Assignment - 7

→ Do manual calculations for two iterations with first two samples using BGD optimizer.

Sample (i)	x_i	y
1	0.2	3.4
2	0.4	3.8

$$E = \frac{1}{2n_s} \sum_{i=1}^{n_s} (y_i - mx_i - c)^2$$

$$E = \frac{1}{2n_s} \sum_{i=1}^{n_s} (y_i^a - y_i)^2$$

Step 1:- Read dataset, $\eta = 0.1$, epochs = 2, $m = 1$, $c = -1$

Step 2:- iter = 1

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

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

$$\frac{\partial E}{\partial c} = \frac{-1}{n_s} \sum_{i=1}^{n_s} (y_i - mx_i - c)$$

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

$$\frac{\partial E}{\partial c} = -4.3 \qquad \frac{\partial E}{\partial m} = -1.3$$

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

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

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

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

Step6:- iter = iter + 1

Step7:- if ($iter^2 > epoch^2$)
next step 8 ✓
else
step 3 ✓

~~Step 8:- m = 1.13 c = 0.57~~

Step 3:- $\frac{\partial E}{\partial m} = -\frac{1}{2}[(3.4-(1.13)(0.2)+0.57)0.2 + (3.8-(1.13)(0.4)+0.57)0.4]$

$= -\frac{1}{2}[3.744 \times 0.2 + 3.918 \times 0.4]$

$= -1.158$

$\frac{\partial E}{\partial c} = -\frac{1}{2}[(3.4-(1.13)(0.2)+0.57)+(3.8-(1.13)(0.4)+0.57)]$

$= -\frac{1}{2}[3.744+3.918]$

$= -3.831$

Step 4:- $\Delta m = -\eta \frac{\partial E}{\partial m} = -(0.1)(-1.158) = 0.1158$

$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.1)(-3.831) = 0.3831$

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 = iter + 1

Step 7:- if (3 > 2)
step 8

Step 8:- m = 1.2458, c = -0.1869