Assignment - 5

18K41A0420

Let us consider a sample dataset have one input (x_i) and one output (y_i) and number of samples of, Develop a SLR model using MGBD.

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

→ Do manual calculations for 2 iterations with $bs = 2$

	x	y
batch 1 →	0.2	3.4
	0.4	3.8
batch 2 →	0.6	4.2
	0.8	4.6

Step 1: $[X, Y]$, $m = 1$, $c = -1$, $\eta = 0.1$, epochs = 9, $bs = 2$

Step 2: $nb = \frac{\eta s}{bs} = \frac{4}{2} = 2$

Step 3: iter = 1

Step 4: Batch = 1

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

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

$= -1.34$

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

$= -4.3$

step6: $\Delta m = -(0.1)(-1.54) = 0.134$

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

step7: $m = m + \Delta m = 1 + 0.134 = 1.134$

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

step8: Batch t = 1

1 + 1 = 2

step9: if (Batch > nb) : goto step10

2 > 2

else : go to step 5

step5: $\frac{\partial E}{\partial m} = -\frac{1}{2}\left[(4.2 - (1.134)(0.6) + 0.57)0.6 + [4.6 - (1.134)(0.8) + 0.57)0.8\right]$

$= -2.932$

$\frac{\partial E}{\partial c} = -\frac{1}{2}\left[[4.2 - (1.134)(0.6) + 0.57) + (4.6 - (1.134)(0.8) + 0.57)\right]$

$= -4.1762$

step6: $\Delta m = -(0.1)(-2.932) = 0.2932$

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

step7: $m_t = \Delta m = 1.34 + 0.2932 = 1.4272$

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

step8: Batch t = 1 $\Rightarrow$ 2 + 1 = 3

step9: if (batch > nb) ; goto step10

3 > 2

else:

go to step 5

step10: iter = iter+1
= 1+1 ⇒ 2

step11: if (iter > epochs) : goto step12
2 > 2
else:
goto step 4.

step4: Batch = 1

step5: $\frac{\partial E}{\partial m} = -\frac{1}{2}[(3.4 - (1.4272)(0.2) + 0.1523)0.2 + (3.8 - (1.4272)(0.4) + 0.1523)0.4]$

$= -1.0029$

$\frac{\partial E}{\partial c} = -\frac{1}{2}[(3.4) - (1.4272)(0.2) + 0.1523) + (3.88 - (1.4272)(0.4) + 0.1523]$

$= -3.3241$

step6: $\Delta m = (-0.1)(-1.0029) \Rightarrow 0.1002$

$\Delta c = (-0.1)(-3.3241) \Rightarrow 0.332$

step7: $m_t = \Delta m \Rightarrow 1.4272 + 0.1002 = 1.5274$

$c_t = \Delta c \Rightarrow -0.1523 + 0.332 = 0.1797$

step8: Batch_t = 1 ⇒ 1+1 ⇒ 2

step9: if (Batch > nb):
goto step 10
2 > 2
else: goto step 7.

step5: $\frac{\partial E}{\partial m} = -\frac{1}{2}[(4.2 - (1.5274)(0.6) - 0.1797)0.6 + (4.6 - (1.5274)(0.8) - 0.1797)0.8]$

$= -2.21$

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

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

$= 0.221$

$\Delta c = -0.1 \times -3.151 \Rightarrow 0.315$

step 7: $m_t = \Delta m = 1.5274 + 0.221 = 1.748$

$c_t = \Delta c = 0.1797 + 0.315 = 0.494$

step 8: Batch += 1

$= 2 + 1 = 3$

step 9: if (Batch > nb): goto step10

$3 > 2$

else: goto step5

step10: iter += 1 $\Rightarrow 2+1 \Rightarrow 3$

step11: if (iter > epochs): goto step12

$3 > 2$

else: goto step4

step12: print m, c

$m = 1.748$, $c = 0.494$.