ASSIGNMENT 15

18K41A04B2

Let consider a sample dataset have one input (x_i^a) and one output (y_i^a), and number of samples 4, Develop a simple linear regression model using RMSprop 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 two iterations with first two samples.

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

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

Step 6:- $\Delta m = \frac{-0.1}{\sqrt{0.07 + 10^{-8}}} \times -0.84$

$= 0.31$

$\Delta c = \frac{-0.1}{\sqrt{1.769 + 10^{-8}}} \times -9.2 = 0.31$

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

$= 1 + 1 \Rightarrow 2$

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

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:- $\epsilon m = (0.9)(0.07) + (0.1)(-1.5)^2 = 0.28$

$\epsilon c = (0.9)(1.76) + (0.1)(-3.9)^2 = 3.1$

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

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

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 + = 1

$\Rightarrow 2+1 = 3$

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

$3 > 2$

else step (4)

Step 10:- iter = iter + 1

$1+1 \Rightarrow 2$

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

else step (3)

Step 3:- sample = 1

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

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

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

$\epsilon c = (0.9)(3.1) + (0.1)(-3.5)^2 = 4.0$

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

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

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

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

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

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

2 > 2

else goto step (4).

step 4 :- $gm = -(3.8 - (1.71)(0.4) + 0.3) \times 0.4 = -1.4$

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

step 5:- $\epsilon m = (0.9)(0.3) + (0.1)(-1.4)^2 = 0.46$

$\epsilon c = (0.9)(4.0) + (0.1)(-3.6)^2 = 4.89$

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

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

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

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

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

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

3 > 2

else : goto step (4)

step 10:- 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