

### Assignment -3.

Let us consider sample dataset have one input ( $x_{ia}$ ) and one output ( $y_{ia}$ ) and number of samples develop a sample regression model using stochastic gradient descent optimise.

Sample (i)	$x_{ia}$	$y_{ia}$
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, 2 samples.

Step -1:-  $x, y, m=1, c=-1, \lambda=0.1, \text{epoches}=2, ns=2$ .

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

Step -3 :- Samples = 1

$$\begin{aligned}\text{Step -4:- } \frac{\partial E}{\partial m} &= \frac{1}{2} (8.4 - (1)) (0.2) - (-1) \cdot 0.2 \\ &= -0.84\end{aligned}$$

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

Step -5:-

$$\Delta m = - (0.1) (-0.84) = 0.084$$

$$\Delta C = -(0.1)(-4.2)$$

$$= 0.42$$

Step-6:-

$$m = m + \Delta m$$

$$= 1 + 0.084 = 1.084$$

$$C = C + \Delta C$$

$$= -1 + 0.42 = -0.58$$

Step-7:- Sample + = 1

$$= 1 + 1$$

$$= 2.$$

Step-8:- if (sample > ns)

$$2 > 2$$

goto step 9.

else

goto step 4.

Step-9:-

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

$$= -1.5785$$

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

$$= -3.9464$$

Step-5:-

$$\Delta m = -(0.1)(-1.5785) = 0.1578$$

$$\Delta C = -(0.1)(-3.9464) = 0.39464$$

\* Step 7:-

Sample  $t = 1$

$$= 2 + 1 = 3.$$

Step 6:-

$$m = m + \Delta m = 1.084 + 0.1578 = 1.2418.$$

$$\Delta c = c + \Delta c = -0.58 + 0.3964 = -0.1854,$$

Step 8:-

if (sample > ns)

$$z > 2$$

goto step 9.

else -

goto step 4.

Step 9:-

ctr  $t = 1$

$$= 1 + 1 - 2.$$

Step 10:- if (iter > epochs)

$$2 > 2$$

goto step 11

else -

goto step 3.

Step 3:-

Sample = 1

Step-4:-

$$\begin{aligned}\frac{\partial E}{\partial m} &= -(3.4 - (1.2)(0.2) + 0.18) 0.2 \\ &= -(3.34) 0.2 \\ &= -0.668\end{aligned}$$

$$\begin{aligned}\frac{\partial E}{\partial c} &= -(3.4 - (1.2)(0.2) + 0.18) \\ &= -3.34\end{aligned}$$

Step-5:-

$$\begin{aligned}\Delta m &= -(0.1)(-0.668) \\ &= 0.0668\end{aligned}$$

Step-6:-

$$m = m + \Delta m = 1.24 + 0.066 = 1.3$$

$$c = c + \Delta c = 0.18 + 0.33 = 0.18$$

Step-7:- sample + = 1

$$= 1 + 1 = 2.$$

Step-8!- if (sample > ns)

2x2

goto step 9

else

goto step 4.

Step-4:-

$$\frac{\partial E}{\partial m} = -(3.8 - (1.3)(0.4) - 0.15)(0.4)$$

Step - 4 :-

$$\frac{\partial E}{\partial m} = -(2.8 - (1.3)(0.4) - 0.18) 0.4 \\ \Rightarrow -1.25$$

$$\frac{\partial E}{\partial c} = -(2.8 - (1.3)(0.4) - 0.18) \\ \Rightarrow -3.13$$

Step - 5 :-

$$\Delta m = -(0.1)(-1.25) = 0.12$$

$$\Delta C = -(0.1)(-3.13) = 0.31$$

Proposed Solution :-

Step - 6 :-

$$m_2 = m + \Delta m = 1.3 + 0.12 = 1.42$$

$$C = C + \Delta C = 0.15 + 0.31 = 0.46$$

Step - 7 :-

$$\text{Sample} = \text{sample} + 1$$

$$\Rightarrow 2+1 = 3$$

Step - 8 :- if (sample > ns)

$$3 > 2$$

goto step 9

else

goto step 4

Step - 9 :-

$$i_{ter} = i_{ter} + 1$$

$$\Rightarrow 2+1 = 3$$

num  
u

Step - 10 :-

if ( $\text{iter} > \text{epoch}$ )

$3 > 2$

goto step 11

else

goto step 3.

Step 11 :-

print m & c.

$m = 1.42$

$c = 0.46$