

Assignment - 7

Develop a Simple Linear Regression Model using BGD for the following data where, $n_s = 4$.

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 2 iterations with first two samples.

X	Y
0.2	3.4
0.4	3.8

Step 1: $[x, y]$, $m=1$, $c=-1$, $\eta=0.1$, epochs = 2

Step 2: iter = 1

$n_s = 2$

Step 3: $\frac{\partial \mathcal{L}}{\partial m} = -\frac{1}{n_s} \sum_{i=1}^{n_s} (y_i - mx_i - c)x_i$

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

$$= -1.3 //$$

$$\frac{\partial \mathcal{L}}{\partial c} = -\frac{1}{n_s} \sum_{i=1}^{n_s} (y_i - mx_i - c)$$

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

$$= -4.3 //$$

Step 4: $\Delta m = \eta \frac{\partial \mathcal{L}}{\partial m} = -(0.1)(-1.3) = 0.13 //$

$$\Delta c = -\eta \frac{\partial \mathcal{L}}{\partial c} = -(0.1)(-4.3) = 0.43 //$$

Step 5: $m = m + \Delta m = 1 + 0.13 = 1.13 //$

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

$$m = 1.13$$

$$c = -0.57$$

Step 6: $iter = iter + 1 = 2$

Step 7: if ($iter \geq epochs$)

no

else

goto steps.

Step 3: $\frac{\partial \mathcal{L}}{\partial m} = \frac{-1}{n_s} \sum_{i=1}^{n_s} (y_i - mx_i - c) x_i$

$$= \frac{-1}{2} [(3.4 - (1.13)(0.2) + 0.57)(0.2) + (3.8 - (1.13)(0.4) + 0.57)(0.4)]$$

$$= -1.158 //$$

$$\frac{\partial \mathcal{L}}{\partial c} = \frac{-1}{n_s} \sum_{i=1}^{n_s} (y_i - mx_i - c)$$

$$= \frac{-1}{2} [(3.4 - (1.13)(0.2) + 0.57) + (3.8 - (1.13)(0.4) + 0.57)]$$

$$= -3.831 //$$

Step 4: $\Delta m = -\eta \frac{\partial \mathcal{L}}{\partial m} = -(0.1)(-1.158) = 0.1158 //$

$$\Delta c = -\eta \frac{\partial \mathcal{L}}{\partial c} = -(0.1)(-3.831) = 0.3831 //$$

Step 5: $m = m + \Delta m = 1.13 + 0.1158 = 1.2458 //$

$$c = c + \Delta c = -0.57 + 0.3831 = -0.1869 //$$

Step 6: $iter = 2 + 1 = 3 //$

step 7: if ($\overset{3 > 2}{\text{iter}} > \text{epochs}$)
yes, goto step 8.

step 8: if { print(m, c)

$$m = 1.2458$$

$$c = -0.1869$$