Assignment-5

Do manual calculations for two iterations with batchsize -2 (MBGD optimizer)

	Samples	X	Y
Batch 1	1	0.2	3.4
	2	0.4	3.8
Batch 2	3	0.6	4.2
	4	0.8	4.6

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

Step1:- $m = 1$, $c = -1$, epochs = 2, $\eta = 0.1$, $b = 2$,

Step2:- split data into 'b' batches

step3:- iter = 1

Step4:- batch = 1

Step.5:- $\frac{\partial E}{\partial m} = -\frac{1}{b} \sum_{i=1}^{b} (y_i - mx_i - c) x_i$

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

$$= -\frac{1}{2} [0.84 + 1.76]$$

$$= -1.3$$

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

$$= -\frac{1}{2} [4.2 + 4.4]$$

$$= -4.3$$

Step6:- $\Delta m = -\eta \frac{\partial E}{\partial m} = -(0.1)(-1.3) = 0.13$

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

Step7:- $m = m + \Delta m = 1 + 0.13 = 1.13$

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

$m = 1.13, c = -0.57$

Step8:- batch = 1 + 1 = 2

Step9:- if (batch > 2)

step 8

else

step 5

Step5:- $\frac{\partial E}{\partial m} = -\frac{1}{2}\left[(4.2 - (1.13) * (0.6) + 0.57) * 0.6 + (4.6 - (1.13) * (0.8) + 0.57) * 0.8\right]$

$= -2.934$

$\frac{\partial E}{\partial c} = -\frac{1}{2}\left[(4.2 - 1.13 + 0.6 + 0.57) + (4.6 - 1.13 * 0.8 + 0.57)\right]$

$\frac{\partial E}{\partial c} = -4.179, \frac{\partial E}{\partial m} = -2.934$

Step6:- $\Delta m = (-0.1) \times (-2.934) = 0.2934$

$\Delta c = (-0.1) \times (-4.179) = 0.417$

Step7:- $m = m + \Delta m = 1 + 0.2934 = 1.2934$

$c = c + \Delta c = -1 + 0.417 = -0.583$

Step8: batch = 2 + 1 = 3.

Step 9:- if (3>2)
    Step 10
  else
    Step 5

Step 10:- iter = 1+1 = 2

Step 11:- if (iter > epoch)
    (2 > 2)
    Step 12
  else
    Step 4

Step 4:- Batch = 1

Step 5:- $\frac{\partial E}{\partial m} = -0.5 \times ((3.4 - (1.29)(0.2) + 0.58) \times 0.2 + (3.8 - (1.29)(0.4) + 0.58) \times 0.4)]$

$\frac{\partial E}{\partial m} = -0.5 \times (0.744 + 1.5458)$

$\frac{\partial E}{\partial m} = -1.14$

$\frac{\partial E}{\partial c} = -0.5((3.4 - (1.29)(0.2) + 0.58) + (3.8 - (1.29)(0.4) + 0.58))$

$= -0.5(3.722 + 3.864)$

$= -3.793$

Step 6:- $\Delta m = (0.1)(-1.14) = 0.114$

$\Delta c = (0.1)(-3.793) = 0.379$

Step 7:- $m = m + \Delta m = 1.2934 + 0.114 = 1.4074$

$c = c + \Delta c = -0.583 + 0.379 = -0.204$

Step 8 :- Batch = 2

Step 9 :- if (2 > 2)
Step 10
else
Step 5

Step 5 = $\frac{\partial E}{\partial m} = -0.5[(4.2 - (1.407 \times 0.6) + 0.204)0.6 + (4.6 - (1.407 \times 0.8) + 0.204)0.8]$

$= -0.5[3.55 \times 0.6 + 3.67 \times 0.8]$

~~$= -0.5[$~~ $= -2.533$

$\frac{\partial E}{\partial c} = -0.5[3.55 + 3.67]$

$= -3.61$

Step 6 :- $\Delta m = (0.1) \times (-2.533) = 0.253$

$\Delta c = (-0.1) \times (-3.61) = 0.361$

Step 7 :- $m = m + \Delta m = 1.407 + 0.253 = 1.66$

$c = c + \Delta c = -0.204 + 0.361$

$= 0.157$

Step 8 :- Batch = 3

Step 9 :- if (3 > 2)
Step 10

Step 10 :- iter = 3

Step 11 :- if (3 > 2)
step 12

Step 12 :- m = 1.66, c = 0.157