Assignment -7

Develop a simple linear Regression model using BGD for the following data where $n_s = 4$.

Sample (i)	x_i	$\hat{y}_i$
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 first 2 Samples.

X	Y
0.2	3.4
0.4	3.8

Step1 : $[n, y]$, $m = 1$, $c = -1$, $\eta = 0.1$, epochs = 2, $n_s = 2$

Step2: iter = 1

Step 3 : $\dfrac{\partial E}{\partial m} = \dfrac{-1}{n_s} \sum\limits_{i=1}^{n_s} (y_i - m x_i - c) x_i$

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

$= -1.3$ //

$\dfrac{\partial E}{\partial c} = \dfrac{-1}{n_s} \sum\limits_{i=1}^{n_s} (y_i - m x_i - c)$

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

$= -4.3$ //

Step 4 : $\Delta m = -\eta \dfrac{\partial E}{\partial m} = -(0.1)(-1.3) = 0.13$ //

$\Delta c = -\eta \dfrac{\partial E}{\partial c} = -(0.1)(-4.3) = 0.43$ //

Step 5: $m = m + \Delta m = 1 + 0.13 = 1.13$ //

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

$$\boxed{\begin{array}{l} m = 1.13 \\ c = -0.57 \end{array}}$$

Step 6: iter = 1 + 1 = 2

no

else

goto step 3.

step 3:. $\dfrac{\partial E}{\partial m} = -\dfrac{1}{ns} \overset{ns}{\underset{i=1}{\sum}} (y_i - mx_i - c) x_i$

$= -\dfrac{1}{2} \left[(3.4 - (1.13)(0.2) + 0.57)(0.2) + (3.8 - (1.13)(0.4) + 0.57)(0.4) \right]$

$= -1.158$

$\dfrac{\partial E}{\partial c} = -\dfrac{1}{ns} \overset{ns}{\underset{i=1}{\sum}} (y_i - mx_i - c)$

$= -\dfrac{1}{2} \left[(3.4 - (1.13)(0.2) + 0.57) + (3.8 - (1.13)(0.4) + 0.57) \right]$

$= -3.831$

Step 4: $\Delta m = -n \cdot \dfrac{\partial E}{\partial m} = -(0.1)(-1.158) = 0.1158$

$\Delta c = -n \cdot \dfrac{\partial E}{\partial c} = -(0.1)(-3.831) = 0.3831$

Step 5: $m = m + \Delta m = 1.13 + 0.1158 = 1.2458$

$c = c + \Delta c = -0.57 + 0.3831 = -0.1869$

Step 6: iter $= 2 + 1 = 3$

Step7 : if (iter$\overset{3 > 2}{>}$epochs)

yes, goto step 8.

Steps: print (m, c)

$\boxed{m = 1.2458}$ $\boxed{c = -0.1869}$