

Assignment - 7

Q) Develop a simple linear regression model using BGD.

Sample	X	Y
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 first two samples.

Sol) Step-1: $x, y, m=1, c=-1, \eta=0.1, \text{epochs}=2, ns=2$

Step-2: iter = 1

$$\begin{aligned}\text{Step-3: } \frac{\partial E}{\partial m} &= -\frac{1}{2} [(3.4 - (1)(0.2) + 1)0.2 + (3.8 - (1) \\ &\quad (0.4) + 1)0.4] \\ &= +1.34\end{aligned}$$

$$\begin{aligned}\frac{\partial E}{\partial c} &= -\frac{1}{2} [(3.4 - 0.2 + 1) + (3.8 - 0.4 + 1)] \\ &= -4.3\end{aligned}$$

$$\text{Step-4: } \Delta m = -0.1 \times (-1.34) = 0.134$$

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

$$\text{Step-5: } m = m + \Delta m = 1 + 0.134 = 1.134$$

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

Step-6: iter = 1+1 = 2

Step-7: if (2 > 2)
goto step 8
else
goto step 3

Step-3: $\frac{\partial E}{\partial m} = -\frac{1}{2} \left[(3.4 - (1.134)(0.2) + 0.57)(0.2) + (3.8 - (1.134)(0.4) + 0.57)(0.4) \right]$
 $= -1.157$

$$\frac{\partial E}{\partial c} = -\frac{1}{2} \left[(3.4 - (1.134)(0.2) + 0.57) + (3.8 - (1.134)(0.4) + 0.57) \right]$$
$$= -3.829$$

Step-4: $\Delta m = (-0.1)(-1.157) = 0.1157$
 $\Delta c = (-0.1)(-3.829) = 0.3829$

Step-5: $m = m + \Delta m = 1.134 + 0.1157 = 1.2497$
 $c = c + \Delta c = -0.57 + 0.3829 = -0.187$

Step-6: iter = 2+1 = 3

Step-7: if (3 > 2)
goto step 8

Step-8: $m = 1.2497$
 $c = -0.187$