18KC1A0243.

Assignment 9.

momentum optimizer.

X	Y
0.2	3.4
0.4	3.8

step 1 :- [x, y], m = 1, c = -1, η = 0.1 epochs = 2

$\gamma = 0.9$; $v_m = v_c = 0$

step 2 :- $it_2 = 1$

step 3 :- sample = 1

step 4 :- $\frac{\partial E}{\partial m} = -(y_i - mx_i - c)x_i$

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

$\frac{\partial E}{\partial m} = -0.84.$

$g_c = \frac{\partial E}{\partial c} = -[3.4 - 1(0.2) + 1].$

$\frac{\partial E}{\partial c} = -4.2.$

step 5 :- $v_m = \gamma v_m - \eta g_m.$

$= (0.9)(0) - (0.1)(-0.84).$

$v_m = 0.084.$

$v_c = \gamma . v_c - \eta g_c.$

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

$V_c = 0.42.$

Step 6:- $m = m + v_m = 1 + 0.084 = 1.084.$

$c = c + v_c = -1 + 0.42 = -0.58.$

Step 7:- sample = 1 + 1 = 2.

Step 8:- if (sample > 45)

$2 > 2.$

Step 9:- $g_m = \frac{\partial E}{\partial m} = -[3.8 - (1.084)(0.4) + 0.58]$

$(0.4).$

$g_m = -1.57856.$

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

$g_c = \frac{\partial E}{\partial c} = -3.9464.$

Step 5: $v_m = \gamma v_m - \eta g_m.$

$= (0.9)(0.084) - (0.1)(-1.57856)$

$v_m = 0.233456.$

$v_c = \gamma v_c - \eta g_c$

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

$v_c = 0.77264.$

step6:- $m = m + v_m = 1.084 + 0.233456$.

$m = 1.3174$.

$c = c + v_c = -0.58 + 0.79264$

$c = 0.19264$.

step7:- sample = 2+1=3.

step8:- if (3>2)

step9:- itr = itr+1 = 1+1=2.

step10:- if (2>2).

step3:- sample 1.

step4:- $g_m = \frac{\partial E}{\partial m} = -\left[3.4 - (1.3174)(0.2) - 0.19264\right](0.2)$

$g_m = -0.5887$

$g_c = \frac{\partial E}{\partial c} = -\left[3.4 - (1.3174)(0.2) - 0.19264\right]$.

$g_c = -2.9438$.

step5:- $v_m = \gamma v_m - \eta g_m$.

$= (0.9)(0.23845) - (0.1)(-0.5887)$.

$v_m = 0.26897$.

$v_c = \gamma v_a - \eta g_c$.

$= (0.9)(0.77264) - (0.1)(-2.9437)$.

$v_c = 0.9997$.

Step 6 :- $m = m + V_m = 1.3134 + 0.268997$

$m = 1.5863.$

$c = c + V_c = 0.19264 + 0.9897.$

$c = 1.18234.$

Step 7 :- sample = 1+1=2.

Step 8 :- If (sample > no)

$2 > 2.$

Step 9 :- $g_m = \frac{\partial E}{\partial m} = -[3.3 - (1.586)(0.4) + 1.1823](0.4)$

$g_m = -1.7391.$

$g_c = \frac{\partial E}{\partial c} = -4.3479.$

Step 5: $V_m = \gamma V_m - \eta g_m.$

$= (0.9)(0.26897) - (0.1)(-1.7391).$

$V_m = 0.41604.$

$V_c = \gamma V_c - \eta g_c = 1.3255.$

Step 6 :- $m = m + V_m$

$= 1.5863 + 0.41604.$

$= 2.0023.$

$c = c + V_c = 1.18234 + 1.3255$

$c = 2.507.$

step 7:- sample = 2+1=3.

step 8:- if (3>2)

step 9:- itr = 2+1=3.

step 10:- if (3>2)

step 11:- m = 2.184

c = 1.381.

8)

Assignment 13.

Adagrad Optimizer.

Sample (i)	x_i a.	y_i a.
1	0.2	8.4
2	0.4	2.8
3	0.6	4.2
4	0.8	4.6.

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

$\eta = 0.1$, $\varepsilon = 10^{-8}$.

step 2: itr = 1

step 3: sample = 1

step 4: $g_m = -(y_i - mx_i - c)x_i$

$= -(8.4 - (1)(0.2) + 1]\ 0.2$.

$g_m = -0.84$.

$g_c = 0 - [y - mx_i - c]$.

$= -[8.4 - (1)(0.2) + 1]$.

$g_c = -4.2$.

step 5 :

$G_m = G_m + (g_m)^2$; $G_c = G_c + (g_c)^2$.

