

Assignment-7

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

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 first two sample.

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

Step 2 :- $i=1$

$$\begin{aligned}\text{Step 3 :- } \frac{\partial \epsilon}{\partial m} &= -\frac{1}{n_s} \sum_{i=1}^{n_s} (y_i - mx_i - c)x_i \\ &= -\frac{1}{2} [(3.4 - (1)(0.2) + 1)0.2 + (3.8 - (1)(0.4) + 1)0.4] \\ &= -1.34\end{aligned}$$

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

$$\begin{aligned}\text{Step 4 :- } \Delta m &= -\eta \frac{\partial \epsilon}{\partial m} \\ &= -0.1 \times -1.34 \\ &= 0.134 \\ \Delta c &= -\eta \frac{\partial \epsilon}{\partial c} \\ &= -0.1 \times -4.3 = 0.43\end{aligned}$$

$$\begin{aligned}\text{Step 5 :- } m+ &= \Delta m & c &= c + \Delta c \\ &= 1 + 0.134 & &= -0.1 \times 4.3 \\ &= 1.134 & &= 0.43\end{aligned}$$

Step 6:- $i+1$
 $1+1=2$

Step 7:- if ($i > \text{epochs}$)

Step 8
 else

Step 3

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

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

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

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

Step 6:- $i+1$
 $2+1=3$

Step 7:- if ($i > \text{epochs}$)

Step 8

else

Step 3

Step 8:- $m = 1.2497, c = -0.1871$