

In batch gradient descent ton MIR, we need to itercatively update Boloffed) and B1, \$2,..., Pm (coefficients) as ben the following equations:

Let's calculate the loss tunction (L) and respective slopes for eq. (3):

L=1055 tunction =
$$\frac{1}{n}\sum_{i=1}^{N}(y_i-\hat{y}_i)^2$$
 => denotes MSE(mean squared error)

From eq. (1), 9; cambe written as:

Hence,



Consider, in the given data set,

no no. of rows | no. of data points

m > no. of ilbon briedicton vaniables

and there is single of p

Hence, the dataset can be look like:

XI	X2	1 73	1	1 xm	4,
XII	X12	X13		Xim	
X21	¥22	X23		X2m	72
		1			
				1 xnm	1 7

NOW, for MLR, the predicted of p cambe written as:

- where Bo = intercept offcet

Bis B2, B3, ..., Bm = coefficients, linked to m' no. of ilp variables

El abonciting eq. (1), we get:

Elaborating eq. (1), we get:

$$\hat{y}_1 = Bo + B_1 \times 11 + B_2 \times 12 + B_3 \times 13 + \cdots + B_m \times 1m$$

$$\hat{y}_1 = \beta_0 + \beta_1 \times 11 + \beta_2 \times 12 + \beta_3 \times 13 + \dots + \beta_m \times 2m$$

 $\hat{y}_2 = \beta_0 + \beta_1 \times 21 + \beta_2 \times 22 + \beta_3 \times 23 + \dots + \beta_m \times 3m$

$$\hat{y}_2 = \beta_0 + \beta_1 \times 21 + \beta_2 \times 22 + \beta_3 \times 23 + \cdots + \beta_m \times 5m$$

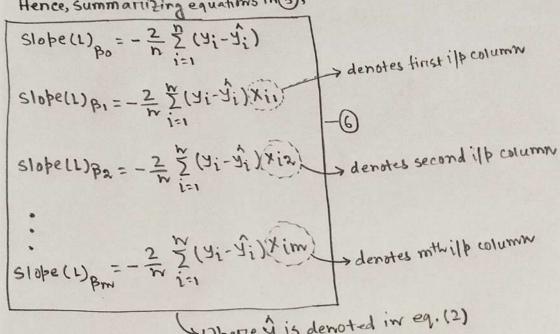
$$\hat{y}_3 = \beta_0 + \beta_1 \times 31 + \beta_2 \times 32 + \beta_3 \times 33 + \cdots + \beta_m \times 5m$$



And,
$$\frac{\partial L}{\partial \beta m} = \frac{1}{n} \sum_{i=1}^{N} 2(y_i - \hat{y_i}) (-x_{im})$$

$$\Rightarrow \frac{\partial L}{\partial \beta m} = -\frac{2}{n} \sum_{i=1}^{N} (y_i - \hat{y_i}) (x_{im}) - 6d$$

Hence, Summarizing equations in (5),



> Where g is denoted in eq. (2)

Implementation steps

- · calculate ŷ using eq. (2)
- . calculate slopes of loss function using eq. (6)
- · up date ten intencept and coefficients using eq. (3)