

### Assignment - 3

let us consider sample dataset have one input ( $x_{i,a}$ ) and output ( $y_{i,a}$ ) and number of samples. Develop a sample regression model using stochastic gradient descent optimiser.

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

→ Manual calculations for 2 iterations, 2 samples

step 1:-  $x, y, m=1, c=-1, \eta=0.1, \text{epochs}=2,$

$$n_s = 2$$

step 2:-  $\text{itr} = 1$

step 3:-  $\text{sample} = 1$

$$\begin{aligned}\text{step 4:- } \frac{\partial E}{\partial m} &= - (3.4 - (1 \times 0.2) + 1)(0.2) \\ &= -0.84\end{aligned}$$

$$\begin{aligned}\frac{\partial E}{\partial c} &= - (3.4 - (1 \times 0.2) + 1) \\ &= -4.2\end{aligned}$$

$$\text{step 5 :- } \Delta m = -(0.1)(-0.54) = 0.084$$

$$\Delta c = -(0.1)(-4.2) = 0.42$$

$$\text{step 6 :- } m = m + \Delta m$$

$$= 1 + 0.084$$

$$= 1.084$$

$$c = c + \Delta c$$

$$= -1 + 0.42$$

$$= -0.58$$

$$\text{step 7 :- } \text{sample} = \text{sample} + 1$$

$$= 1 + 1$$

$$= 2$$

$$\text{step 8 :- } \begin{array}{l} \text{if (sample} > \text{ns)} \\ 2 > 2 \end{array} \left| \begin{array}{l} \text{if true goto step 9} \\ \text{else go to step 4} \end{array} \right.$$

goto step 4

$$\text{step 4 :- } \frac{\partial E}{\partial m} = - \left( 3.8 - (1.084)(0.4) + 0.58 \right) 0.4$$

$$= -1.5785$$

$$\frac{\partial E}{\partial c} = - \left( 3.8 - (1.084)(0.4) + 0.58 \right)$$

$$= -3.9464$$

Step 5 :-  $\Delta m = -(0.1)(-1.5785) = 0.1578$

$$\Delta c = -(0.1)(-3.9464) = 0.3946$$

Step 6 :-  $\text{sample} = \text{sample} + 1$

$$= 2 + 1$$

$$= 3$$

Step 7 :-  $m = m + \Delta m = 1.084 + 0.1578$

$$= 1.2418$$

$$c = c + \Delta c = -0.58 + 0.3946$$

$$= -0.1854$$

Step 8 :- if (sample > n<sub>s</sub>)

$$3 > 2$$

goto step 9

Step 9 :-  $\text{itr} = \text{itr} + 1$

$$= 1 + 1$$

$$= 2$$