ASSIGNMENT-5

- 18K41A0502

Let us consider a sample dataset have one input (x_i^a) and one output (y_i^a) and number of samples 4 Develop a simple linear reggression 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

- Do manual calculations for two iterations with batch size 2.
- Write the python code to build simple linear regression model using MBGD optimizer (consider all 4 samples)

Batch 1

X	Y
0.2	3.4
0.4	3.8

Batch 2

X	Y
0.6	4.2
0.8	4.6

S-1: [X, Y], m=1, c=-1, η=0.1, epochs=2, bs=2

S-2: $nb = \frac{ns}{bs} = \frac{4}{2} = 2$

S-3: itr=1

S-4: Batch = 1

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

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

$= -1.34$

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

$= -4.3$

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

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

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

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

S-8: Batch = 1

$1+1=2$

S-9: If (Batch > nb)

goto S-10

$2 > 2$

else

goto S-5

S-5: $\frac{\partial t}{\partial m} = -\frac{1}{2}\{(4.2-(1.134)(0.6)+0.57)0.6 + (4.6-(1.134)(0.8)+0.57)0.8\}$

$= -2.932$

$\frac{\partial t}{\partial c} = -\frac{1}{2}\{(4.2-(1.134)(0.6)+0.57) + (4.6-(1.134)(0.8)+0.57)\}$

$= -4.1762$

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

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

S-7: $m_t = \Delta m = 1.134 + 0.2932 = 1.4272$

$c_t = \Delta c = -0.57 + 0.4176 = -0.1523$

S-8: Batch += 1

2+1=3

S-9: if (batch > nb)

goto S-10

3 > 2

else

goto S-5

S-10: ptr = ptr + 1

1+1=2

S-11: if (ptr > epochs)

goto S-12

2 > 2

else goto S-4

S-4: Batch = 1

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

$(3.8-(1.4272)(0.4)+0.1523)0.4\}$

$= -1.0029$

$\frac{\partial E}{\partial c} = \frac{-1}{2}\{(3.4)-(1.4272)(0.2)+0.1523)+$

$(3.8-(1.4272)(0.4)+0.1523\}$

$= -3.3241$

S-6: $\Delta m = (-0.1)(-1.0029)$

$= 0.1002$

$\Delta c = (-0.1)(-3.3291)$

$= 0.332$

S-7: $m_t = \Delta m$

$= 1.4272 + 0.1002 = 1.5274$

$c_t = \Delta c$

$= -0.1523 + 0.332 = 0.1797$

S-8: Batch += 1

$1 + 1 = 2$

S-9: if (Batch > nb)

goto S-10

$2 > 2$

else

goto S-7

S-5: $\frac{\partial E}{\partial m} = -\frac{1}{2}\{(4.2 - (1.5274)(0.6) - 0.1797)0.6 +$

$(4.6 - (1.5274)(0.8) - 0.1797)0.8\}$

$= 2.21$

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

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

$= 0.221$

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

$= 0.315$

S-7: $m + \Delta m = 1.5274 + 0.221$

$= 1.748$

&

$c + \Delta c = 0.1797 + 0.315$

$= 0.494$

S-8: Batch+=1

2+1=3

S-9: if (Batch>nb)

goto S-10

else

goto S-5

S-10: itr=1

2+1=3

S-11: if (itr>epochs)

3>2 goto S-12

else

goto S-4

S-12 & print m, c

m=1.748, c=0.494