$G_m = 0 + (-0.901)^2$ $\quad G_c = 0 + (-0.2)^2$.

$G_c = 17.64$.

$G_m = 0.7056$

step 6 : $\Delta m = \dfrac{-\eta}{\sqrt{G_m + \varepsilon}} g_m = \dfrac{-0.1}{\sqrt{0.7056 + 10^{-7}}} \times (0.901)$

$\Delta m = 0.099$.

$\Delta c = \dfrac{-\eta}{\sqrt{G_c + \varepsilon}} \quad g_c = \dfrac{-0.1}{\sqrt{17.64 + 10^{-8}}} \times (-0.2)$

$\Delta c = 0.092$

step 7 : $m = m + \Delta m = 1 + 0.099$.

$m = 1.099$.

$c = c + \Delta c = -1 + 0.099$.

$c = -0.901$.

step 8 : sample = sample + 1 = 1 + 1 = 2

step 9 : if [sample > ns].

$2 > 2$.

false → goes to step (4)

step 4 : $g_m = -[3.8 - (1.099)(0.4) + 0.901](0.4)$

$g_m = -1.70456$.

$g_c = -[3.8 - (1.099)(0.4) + 0.901]$.

$g_c = -4.2614$.

Step 5: $G_m = G_m + (g_m)^2$; $G_c = G_c + (g_c)^2$.

$G_m = 0.7056 + (-1.7056)^2$. $G_c = 17.64 + (-4.2614)^2$.

$G_m = 3.611$. $G_c = 35.799$.

Step 6:

$$\Delta m = \frac{-\eta}{\sqrt{G_m + \varepsilon}} \times g_m = \frac{-0.1}{\sqrt{3.6111 + 10^{-8}}} \times (-1.704).$$

$\Delta m = 0.0896$.

$$\Delta c = \frac{-\eta}{\sqrt{G_c + \varepsilon}} \times g_c = \frac{-0.1}{\sqrt{35.799 \times 10^{-8}}} \times (-4.2614).$$

& $\Delta c = 0.07122$.

Step 7: $m = m + \Delta m = 1.099 + 0.0896$.

$m = 1.1886$.

$c = c + \Delta c = -0.901 + 0.07122$.

$c = -0.82978$.

Step 8: sample $= 2 + 1 = 3$.

Step 9: if (sample > no)

$3 > 2$.

Step 10: itr = itr + 1 = 1 + 1 = 2

Step 11: if (itr > epoch)

$2 > 2$.

step 3 :- sample = 1

step 4 :- $g_m = -[3.4 - (1.1886)(0.2) + 0.829478)(0.2)$

$g_m = -0.798412$.

$g_c = -[3.4 - (1.1886)(0.2) + 0.829478)$

$g_c = -3.99206$.

step 5 :- $G_m = G_m + (g_m)^2$, $G_c = G_c + (g_c)^2$

$= 3.611 + (-0.798412)^2$ $G_c = 35.799 + (-3.99206)^2$.

$G_m = 4.26484$ $G_c = 51.4355$

step 6 :- $\Delta m = \frac{-\eta}{\sqrt{G_m + \varepsilon}} g_m = \frac{-0.1}{\sqrt{4.26484 + 10^{-8}}} (0.798412)$

$\Delta m = 0.0387$.

$\Delta c = \frac{-\eta}{\sqrt{G_c + \varepsilon}} g_c = \frac{-0.1}{\sqrt{51.78 + 10^{-8}}} (-3.99206)$

$\Delta c = 0.0555$.

step 7 :- $m = m + \Delta m = 1.1826 + 0.0387$.

$m = 1.2273$.

$c = c + \Delta c = -0.829478 + 0.0555$.

$c = -0.774428$.

step 8 :- sample = sample + 1 = 1 + 1 = 2.

$2 > 2$.

go to step (4)

Step 6: $g_m = -[8-8-(1.23)(0.4) + 0.22428)0.4$

$g_m = -1.633$

$g_c = -[8-8-(1.823)(0.4) + 0.22428]$

$g_c = -4.093$

Step 5: $G_m = (1.2.4)8(4) + (-1.6)^2 = 6.91$

$G_c = 51.4555(-4.08)^2 - 68.3819$

Step 6: $\Delta m = \frac{-0.1}{\sqrt{6.91 * 10^{-8}}} * (-1.633)$

$\Delta m = 0.0621$

$\Delta c = \frac{-0.1}{\sqrt{61.87 * 10^{-8}}} * (-4.093)$

$\Delta c = 0.0496$

Step 7: $m = m + \Delta m = 1.2896$

$c = c + \Delta c = -0.72518$

Step 8: sample = sample + 1

$= 2 + 1 = 3$

Step 9: if (sample > ns)

$3 > 2$

Step 10: itr = itr + 1

$= 2 + 1 = 3$

step 11 : if (itr > epoche)

3 > 2.

step 12 : m = 1.2896.

c = -0.72518.

