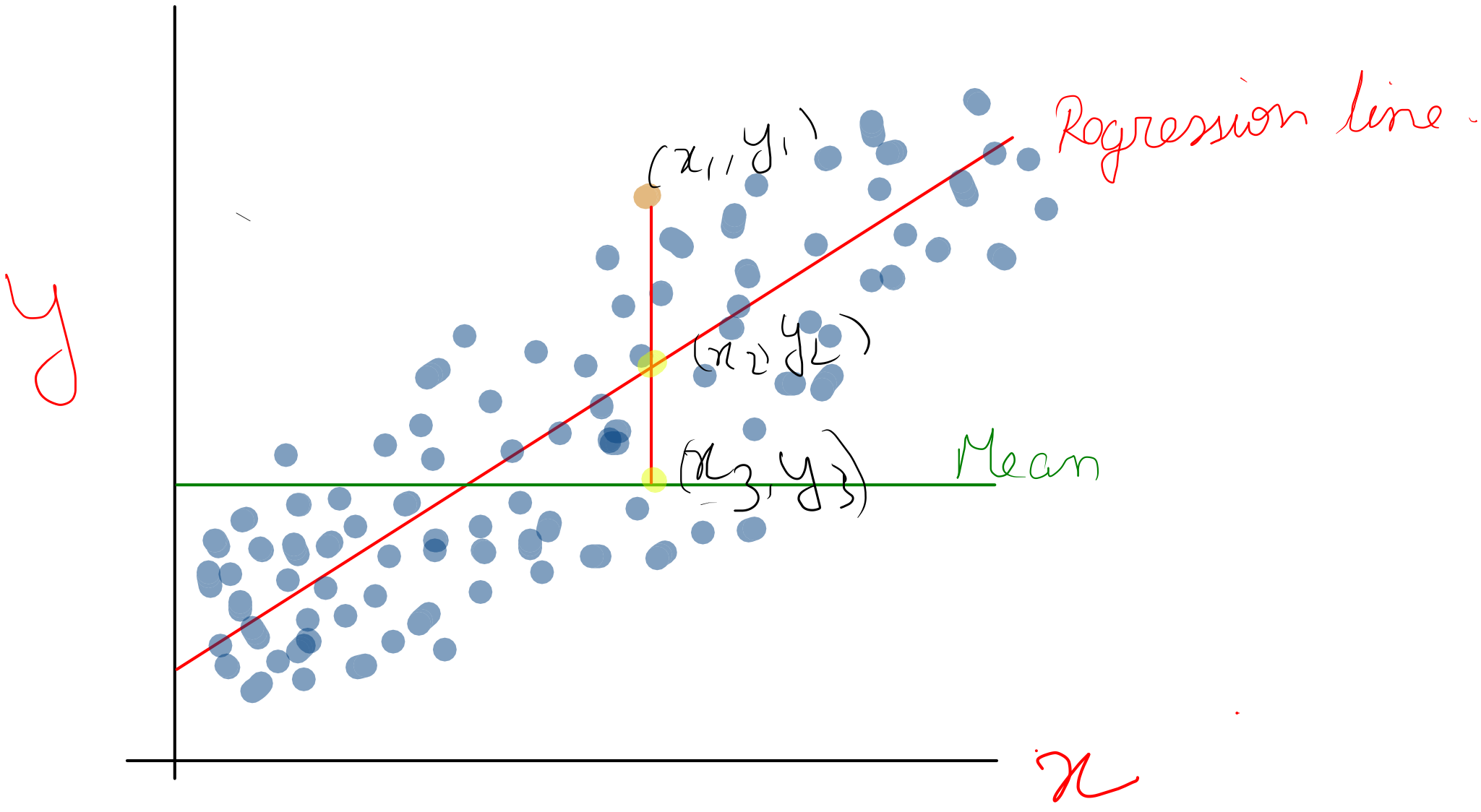
1) MSE = Mean Square Error

2) R^2 or R_{square} (Coefficient of Determinant)



$$R^2 = \frac{SSR}{SST} = \frac{SSR}{SSR + SSE}$$

SSR = Sum square Residual

$$= \sum (y_2 - y_3)^2$$

SST = Sum square Total =

SSE = Sum square Error = $\sum (y_1 - y_2)^2$

Higher the R^2 better is the model.

Apart from MSE, R^2 is also an good cost function for MSE

Cost function is collection of Errors.

For now we only have 1 term is our Cost function.

other:

1) MSE
2) RMSE = $\sqrt{MSE}$
3) R^2
4) Adjusted R^2
5) MAPE

$$\text{Adjusted } R^2 = 1 - \left[\frac{(1-R^2)(N-1)}{N-k-1} \right]$$

R^2 = R square of coeff of determinant

N = No of instances / rows

k = no of features (columns)

Mathmatically it is possible to Adjusted R^2 to be -ve. But in that case our R^2 is very less. Hence we can discard the model or it is of no use.

MAPE = Mean absolute percentage

error = prediction.

$$= \frac{1}{n} \left| \sum_{i=1}^{n} \frac{(\hat{y} - y_i)}{y_i} \times 100 \right|$$

$$= \frac{\text{error}}{\text{actual}} \times 100$$

Linear

$\hat{y} = \theta^T \cdot X$

$y = mx + c$

$X = [c, x_1, x_2, x_3 \ldots ; x_n]$

$\theta^T = \begin{bmatrix} 1 \\ \theta_1 \\ \theta_2 \\ \theta_3 \\ \theta_4 \\ \vdots \\ \theta_n \end{bmatrix}$

$y = c + \theta_1 x_1 + \theta_2 x_2 \ldots$

$+ \theta_n x_n$

MSE(θ) = Mean squar Error

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

$$MSE(\theta) = \frac{1}{n} \sum_{i=1}^{n} \left(\theta^T \cdot x - y \right)^2$$

$\theta_1, \theta_2 \theta_3 \theta_4$ - -

$\frac{\partial}{\partial \theta_1} MSE(\theta)$, $\frac{\partial}{\partial \theta_2} MSE(\theta)$ .. $\frac{\partial}{\partial \theta_n} MSE(\theta)$

$$\hat{\theta}_{(best)} = (X^T \cdot X)^{-1} \cdot X^T \cdot y$$

↓ Minimize my Cost function

↳ Target value.

↳ Training set.

↳ Vector.

That inverse of $(n \times n)$ matrix = takes $O(n^{2.4})$ time

$(1000)^3 = 10^9$ Limit python is 10^7 calculations in 1sec.

$(1000, 1)$ equation = 100 sec

$(10000, 1)$ $= \frac{10^{12}}{10^7} = \frac{10,0000}{3600}$

$= 27.778$

hours