

ASSIGNMENT-13

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Let us consider a sample dataset have one input (x_i^a) and one output (y_i^a) and number of sample 4. Develop a simple linear regression model using FIDAGRAD optimizer.

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 samples.

step-1: $[x, y]$, epochs = 2, $m=1$, $c=-1$, $G_m=0$, $G_c=0$

$$\eta = 0.1, \quad \epsilon = 10^{-8}$$

step-2: $itr=1$

step-3: sample = 1

$$\text{step-4: } g_m = -(3.4 - (1)(0.2) + 1)0.2 = -0.84$$

$$g_c = -(3.4 - (1)(0.2) + 1) = -4.2$$

$$\text{step-5: } G_m = 0 + (-0.84)^2 = 0.7056$$

$$G_c = 0 + (-4.2)^2 = 17.64$$

$$\begin{aligned} \text{step-6: } \Delta m &= \frac{-\eta}{\sqrt{G_m + \epsilon}} g_m \\ &= \frac{-(0.1)}{\sqrt{0.7056 + 10^{-3}}} * -0.84 \end{aligned}$$

$$\approx 0.09$$

$$\Delta c = \frac{-(0.1)}{\sqrt{17.64 + 10^8}} \times -4.2$$

$$= 0.09$$

step - 7 :- $m = m + \Delta m = 1 + 0.09 = 1.09$

$$c = c + \Delta c = -1 + 0.09 = -0.91$$

step - 8 :- $\text{Sample} = \text{Sample} + 1$

$$= 1 + 1$$

step - 9 : if (sample ^{= 2} > ns) goto step - 10

$$2 > 2$$

else

step 4

step 4 : $g_m = -(3.8 - (1.09)(0.4) + 0.91)0.4 = -1.7$

$$g_c = -(3.8 - (1.09)(0.4) + 0.91) = -4.27$$

step - 5 : $E_m = 0.7056 + (-1.7)^2 = 3.59$

$$E_c = 17.64 + (-4.22)^2 = 35.87$$

step 6 : $\Delta m = \frac{-0.1}{\sqrt{3.59 + 10^8}} \times -1.7 = 0.08$

$$\Delta c = \frac{-0.1}{\sqrt{35.87 + 10^8}} \times -4.27 = 0.07$$

step - 7 :- $m, m + \Delta m = 1.09 + 0.08 = 1.17$

$$c = c + \Delta c = -0.91 + 0.07 = -0.84$$

step 8 :- $\text{Sample} = \text{sample} + 1$

$$= 2 + 1 = 3$$

step 9 : if (sample ^{= 3} > ns) goto step 10

else

goto step - 4

step - 10 : $\text{itr} = \text{itr} + 1 = 1 + 1 = 2$

step - 11 :- if (itr > epochs) goto step - 12

$$2 > 2$$

else

goto step - 3

step 3 : $\text{Sample} = 1$

$$\text{Step 4 :- } g_m = -(3.4 - (1.17)(0.2) + 0.84)0.2 = -0.80$$

$$g_c = -(3.4 - (1.17)(0.2) + 0.84) = -4.0$$

$$\text{Step 5 :- } G_m = 3.59 + (-0.80)^2 = 4.23$$

$$G_c = 35.89 + (-4.0)^2 = 51.89$$

$$\text{Step 6 :- } \Delta m = \frac{-0.1}{\sqrt{4.23 + 10^{-8}}} \times -0.80 = 0.038$$

$$\Delta c = \frac{-0.1}{\sqrt{51.89 + 10^{-8}}} \times -4.0 = 0.05$$

$$\text{Step 7 :- } m = m + \Delta m = 0.038 + 1.17 = 1.208$$

$$c = c + \Delta c = -0.84 + 0.05 = -0.79$$

$$\text{Step 8 :- } \text{Sample} = \text{Sample} + 1 = 1 + 1 = 2$$

$$\text{Step 9 :- } \text{if (Sample} > \text{ns)} \text{ goto step - 10}$$

$$\text{else}$$

$$\text{goto step - 4.}$$

$$\text{Step 4 :- } g_m = -(3.8 - (1.20)(0.4) + 0.79) * 0.4 = -1.64$$

$$g_c = -(3.8 - (1.20)(0.4) + 0.79) = -4.11$$

$$\text{Step 5 :- } G_m = 4.23 + (-1.64)^2 = 6.9$$

$$G_c = 51.89 + (-4.11)^2 = 68.7$$

$$\text{Step 6 :- } \Delta m = \frac{-0.1}{\sqrt{6.9 + 10^{-8}}} \times -1.64 = 0.06$$

$$\Delta c = \frac{-0.1}{\sqrt{68.7 + 10^{-8}}} \times -4.11 = 0.04$$

$$\text{Step 7 :- } m = m + \Delta m = 1.208 + 0.06 = 1.26$$

$$c = c + \Delta c = -0.79 + 0.04 = -0.75$$

$$\text{Step 8 :- } \text{sample} = \text{sample} + 1$$

$$= 2 + 1$$

Step 9 :- if (sample > ns)
3 > 2 goto step-10

else
goto step-4 .

step-10 :- ita = ita + 1
= 2 + 1
= 3

step-11 :- if (ita > epochs)
3 > 2 goto step-12

else
goto step-3 .

step-12 :- m = 1.26
C = -0.75