Assignment-5

let us consider a sample dataset have one input (x_i) and one output (y_i) and number of samples of , Develop a SLR model using MBGD

Sample (i)	x_i a	y_i a
1	0.2	3.4
2	0.4	3.8
3	0.6	4.2
4	0.8	4.6

Do manual calculations for 2 iterations with $bs = 2$

step 1 :- $[X, Y]$, $m = 1$, $c = -1$, $\eta = 0.1$, epochs = 2 , $bs = 2$

step 2: $nb = \frac{ns}{bs} = \frac{4}{2} = 2$

step 3: iter = 1

step4: Batch = 1

step 5:- $\frac{\partial E}{\partial m} = -\frac{1}{bs} \sum_{i=1}^{bs} (y_i - mx_i - c)\, x_i$

$$= -\frac{1}{2}\left[((3.4 - (1)\ (0.2) + 1)\ 0.2\right] + \left[3.8 - 0.4 + 1\right] 0.4\Big]$$

$$= -1.34$$

$$\frac{\partial E}{\partial c} = -\frac{1}{2}\left[(3.4 - 0.2(1) + (3.8 - 0.4 + 1)\right]$$

$$= -4.3$$

step 6 :- $\Delta m = -(0.1)(-1.34) = 0.134$

$\Delta c = -(0.1)(-4.3) = 0.43$

step 7 :- $m = \Delta m + m = 1 + 0.134 = 1.134$

$c = \Delta c + c = -1 + 0.43 = -0.57$

step 8 : Batch = Batch + 1

step 9 :- if (Batch > nb) : goto step 10

2 > 2

else goto step 5

step 10 : iter = iter + 1

= 1 + 1 = 2

step 11 :- if (iter > epochs) - goto step 12

2 > 2

else, go to step 4.

step 4 :- Batch = 1

$$\frac{\partial E}{\partial m} = -\frac{1}{2}\left[(3.4 - (1.4272)(0.2) + 0.1523)0.2 + (3.8 - (1.4272)(0.4) + 0.1523)0.4\right]$$

$$= -1.0029$$

$$\frac{\partial E}{\partial c} = -\frac{1}{2}\left[(3.4) - (1.4272)(0.2) + 0.1523) + (3.8) - (1.4272)(0.4) + 0.1523\right]$$

$$= -3.3241$$

step 6 :- $\Delta m = (-0.1)(-1.0029) \Rightarrow 0.1002$

$\Delta c = (-0.1)(-3.3241) \Rightarrow 0.3324$

step 7:- $m = \Delta m + m \Rightarrow 1.4272 + 0.1002 = 1.5274$

$c = c + \Delta c \Rightarrow -0.1523 + 0.332 = 0.1797$

step 8: Batch = Batch + 1 $\Rightarrow 1 + 1 = 2$

step 9: if (Batch > n_b) : goto step 10

$2 > 2$

else : goto step 7

step 5: $\frac{\partial E}{\partial m} = \frac{-1}{2}\Big[(4.2 - (1.5274)(0.6) - 0.1797)0.6 +$

$(4.6 - (1.5274)(0.8) - 0.1797)0.8\Big]$

$= -2.21$

$\frac{\partial E}{\partial c} = -3.151$

step 6: $\Delta m = -0.1 \times -2.21$

$= 0.221$

$\Delta c = -0.1 \times -3.121 \Rightarrow 0.315$

step 7: $m = m + \Delta m = 1.5274 + 0.221 = 1.748$

$c = c + \Delta c = 0.1797 + 0.315 = 0.494$

Step 8: Batch = Batch + 1

$= 2 + 1 = 3$

Step 9: if (Batch > nb) : goto step 10

$3 > 2$

else: goto step 5

Step 10 :- iter = iter + 1

= 2 + 1 = 3

step 11 : if (iter > epochs) : goto step 12

3 > 2

else : goto step 4

step 12 : print m, c

m = 1.748 , c = 0.494