

## Assignment-8:-

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

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

	$x$	$y$
batch-1.	0.2	3.4
	0.4	3.8
batch-2	0.6	4.2
	0.8	4.6

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

Step-4:- Batch=1

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

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

$$= -1.34$$

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

$$= -4.3$$

Step-6:-

$$\Delta m = -(0.1) (-1.34) = 0.134$$

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

Step-7:-

$$m = m + \Delta m = 1 + 0.134 = 1.134$$

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

Step-8:-

$$\text{Batch} \neq 1$$

$$1+1=2$$

Step-9:-

if (Batch > nb) : goto step 10

$$2 > 2$$

else : goto step 5

Step-5:-

$$\frac{\partial E}{\partial m} = \frac{-1}{2} [(4.2 - (1.134)(0.6) + 0.57) 0.6 +$$

$$(4.6 - (1.134)(0.8) + 0.57) 0.8]$$

$$\frac{\partial E}{\partial c} = \frac{-1}{2} [(4.22 - (1.134)(0.6) + 0.57) +$$

$$(4.6 - (1.134)(0.8) + 0.57)]$$

$$= -4.1762$$

Step-6:-

$$\Delta m = -(0.1) (-2.932) = 0.2932$$

$$\Delta c = -(0.1) (-4.1762) = 0.41762$$

Step - 7 :-  $m + \Delta m = 1.134 + 0.2932 = 1.4272$

$C + \Delta C = -0.57 + 0.4176 = -0.1523$

Step - 8 :- Batch  $+ = 1 \Rightarrow 2 + 1 = 3$

Step - 9 :- if (batch > nb) : goto step 10.

$3 > 2$

else : goto step 5

Step - 10 :-  $\text{itee} = \text{itee} + 1$   
 $= 1 + 1 = 2$

Step - 11 :- if (itee > epochs) : goto step 12.

$2 > 2$

else : goto step 4.

Step - 4 :- Batch = 1

Step 5 :- 
$$\frac{\partial E}{\partial m} = \frac{-1}{2} \left[ (3.4 - (1.4272)(0.2) + 0.1523)0.2 + (3.8 - (1.4272)(0.4) + 0.1523)0.4 \right]$$
  
 $= -1.0029$

$$\frac{\partial E}{\partial c} = \frac{-1}{2} \left[ (3.4 - (1.4272)(0.2) + 0.1523) + (3.8 - (1.4272)(0.4) + 0.1523) \right]$$
  
 $= -3.3241$

Step - 6 :-

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

$\Delta C = (-0.1)(-3.3241) \Rightarrow 0.332$



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

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

Step-8:- Batch  $+= 1 \Rightarrow 1+1 \Rightarrow 2$

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

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else goto step 5

Step-5:-  $\frac{\partial E}{\partial m} = \frac{1}{2} [(4.2 \cdot - (1.5274)(0.6) - 0.1797)(0.6 + (4.6 - (1.5274)(0.8) - 0.1797)(0.8)]$

$= -2.21$

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

Step-6:-  $\Delta m = -0.1 \times -2.21 = 0.221$

$\Delta C = -0.1 \times -3.151$

$= 0.315$

Step-7:-  $m += \Delta m = 1.5274 + 0.221 = 1.748$

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

Step-8:- Batch  $+= 1$

$= 2+1 = 3$

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

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else : goto step 5

Ans.

Step 10!  $iter = 1 \Rightarrow 2+1 = 3$ .

Step 11:- If ( $iter > epochs$ ) : goto step 12

$3 > 2$

else goto step 4

Step 12 :- print m, C.

$m = 1.748$  -  $C = 0.494$