Assignment -15

Let us consider a sample dataset have one input $(x_i^{(q)})$ & one ouput $(y_i^q)$ & no. of samples as

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 first two samples.

Step-1: $\{x, y\}$, $\eta = 0.1$, epoches $= 2$, $m = 1$, $c = -1$, $\beta = 0.9$

$E_m = E_c = 0$, $\varepsilon = 10^{-8}$

Step-2: itr = 1

Step-3: sample = 1

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

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

Step-5: $E_m = (0.9)(0) + (1-0.9)(-0.84)^2 = 0.07$

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

Step-6: $\Delta m = \dfrac{-0.1}{\sqrt{0.07 + 10^{-8}}} * -0.84 = 0.31$

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

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

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

Step-8 : Sample = sample +1

$\quad\quad\quad = 1 + 1 = 2$

Step-9 : if (sample > ns) goto step-10

$\quad\quad\quad\quad\quad 2 \quad\quad > 2$

$\quad\quad$ else

$\quad\quad\quad$ goto step-4

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

$\quad\quad g_c = -(3.8 - (1.31)(0.4) + 0.19) = -3.9$

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

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

Step-6 : $\Delta m = \dfrac{-0.1}{\sqrt{0.28 + 10^{-8}}} * -1.5 = 0.28$

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

Step-7 : $m = m + \Delta m = 1.31 + 0.28 = 1.59$

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

Step-8 : Sample = sample +1

$\quad\quad\quad = 2 + 1 = 3$

Step-9 : if (sample > ns) goto step-10

$\quad\quad\quad\quad\quad 3 \quad > 2$

$\quad\quad$ else

$\quad\quad\quad$ step-4

Step-10 : itr = itr +1

$\quad\quad\quad\quad 1 + 1 = 2$

Step-11 : if (itr > epoches)

$\quad\quad\quad$ goto step-12

$\quad\quad$ else goto 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: $\Delta m = \dfrac{-0.1}{\sqrt{0.3+10^{-8}}} \ast -0.7 = 0.12$

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

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)

$2 > 2$

go to step-10

else

go to step-4

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

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

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: $\Delta m = \dfrac{-0.1}{\sqrt{0.46+10^{-8}}} \ast -1.4 = 0.2$

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

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

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

step-8 : sample = sample + 1

$$= 2+1 = 3$$

step-9 : if (sample > ns)

$$3 > 2$$

go to step -10

else

go to step - 4

step-10 : itr = itr + 1

$$= 2+1 = 3$$

step -11 : if (itr > epoches)

$$3 > 2$$ goto step -12

else

go to step - 3

step-12 : m = 1.91

c = -0.14