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Assignment - 15

Let us consider a sample dataset. have one Input (x;a) and one output (y;a) and numbers of Samples 2. Develop a simple linear regression model using RMS Prop optimiser.

Sample (i)	x;a	y;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.

Step1:- [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:-

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

$$\Delta C = \frac{-0.1}{\sqrt{9.764 + 10^{-8}}} \times -4.2 = 0.31$$

Step 7:- $m = m + \Delta m = 1 + 0.31 = 1.31$

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

Step - 8:- sample + = 1

$\Rightarrow 1 + 1 = 2$.

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

$E_c = (0.9)(9.76) + (0.1)(-3.9)^2 = 3.1$

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

$1+1=2$.

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

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

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

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

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 += 1 $\Rightarrow 1+1=2$.

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

2 > 2

else goto step 4

Step 4 :- $g_m = -(3.8 - (1.71)(0.4) + 0.3) \times 0.4 = -1.4$.

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

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 = 1 ⇒ 2 + 1 ⇒ 3.

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

3 > 2

else

goto step3.

step - 12 :- m = 1.91

c = - 0.14.