Assignment - 7 :-

Let consider a sample dataset have one Input (xi) and the output (yi) and number of samples & develop a sample linear regression model by using BGD

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 2 iterations with 2 samples.

Step-1 :- [x, y] ; m = 1, c = -1, $\eta = 0.1$, epochs = 2, ns = 2.

Step-2 :- iter = 1

Step-3 :- $\frac{\partial E}{\partial m} = \frac{-1}{ns} \sum_{i=1}^{ns} (y_i - m x_i - c)\, x_i$

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

$= -1.34.$

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

$= -4.3$

Step-4:-

$$\Delta m = -\eta \frac{\partial E}{\partial m}$$

$$= -0.1 \times -1.34 = 0.134$$

$$\Delta c = -\eta \frac{\partial E}{\partial c}$$

$$= -0.1 \times -4.3 = 0.43$$

Step-5:-

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

$$c = c + \Delta c = -0.1 \times -4.3 = 0.4c.$$

Step 6 : iter += 1

$= 1+1 = 2.$

Step 7:- if (iter > epochs) : goto step 8.

2 > 2

else goto step 3

Step-8:- $\frac{\partial E}{\partial m} = \frac{-1}{2}[(3.4 - (1.134)(0.2) + 0.57(0.2) +$

$(3.8 - (1.134)(0.4) + 0.57)(0.4)]$

$= -1.157$

$\frac{\partial E}{\partial c} = \frac{-1}{2}[(3.4 - (1.134)(0.2) + 0.57) +$

$(3.8 - (1.134)(0.4) + 0.57)]$

$= -3.829.$

Step - 4 :- $\Delta m = -0.1 \times -1.157 = 0.1157$

$\Delta c = -0.1 \times -3.829 = 0.3829$

Step - 5 :-

$m = m + \Delta m = 1.134 + 0.1157 = 1.2497$

$c = c + \Delta c = -0.57 + 0.3829 = -0.187$

Step - 6 : iter += 1

$\Rightarrow 2 + 1 = 3$

Step - 7 :- if (iter > epochs) : goto step 8.

$3 > 2$

else : goto step 3.

Step - 8 :- $m = 1.2497$ $c = -0.1871$