Assignment-5

- 18K41A0545

Let us consider a sample dataset have one input (x_i^a) & one output (y_i^a) & number of samples 4. Develop a simple linear regression model using MBGD

sample(i)	x_i^a	y_i^a
1	0.2	3.4
2	0.4	3.8
3	0.6	4.2
4	0.8	4.6

Sol:-

Batch-1

x	y
0.2	3.4
0.4	3.8

Batch-2

x	y
0.6	4.2
0.8	4.6

Step-1:- [x, y], m=1, c=-1, η=0.1, epochs=2,

bs = 2

Step 2:- $nb = \frac{n_s}{bs} = \frac{4}{2} = 2$

Step 3:- i=1

Step 4:- Batch = 1

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

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

$= -1.34$

$$\frac{\partial E}{\partial c} = \frac{-1}{2}[(3.4-0.2+1)+(3.6-0.4+1)]$$

$$= -4.3$$

Step 6:- $\Delta m = -(0.1)(-1.34) = 0.134$

$\Delta c = -(0.1)(-4.3) = 0.43$

Step 7:- $m = m + \Delta m = 1 + 0.134 = 1.134$

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

Step 8:- Batch += 1

1+1=2

Step 9:- if (Batch > nb)

step 10

else

step 5

Step 5:- $\frac{\partial E}{\partial m} = \frac{1}{2}[(4.2-(1.134)(0.6)+0.57)0.6+$

$(4.6-(1.134)(0.8)+0.57)0.8]$

$= -2.932$

$\frac{\partial E}{\partial c} = \frac{1}{2}[(4.2-(1.134)(0.6)+0.57)+(4.6-$

$(1.134)(0.8)+0.57)]$

$= -4.1762$

Step 6:- $\Delta m = -(0.1)(-2.932) = 0.2932$

$\Delta c = -(0.1)(-4.1762) = 0.41762$

Step 7:- $m = m + \Delta m$

$= 1.134 + 0.2932 = 1.4272$

$c = c + \Delta c$

$= -0.57 + 0.41762 = -0.1523$

Step 8:- Batch += 1

2+1=3

step-9 :- if (batch > nb)
step 10
else
step 5

step-10 :- i = i+1
1+1=2

step-11 :- if (i > epochs)
step 12
else
step 4

step-4 :- Batch = 1

step-5 :- $\frac{\partial E}{\partial m} = \frac{-1}{2}\{(3.4-(1.4272)(0.2)+0.1523)$
$0.2+(3.8-(1.4272)(0.4)+0.1523)0.4$
$= -1.0029$

$\frac{\partial E}{\partial c} = \frac{-1}{2}[(3.4)-(1.4272)(0.2)+0.1523)+$
$(3.8-(1.4272)(0.4)+0.1523]$
$= -3.3241$

step-6 :- $\Delta m = (-0.1)(-1.0029)$
$= 0.1002$
$\Delta c = (-0.1)(-3.324)$
$= 0.332$

step-7 :- $m = m+\Delta m$
$= 1.4272+0.1002 = 1.5274$
$c = c+\Delta c$
$= -0.1523+0.332 = 0.1797$

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

step 9 :- if (Batch > nb)
step 10

else

step 7

step 5 : $\frac{\partial E}{\partial m} = \frac{-1}{2}[(4.2) - (1.5274)(0.6) - 0.179) 0.6 + (4.6 - (1.5274)(0.6) - 0.179) 0.6$

$= -2.21$

$\frac{\partial E}{\partial c} = -3.151$

step 6 :- $\Delta m = -0.1 \times -2.21$

$= 0.221$

$\Delta c = -0.1 \times -3.151$

$= 0.315$

step 7 :- $m = m + \Delta m$

$= 1.5274 + 0.221$

$= 1.748$

$c = c + \Delta c$

$= 0.1797 + 0.315$

$= 0.494$

step 8 :- Batch = 1

$2 + 1 = 3$

step 9 :- if (Batch > n b)

step - 10

else

step 5

step 10 :- i = 1

$2 + 1 = 3$

step 11 :- if (i > epochs)

step 12

else

step 4

step 12 - Print $m = 1.745$, $c = 0.494$