Assignment - 15

Let us Consider a sample dataset have one i/p ($x_i^{(q)}$) and one output ($y_i^{(q)}$) and number of samples N. Develop a simple linear regression model using RMS prop optimizer.

Sample(i)	$x_i^{(q)}$	$y_i^{(q)}$
1	0.2	3.4
2	0.4	3.8
3	0.6	4.2
4	0.8	4.6

Do manual Calculations for 2 iterations with 1st 2 Samples

Step1 :- $[x,y]$, $\eta = 0.1$, epochs $= 2$, $m = 1$, $c = -1$, $\gamma = 0.9$,

$\varepsilon_m = \varepsilon_c = 0$, $\epsilon = 10^{-8}$

Step2 : iter $= 1$

Step 3 : Sample $= 1$

Step 4 : $g_m = -(3.4 - (1)(0.2) + 1)(0.2) = -0.84$

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

Step 5 :

$\varepsilon_m = (0.9)(0) + (1-0.9)(-0.84)^2 = 0.07$

$\varepsilon_c = (0.9)(0) + (1-0.9)(-4.2)^2 = 1.764$

Step 6:

$$\Delta m = \frac{-0.1}{\sqrt{0.07 + 10^{-8}}} * 0.84 = 0.31$$

$$\Delta c = \frac{-0.1}{\sqrt{1.764 + 10^{-8}}} * 4.2 = 0.31$$

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

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

Step 8:- Sample = Sample + 1

$= 1 + 1 = 2$

Step 9: if (Sample > ns) goto step 10

$2 > 2$

else goto step 4.

Step 4: $gm = -(3.8 - (1.31)(0.4) + 0.69)0.4 = -1.5$

$gc = -(3.8 - (1.31)(0.4) + 0.69) = -3.9$

Step 5: $Em = (0.9)(0.07) + (0.1)(-1.5)^2 = 0.28$

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

Step 6:

$$\Delta m = \frac{-0.1}{\sqrt{0.28 + 10^{-8}}} * -1.5 = 0.28$$

$$\Delta c = \frac{-0.1}{\sqrt{3.1 + 10^{-8}}} * -3.9 = 0.22$$

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 = Sample + 1

= 2 + 1 = 3

Step 9: if (Sample > ns) goto step 10

3 > 2

else

Step 4

Step 10: iter = iter + 1 = 1 + 1 = 2

Step 4: if (iter > epochs) goto step 12

else Step 3

Step 3: Sample = 1

Step 4: $g_m = -(3.4 - (1.59)(0.2) + 0.47)(0.2) = -0.7$

$g_c = -(3.4 - (1.59)(0.2) + 0.47) = -3.5$

Step 5: $E_m = (0.9)(0.28) + (0.1)(-0.7)^2 = 0.3$

$E_c = (0.9)(3.1) + (0.1)(-3.5)^2 = 4.0$

Step 6: $\Delta m = \frac{-0.1}{\sqrt{0.3 + 10^{-8}}} * -0.7 = 0.12$

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

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) goto Step 10

2 > 2

else goto Step 4

Step 4 : $g_m = -(3.8 - (1.71)(0.4) + 0.3) * 0.4 = -1.4$

$g_c = -(3.8 - (1.71)(0.4) + 0.3) = -3.6$

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

$E_c = (0.9)(4.0) + (0.1)(-3.6)^2 = 4.89$

Step 6 : $\Delta m = \frac{-0.1}{\sqrt{0.46 + 10^{-8}}} * -1.4 = 0.2$

$\Delta c = \frac{-0.1}{\sqrt{4.89 + 10^{-8}}} * -3.6 = 0.16$

Step 7 : $m = m + \Delta m = 1.71 + 0.2 = 1.91$

$c = c + \Delta c = -03 + 0.16 = -0.14$

Step 8 : Sample = Sample + 1 $= 2 + 1 = 3$

Step 9 : if (Sample > 3) goto step 10

$3 > 2$

else

goto step 4

Step 10 : iter = iter + 1 $= 2 + 1 = 3$

Step 11 : if (iter > epochs) goto step 12

$3 > 2$

else

goto step 3

Step 12 : $m = 1.91$

$c = -0.14$