18K41A04C8

Assignment -15.

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 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: $[x,y]$, $\eta = 0.1$, 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: $E_m = \gamma E_m + (1-\gamma)(g_m)^2$

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

$E_m = 0.07$

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

$E_c = 1.764$

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

$\Delta m = 0.31$

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

$\Delta c = 0.31$

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

if (sample > ns)
2 > 2 goto step10

else goto step4

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

$g_m = -1.58$

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

$g_c = -3.9$

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

$E_m = 0.28$

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

$E_c = 3.105$

Step 6: $\Delta m = \frac{-0.1}{\sqrt{0.28 + 10^{-8}}} \times (-1.58)$

$\Delta m = 0.29$

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

$\Delta c = 0.22$

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)

3 > 2 True

goto step 10

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

$g_m = -0.7$

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

$g_c = -3.5$

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

$E_m = 0.3$

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

$E_c = 4.0$

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

$\Delta m = 0.12$

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

$\Delta c = 0.17$

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: $g_m = -(3.8 - (1.71)(0.4) + 0.3)(0.4)$

$g_m = -1.36$

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

$g_c = -3.4$

Step 5: $E_m = (0.9)(0.3) + (0.1)(-1.36)^2$

$E_m = 0.45$

$E_c = (0.9)(4.0) + (0.1)(-3.4)^2$

$E_c = 4.75$

Step 6: $\Delta m = \frac{-0.1}{\sqrt{0.45 + 10^{-8}}} \times (-1.36)$

$\Delta m = 0.2$

$\Delta c = \frac{-0.1}{\sqrt{4.75 + 10^{-8}}} \times (-3.4)$

$\Delta c = 0.156$

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

$c = c + \Delta c = -0.3 + 0.156 = -0.14$

Step 8: sample = sample + 1 = 2 + 1 = 3

Step 9: if (sample > ns)

3 > 2 ✓ goto step 10

else

goto step 4

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

Step 11: if (iter > epochs)

3 > 2 goto step 12

Step 12: m = 1.91

c = − 0.14.