Assignment :- 5

18K41A0588

manual calculations :

step:-1

read dataset[x,y], $\eta = 0.1$, $m = 1$ $c = -1$,

epoches = 2, batch_size = 2

x	Y
0.2	3.4
0.4	3.8
0.6	4.2
0.8	4.6

step:-2 splitting data into batches

batch 1

0.2	3.4
0.8	4.6

batch 2

0.4	3.8
0.6	4.2

step:-3 iter = 1

step:-4 batch = 1

step:-5 calculate gradient descents

$$\frac{\partial E}{\partial m} = \frac{-1}{2}\left[(3.4-(1)(0.2)-(-1)(0.2)+ (4.6-(1)(0.8)-(-1)(0.8)\right]$$

$$= \frac{-1}{2}\left[(3.4-0.2+1)(0.2)+(4.6-0.8+1)(0.8)\right]$$

$$= \frac{-1}{2}\left[(4.2)(0.2)+(4.8)(0.8)\right] = \frac{-1}{2}[4.68]$$

$$= -2.34$$

$$\frac{\partial E}{\partial c} = -\frac{1}{2}[4.2 + 4.8] = -9.0/2 = -4.5$$

step 6: $\Delta m = -\eta \frac{\partial E}{\partial m} = 0.234$, $\Delta c = 0.45$

step 7: $m = m + \Delta m \Rightarrow 1 + 0.234 = 1.234$

$c = c + \Delta c = -1 + 0.45 = -0.55$

step 8: batch = batch + 1 = -1 + 1 = 2

step 10: if batch > no. of batches $\Rightarrow 2 > 2$ = false

Goto step 5

step 11: $\frac{\partial E}{\partial m} = \frac{-1}{n_6} \sum_{ix}^{n_6} (y_i - mx_i - c)x_i$

$= \frac{-1}{2}[(3.8 - (1.234 \times 0.4) + 0.55)(0.4) + (4.2 - (1.234 \times 0.6) + 0.55)(0.6)]$

$= \frac{-1}{2} \times [(3.8564)(0.4) + (4.0096)(0.6)]$

$= -1.97416$

$\frac{\partial E}{\partial c} = -\frac{1}{2}[3.8564 + 4.0096] = -3.933$

step 12: $\Delta m = -\eta \frac{dE}{\partial m} = 0.197416$

$\Delta c = -\eta \frac{dE}{\partial c} = 0.3933$

step -13 : $m = 1.234 + 0.197416 = 1.4314$

$c = -0.55 + 0.3933 = -0.1567$

step -14 : batch = batch + 1 $\Rightarrow 2+1 = 3$

step-15 : if batch $> n_b \Rightarrow 3 > 2$

goto step 16

step-16 : iter = iter + 1 $= 1+1 = 2$

step-17 :- if iter > epoch $\Rightarrow$ $2 > 2$

false

$\Rightarrow$ goto step 4

step -18 :- batch = 1

step-19 : $\frac{\partial E}{\partial m} = \frac{-1}{2} \times [(3.4 - (1.4314)(0.2) + 0.1567)(0.2) +$

$(4.6 - (1.4314)(0.8) + 0.1567)(0.8)]$

$= \frac{-1}{2} \times [(3.27042)(0.2) + (3.61158)(0.8)]$

$= \frac{-1}{2} \times [0.65408 + 2.88926] = -1.77167$

$\frac{\partial E}{\partial c} = \frac{-1}{2} [3.27042 + 3.61158] = -3.441$

step -20 : $\Delta m = -\eta \frac{dE}{\partial m} = 0.177167$

$\Delta c = -\eta \frac{dE}{\partial c} = 0.3441$

Step-21 :- $m = m + \Delta m = 1.4314 + 0.177167$

$= 1.60856$

$C = C + \Delta C = -0.1567 + 0.3441$

$= 0.1874$

Step-22 :- batch = batch + 1 = 1 + 1 = 2

Step-23 :- if batch > Nb = 2 > 2

= false

goto step 5

Step-24 :- $\frac{\partial E}{\partial m} = -\frac{1}{2}[(3.8 - (1.60856)(0.4) - (0.1874)(0.4) + (4.2 - (1.60856)(0.6) - 0.1874)(0.6)]$

$= -\frac{1}{2}[(2.969147)(0.4) + (3.047464)(0.6)]$

$= -\frac{1}{2}[1.187668 + 1.828478] = -1.50807$

$\frac{\partial E}{\partial C} = -\frac{1}{2}[6.01663] = -3.00831$

Step-25 :- $\Delta m = 0.150807$, $\Delta C = 0.300831$

Step-26 :- $m = 1.60856 + 0.150807 = 1.759067$

$C = 0.1874 + 0.300831 = 0.488231$

step-27 :- batch = 2+1=3

step-28 :- if batch > no = 3 > 2 ⇒ goto step 29

step-29 :-

iter = iter + 1

= 2+1

= 3

step-30 :- if iter > epoch

⇒ 3 > 2

⇒ goto step 31

step-31 :- print (m, c)

⇒ 1.759067, 0.488231

step-32 :- mean square error

$$= \frac{(3.4 - 0.84004) + (3.8 - 1.19185) + (4.2 - 1.54367) + (4.6 - 1.89548)}{4}$$

mse = 2.63224