

Assignment - 9

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* Simple Linear regression model using momentum 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 2 samples.

Calculations

Step 1:- $[x, y] ; m=1, c=-1, \eta=0.1, \text{epochs}=2, \gamma=0.9, \partial_m = \partial_c = 0, n_s = 2$

Step 2:- iter = 1

Step 3:- Sample = 1

$$\text{Step 4:- } E = \frac{1}{2} (y_i - mx_i - c)^2$$

$$g_m = \frac{\partial E}{\partial m} = -(y_i - mx_i - c) x_i$$

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

$$= -0.84$$

$$g_c = \frac{\partial E}{\partial c} = -(y_i - mx_i - c)$$

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

$$= -4.2$$

$$\begin{aligned}\text{Step5:- } \quad & V_m = 8V_m - 2g_m \\ & = (0.9)0 - (0.1)(-0.84) \\ & = 0 + 0.084 \Rightarrow 0.084\end{aligned}$$

$$\begin{aligned}V_C &= 8V_C - 2g_C \\ &= (0.9)0 - (0.1)(-4.2) \Rightarrow 0.42\end{aligned}$$

$$\begin{aligned}\text{Step6:- } \quad & m = m + \Delta m = 1 + (0.084) = 1.084 \\ & C = C + \Delta_C = -1 + 0.42 = -0.58\end{aligned}$$

Step7:- sample+ = 1

Step8:- if (sample > 7s) || Q > 2
 goto step 9

else
 goto step 4

$$\begin{aligned}\text{Step9:- } \quad & g_m = \frac{\partial E}{\partial m} = - (3.8 - (1.084)(0.4) + 0.58) \\ & \qquad \qquad \qquad (0.4) \\ & = -1.5785\end{aligned}$$

$$g_C = \frac{\partial E}{\partial C} = -3.9464$$

$$\begin{aligned}\text{Step10:- } \quad & \Delta m = 8\Delta m - 2g_m \\ & = (0.9)(0.084) - (0.1)(-1.5785) \\ & = 0.0756 + 0.1578 \\ & = 0.2334\end{aligned}$$

$$\nabla c = 8\nabla_c - \nabla g_c$$

$$= (0.9)(0.42) - (0.1)(-3.9464)$$

$$= 0.378 + 0.3946$$

$$= 0.7726$$

step 6:- $m = m + \nabla m = (1.08u) + (0.233u) = 1.3174$

$$c = c + \nabla c = (-0.58) + (0.7726) = 0.1926$$

step 7:- Sample $t = 1$

step 8:- if ($\text{sample} > n_s$) || $3 > 2$
goto step 9

else
goto step 4.

step 9:- $\text{iter } t = 1$

step 10:- if ($\text{iter} > \text{epochs}$) || $3 > 2$
goto step 11

else
goto step 3

step 11:- point (m, c)

$$m = 1.3174$$

$$c = 0.1926$$