

Assignment - 9

Do manual calculations for two iterations with first two samples (momentum optimizer)

Sample	x	y
1	0.2	3.4
2	0.4	3.8

$$v_t = \gamma v_{t-1} - \eta \frac{\partial F(x)}{\partial x}$$

$$x = x + v_t$$

$$\gamma \rightarrow 0.5 - 0.9$$

Step 1: $\eta = 0.1$, $m = 1$, $c = -1$, epochs = 2,

$$\gamma = 0.9, v_m = 0, v_c = 0.$$

Step 2: iter = 1

Step 3: sample = 1

$$\begin{aligned} \text{Step 4: } \frac{\partial E}{\partial m} &= -(3.4 - (1)(0.2) + 1)0.2 \\ &= -4.2 \cdot -0.84 \end{aligned}$$

$$\frac{\partial E}{\partial c} = -(3.8 - (1)(0.4) + 1)0.4 = -4.2$$

$$\text{Step 5: } v_m = \gamma v_m - \eta \frac{\partial E}{\partial m} = 0.9 \times 0 - (0.1)(-0.84)$$

$$v_m = 0.084$$

$$v_c = \gamma v_c - \eta \frac{\partial E}{\partial c} = 0.9 \times 0 - (0.1)(-4.2)$$

$$v_c = 0.42$$

$$\text{step 6:- } m = m + V_m = 1 + 0.084 = 1.084$$

$$c = c + V_c = -1 + 0.42 = -0.58$$

step 7:- Sample = 2

step 8:- if (sample ² > 2)

step 9

else

step 4

$$\text{step 4:- } \frac{\partial E}{\partial m} = -0.4(3.8 - (1.084)(0.4) + 0.58)$$

$$= -1.578$$

$$\frac{\partial E}{\partial c} = -(3.8 - (1.084)(0.4) + 0.58)$$

$$= -3.94$$

$$\text{step 5:- } V_m = \eta V_m - \eta \frac{\partial E}{\partial m}$$

$$= 0.9 \times 0.084 - (0.1)(-1.578)$$

$$\boxed{V_m = 0.233}$$

$$V_c = \eta V_c - \eta \frac{\partial E}{\partial c}$$

$$= 0.9 \times 0.42 - (0.1)(-3.94)$$

$$\boxed{V_c = 0.772}$$

$$\text{step 6:- } m = m + V_m = 1.084 + 0.233 = 1.317$$

$$c = c + V_c = -0.53 + 0.772 = 0.192$$

step 7:- Sample = 3

step 8:- if (3 > 2)

step 9

Step 9 \Rightarrow iter = 2

Step 10 \Rightarrow if (2 > 2)

step 11

else

step 3.

Step 3 \Rightarrow sample = 1

$$\text{Step 4: } \frac{\partial E}{\partial m} = -(3.4 - 1.317 \times 0.2 - 0.192) \cdot 0.2$$
$$= -0.588$$

$$\frac{\partial E}{\partial c} = -(3.4 - 1.317 \times 0.2 - 0.192)$$
$$= -2.944$$

Steps:- $V_m = \delta V_m - \eta \frac{\partial E}{\partial m}$

$$= 0.9 \times 0.233 + (0.1)(0.588)$$

$$\boxed{V_m = 0.2685}$$

$$V_c = \delta V_c - \eta \frac{\partial E}{\partial c}$$

$$= 0.9 \times 0.772 + (0.1)(+2.944)$$

$$\boxed{V_c = 0.9892}$$

Step 6:- $m = m + V_m = 1.317 + 0.268 = 1.58$

$$c = c + V_c = 0.192 + 0.989 = 1.18$$

Step 7:- Sample = ~~zero~~ 2

Step 8:- if (2 > 2) else
step 9 step 4

$$\text{step 4:- } \frac{\partial E}{\partial m} = -(3.8 - 1.58 \times 0.4 - 1.18) \times 0.4$$

$$= -0.79$$

$$\frac{\partial E}{\partial c} = -(3.8 - 1.58 \times 0.4 - 1.18)$$

$$= -1.98$$

$$\text{step 5:- } V_m = \eta V_m - \eta \frac{\partial E}{\partial m}$$

$$= 0.9 \times 0.26 + (0.1) \times (0.79)$$

$$\boxed{V_m = 0.313}$$

$$V_c = \eta V_c - \eta \frac{\partial E}{\partial c}$$

$$= 0.9 \times 0.98 + 0.1 \times 1.98$$

$$\boxed{V_c = 1.08}$$

$$\text{Step 6:- } m = m + V_m = 1.58 + 0.313 = 1.89$$

$$c = c + V_c = 1.18 + 1.08 = 2.26$$

Step 7:- Sample = 3

Step 8:- if (3 > 2)

Step 9

Step 9:- iter = 3

Step 10:- if (3 > 2)

step 11

Step 11:- $m = 1.89, c = 2.26$.