

Assignment - 4

* Momentum optimizer

sample(i)	x_i	y_i
1	0.2	3.4
2	0.4	3.8
3	0.6	4.2
4	0.8	4.6

→ Manual calculations

Step 1: $[x, y]$, $m=1$, $c=-1$, $\eta=0.1$,

epochs = 100, $\gamma=0.9$, $V_m = V_c = 0$, $n_s=2$ ✓

Step 2: iter = 1

Step 3: sample = 1

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

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

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

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

$$= - (4.2)(0.2)$$

$$= -0.84$$

$$\begin{array}{r} 4.2 \\ 0.2 \\ \hline 8.4 \\ 20 \times \end{array}$$

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

$$= -4.2$$

Step 5:

$$v_m = \gamma v_m - n g_m$$

$$= (0.9)(0) - (0.1)$$

$$(-0.084)$$

$$= 0.084$$

$$v_c = \gamma v_c - n g_c$$

$$= (0.9)(0) - (0.1)(-4.2)$$

$$= 0.42$$

Step 6,

$$m = m + v_m$$

$$= 1 + 0.084$$

$$= 1.084 \checkmark$$

$$c = c + v_c$$

$$= -1 + 0.42$$

$$= -0.58$$

Step 7, $s = 2 > 2$

go to step 4.

$$\begin{aligned} g_m &= - \left(3.8 - (1.084)(0.4) + 0.58 \right) (0.4) \\ &= - \left(3.8 - (0.43) + 0.58 \right) (0.4) \\ &= - 1.58 \end{aligned}$$

$$\begin{aligned} g_c &= - \left(3.8 - (1.084)(0.4) + 0.58 \right) \frac{1.084}{0.4} \\ &= - 3.95 \end{aligned}$$

Step 5,

$$\begin{aligned} v_m &= (0.9)(0.084) \\ &\quad - (0.1)(-1.58) \\ &= 0.075 + 0.158 \\ &= 0.23 \end{aligned}$$

$$\begin{aligned} v_c &= (0.9)(0.42) \\ &\quad - (0.1)(-3.95) \\ &= 0.378 + 0.395 \\ &= 0.773 \end{aligned}$$

Steps: $m = 1.0847 \times 0.23$
 $= 1.314$

$C = -0.58 + 0.77$
 $= 0.19$

Step 7: $s = 3 > 2$ ✓ True
 go to Next Step

Step 8: $it = 2$

Step 9: if ($it > epochs$)
 next Step.

~~$m = 1.314$~~

~~$C = 0.19$~~

~~for first two samples~~

Go to Step 3.

Step 3: sample = ~~1~~

Step 4: $g_m = - (3.4 - (1.314)(0.2) - 0.19) \times 0.2$
 $= - (2.94) \times 0.2$
 $= -0.588$

$$g_c = - (3.4 - (1.314)(0.2) - 0.11) \\ = -2.74$$

Step 3

$$v_m = (0.9)(0.23) - (0.1)(0.588) \\ = 0.26$$

$$v_c = (0.9)(0.77) - (0.1)(-2.74) \\ = 0.98$$

Step 6

$$m = 1.314 + 0.26 \\ = 1.574$$

$$c = 0.19 + 0.96 \\ = 1.17$$

Step 7

$$s = 2 > 2 \quad \text{False} \\ \text{go to step 4.}$$

Step 4

$$g_m = - (3.8 - (1.574)(0.4) - 1.17) 0.4 \\ = - (2) \times 0.4 = -0.8$$

$$g_c = - (3.8 - (1.574)(0.4) - 1.17) \\ = -2$$

Step 5

$$v_m = (0.9)(0.26) - (0.1)(-0.8) \\ = 0.314$$

$$v_c = (0.9)(0.98) - (0.1)(-2)$$

$$v_c = 1.08$$

Step 1: $m = 1.574 + 0.314$

$$= 1.88$$

$$C = 1.17 + 1.08$$

$$= 2.25$$

Step 7: $\delta = 3$

Step 8: $3 > 2$ go to next step

Step 9: $it = 3$

Step 10: $if (it > ep)$

$$it (3 > 2)$$

→ go to next step.