Assignment -13

18K41A0508

Let us consider a sample dataset have one input (x_i^a) and one input (y_i^a) and number of sample 4. Develop a simple linear regression model using ADAGRAD 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] , epoches = 2 , m = 1 , c = -1 , $G_m = 0$, $G_c = 0$, $\eta = 0.1$, $\varepsilon = 10^{-8}$

step 2 : itr = 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 : $G_m = 0 + (-0.84)^2 = 0.7056$

$G_c = 0 + (-4.2)^2 = 17.64$

step 6 : $\Delta m = \frac{-\eta}{\sqrt{G_m + \varepsilon}} g_m$

$= \frac{-(0.1)}{\sqrt{0.7056 + 10^{-8}}} * -0.84$

$\Delta c = \frac{-(0.1)}{\sqrt{17.64 + 10^{-8}}} * -4.2 \Rightarrow 0.09$

Step 7: $m = m + \Delta m = 1 + 0.09 = 1.09$

$c = c + \Delta c = -1 + 0.09 = -0.91$

Step 8: Sample = sample + 1

$= 1 + 1$

$= 2$

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

$2 > 2$

else

step-4

Step 4: $g_m = -(3.8 - (1.09)(0.4) + 0.91)0.4 = -1.7$

$g_c = -(3.8 - (1.09)(0.4) + 0.91) = -4.27$

Step 5: $G_m = 0.7056 + (-1.7)^2 = 3.59$

$G_c = 17.64 + (-4.22)^2 = 35.87$

Step 6: $\Delta m = \frac{-0.1}{\sqrt{3.59 + 10^{-8}}} * (-1.7) = 0.08$

$\Delta c = \frac{-0.1}{\sqrt{35.87 + 10^{-8}}} * (-4.27) = 0.07$

Step 7: $m = m + \Delta m = 1.09 + 0.08 = 1.17$

$c = c + \Delta c = -0.91 + 0.07 = -0.84$

Step 8: Sample = Sample + 1

$= 2 + 1 = 3$

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

$3 > 2$

else

goto step 4

step 10: itr = itr + 1

$= 1 + 1$

$= 2$

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step 11 : if (itr > epoches) goto step-12

2 > 2

else

goto step 3

step 3 : Sample = 1

step 4 : $g_m = -(3.4 - (1.17)(0.2) + 0.84)0.2 = -0.80$

$g_c = -((3.4) - (1.17)(0.2) + 0.84) = -4.0$

step 5 : $G_m = 3.59 + (-0.80)^2 = 4.23$

$G_c = 35.89 + (-4.0)^2 = 51.89$

step 6 : $\Delta m = \frac{-0.1}{\sqrt{4.23 + 10^{-8}}} * (-0.80) = 0.038$

$\Delta c = \frac{-0.1}{\sqrt{51.89 + 10^{-8}}} * (-4.0) = 0.05$

step 7 : $m = m + \Delta m = 0.038 + 1.17 = 1.208$

$c = c + \Delta c = -0.84 + 0.05 = -0.79$

step 8 : Sample = Sample + 1

= 1 + 1 = 2

step 9 : if (Sample > ns) goto step 10

2 > 2

else

goto step -4

step 4 : $g_m = -(3.8 - (1.20)(0.4) + 0.79) * 0.4 = -1.64$

$g_c = -(3.8 - (1.20)(0.4) + 0.79) = -4.11$

step 5 : $G_m = 4.23 + (-1.64)^2 = 6.9$

$G_c = 51.89 + (-4.11)^2 = 68.7$

step 6 : $\Delta m = \frac{-0.1}{\sqrt{6.9 + 10^{-8}}} * (-1.64) = 0.06$

$$\Delta c = \frac{-0.1}{\sqrt{68.7 + 10^{-8}}} * (-4.11) = 0.04$$

Step 7 : $m = m + \Delta m = 1.208 + 0.06 = 1.26$

$c = c + \Delta c = -0.79 + 0.04 = -0.75$

step 8 : sample = sample + 1

= 2 + 1 = 3

Step 9 : if (sample > ns)

3 > 2

go to step 10

else

goto step 4

Step 10 : itr = itr + 1

= 2 + 1 = 3

step 11 : if (itr > epoches)

3 > 2

goto step 12

else

goto step 3

Step 12 : m = 1.26

c = -0.75