18K41A0420

Assignment-15

Let us consider a sample dataset have one input (xi a) & one output (yi a) & number of samples 2. Develop a simple linear Regression model using RMSprop optimiser

| sample (i) | xi a | yi a |
|---|---|---|
| 1 | 0.2 | 3.4 |
| 2 | 0.4 | 3.8 |
| 3 | 0.6 | 4.2 |
| 4 | 0.8 | 4.6 |

no manual calculations for 2 iterations with 1st 2 samples.

step 1: [X, Y], $\eta = 0.1$, epochs = 2, m = 1, c = -1, $\gamma = 0.9$,

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

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

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

Step 6:

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

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

Step 7:

$$m = m + \Delta m = 1 + 0.31 = 1.31$$

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

Step 8: Sample + = 1

$\Rightarrow 1+1 \Rightarrow 2$

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

else goto step 4

Step 4:

$$g_m = -(3.8 - (1.31)(0.4) + 0.69)\,0.4 = -1.5$$

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

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:

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

$$\Delta c = \frac{-0.1}{\sqrt{2.1+10^{-8}}} \times -3.9 = 0.22$$

Step 7:

$$m = m + \Delta m \Rightarrow 1.31 + 0.28 \Rightarrow 1.39$$

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

Step 8: Sample + = 1

$\Rightarrow 2 + 1 \Rightarrow 3$

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

3 > 2

else step 4

Step 10: iter = iter + 1

⇒ 1 + 1 ⇒ 2

Step 11: 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: $E_m = (0.7)(0.28) + (0.1)(-0.7)^2 = 0.3$

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

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

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

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

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

Step 8: sample_t = 1 ⇒ 1 + 1 ⇒ 2

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

2 > 2

else go to step 4

Step 4: $g_m = -(3.8 - (1.71)(0.4) + 0.3) \times 0.4 = -1.54$

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

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

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

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

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

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.