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Assignment 15

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 RMSprop optimiser

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

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

step3: sample = 1

step4: $g_m = -(3.4 - (1)(0.2) + 1)(0.2) = -0.84$

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

step5: $E_m = (0.9)(0) + (1-0.9)(-0.84)^2 = 0.07$

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

step6:

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

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

step7: $m = m + \Delta m = 1 + 0.31 = 1.31$

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

step8: sample += 1

⇒ 1+1 ⇒ 2

step9: if (sample > ns) goto step10

else goto step4

step4: $g_m = -(3.8-(1.31)(0.4)+0.69)0.4 = -1.5$

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

step5: $Em = (0.9)(0.07)+(0.1)(-1.5)^2 = 0.28$

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

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

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

step7: $m = m+\Delta m \Rightarrow 1.31+0.28 \Rightarrow 1.59$

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

step8: sample += 1

⇒ 2+1 ⇒ 3

step9: if (sample > ns) goto step10

3 > 2

else step4

step10: iter = iter + 1

⇒ 1+1 ⇒ 2

step11: if (iter > epochs) goto step12

else step3.

step3: sample = 1.

step4: $g_m = -(3.4 - (1.59)(0.2) + 0.47)(0.2) = -0.7$

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

step5: $E_m = (0.9)(0.28) + (0.1)(-0.7)^2 = 0.3$

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

step6: $\Delta m = \frac{-0.1}{\sqrt{0.3 + 10^{-8}}} \times -0.7 = 0.12$

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

step7: $m_t = \Delta m \Rightarrow 1.59 + 0.12 \Rightarrow 1.71$

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

step8: sample $t = 1 \Rightarrow 1 + 1 \Rightarrow 2$

step9: if (sample > ns) goto step10

$2 > 2$

else goto step4

step4: $g_m = -(3.8 - (1.71)(0.4) + 0.3) \times 0.4 = -1.4$

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

step5: $E_m = (0.9)(0.3) + (0.1)(-1.4)^2 = 0.46$

$E_c = (0.9)(4.0) + (0.1)(-3.6)^2 = 4.89$

step6: $\Delta m = \frac{-0.1}{\sqrt{0.46 + 10^{-8}}} \times -1.4 = 0.2$

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

step7: $m_t = \Delta m \Rightarrow 1.71 + 0.2 \Rightarrow 1.91$

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

step8: sample $t = 1 \Rightarrow 2 + 1 = 3$

step9: if (sample > ns) : goto step 10

3 > 2

else : goto step 4

step 10: iter + = 1 ⇒ 2 + 1 ⇒ 3

step11: if (iter > epochs) goto step12

3 > 2

else goto step3

step12 : m = 1.91

c = - 0.14