ASSIGNMENT-15

– 18K41A0530

Let us consider a sample dataset have one input (x_i^a) and one output (y_i^a) and number of samples 2. Develop a simple linear regression model using 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

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: $\delta_m = -(3.4 - (1)(0.2) + 1)(0.2) = -0.84$

$\delta_c = -(3.4 - (1)(0.2) + 1) = -4.2$

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

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

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: $\delta m = -(3.8 - (1.31)(0.4) + 0.69)\,0.4 = -1.5$

$\delta c = -(3.8 - (1.31)(0.4) + 0.69) = -3.9$

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

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

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

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

Step-8: Sample = Sample + 1

$= 2 + 1 = 3$

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

$3 > 2$

else step-4

Step-10: itr = itr + 1

$= 1 + 1 = 2$

Step-11: if (itr > epoches)

goto step-12

else goto step-3

Step-3: Sample = 1

Step-4: $\delta_{3m} = -(3.4 - (1.59)(0.2) + 0.47)(0.2) = -0.7$

$\delta_{3c} = -(3.4 - (1.59)(0.2) + 0.47) = -3.5$

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

$E_c = (0.7)(3.1) + (0.1)(-3.5)^2 = 4.0$

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)

$2 > 2$ goto step-10

else goto step-4

Step-4: $\delta_{3m} = -(3.8 - (1.71)(0.4) + 0.3) * 0.4 = -1.4$

$\delta_c = -(3.8 - (1.71)(0.4) + 0.3) = -3.6$

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

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

Step-8: Sample = Sample + 1

$= 2 + 1 = 3$

Step-9: if (sample > ns)
3 > 2 goto step-10

else goto step-4

Step-10: itr = itr + 1
= 2 + 1 = 3

Step-11: if (itr > epoches)
3 > 2 goto step-12

else goto step-3

Step-12: m = 1.91
c = -0.14