Assignment 15

rms prop 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

step 1 : (x, y) , $\eta = 0.1$ epochs = 2 ; m = 1 , c = 1 .

$\gamma = 0.9$, $\epsilon_m = \epsilon_c = 0$, $\varepsilon = 10^{-8}$.

step 2 : itr = 1

step 3 : sample = 1 .

step 4 : $g_m = [3.4(-1)(0.2)+1)(0.2) = 0.8$

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

Step 5:- $E_m = (0.9)(0) + (1-0.9)(-0.84)^2$

$= 0.07$

$E_c = (0.9)(0) + (1-0.9)(-0.2)^2$

$= 1.764$

Step 6:- $\Delta m = \frac{-0.1}{\sqrt{0.07 + 10^{-7}}} * (-0.84) = 0.31$

$\Delta c = \frac{-0.1}{\sqrt{1.764 + 10^{-8}}} * (-0.2) = 0.31$

Step 7:- $m = m + \Delta m = 1 + 0.31 = 1.31$

$c = c + \Delta c = -1 + 0.31 = -0.69$

Step 8:- sample $= 1 + 1 = 2$

Step 9: if (sample > n)

$2 > 2$

Step 10:- $g_m = -[8.8 - (1.31)(0.1) + 0.69](0.1)$

$g_m = -1.5$

$g_c = -[8.8 - (1.31)(0.1) + 0.69]$

$g_c = -3.9$

step 5:- $E_m = (0.9)(0.07) + (0.1)(-1.5)^2$

$= 0.28$

$E_c = (0.9)(1.76) + (0.1)(-3.9)^2 = 3.1$

step 6: $\Delta m = \frac{-0.1}{\sqrt{0.28 + 10^{-8}}} \times 1.5 = 0.28$.

$\Delta c = \frac{-0.1}{\sqrt{8.1 * 10^{-8}}} * 3.9 = 0.22$.

step 7: $m = m + \Delta m = 1.31 + 0.28 = 1.59$

$c = c + \Delta c = -0.69 + 0.22 = -0.47$.

step 8: sample = 2 + 1 = 3.

step 9: if (sample > n)

3 > 2

Step 10: itr = itr + 1 = 1 + 1 = 2

Step 11: if (itr > epoch)

2 > 2

Step 3: sample = 1

step 4: $g_m = [8.4 - (1.59)(0.2) + 0.47)(0.2)$

$g_m = -0.7$

$g_c = -[8.4 - (1.59)(0.2) + 0.47)$

$g_c = 3.5$.

step 5: $f_m = (0.9)(0.27) + (0.1)(-0.7)^2$

$= 0.3$.

$E_c = (0.9)(5.1) + (0.1)(-3.5)^2 = 4.6$

Step 6: $\Delta m = \frac{-0.1}{\sqrt{0.5 + 10^{-8}}} \times 0.4 = 0.12$.

$\Delta c = \frac{-0.1}{\sqrt{4.0 + 10^{-8}}} \times 3.5 = 0.17$.

Step 7: $m = m + \Delta m = 1.59 + 0.12 = 1.71$

$c = c + \Delta c = 0.47 + 0.17 = 0.3$

Step 8: sample = sample + 1 = 1 + 1 = 2

Step 9: If (sample > ns)

$2 > 2$.

Step 4: $g_m = -[3.8 - (1.71)(0.4) + 0.3](0.4)$

$g_m = +1.6$.

$g_c = -[3.8 - (1.71)(0.4) + 0.3]$.

$g_c = -3.6$.

Step 5: $f_m = (0.9)(0.3) + (0.1)(-1.4)^2 = 0.46$.

$E_c = (0.9)(4.0) + (0.1)(-3.1)^2 = 4.89$

Step 6:

$\Delta m = \frac{-0.1}{\sqrt{0.46 + 1.0^{-2}}} \times -1.4 = 0.12$.

$\Delta c = \frac{-0.1}{\sqrt{4.89 + 10^{-7}}} \times -3.6 = 0.16$

step 7 :- $m = m + \Delta m = 1.81 + 0.2 = 1.91$

$c = c + \Delta c = -0.3 + 0.16 = -0.14$.

step 8 :- sample = sample + 1 = 2 + 1 = 3.

step 9 :- if (sample > ns)

3 > 2.

step 10 :- itr = itr + 1 = 2 + 1 = 3.

step 11 :- if (itr > epoch)

3 > 2

Step 12: $m = 1.91$

$c = -0.14$.