ASSIGNMENT-13

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Let us consider a sample dataset have only one input (x_i^a) and one output (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 : iT = 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 : $\Delta m = \dfrac{-\eta}{\sqrt{G_m + \varepsilon}}\, g_m$

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

$= 0.09$

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

$= 0.09$

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: 9: $m = m + \Delta m = 1.09 + 0.08 = 1.17$

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

Step-8: sample = sample + 1

$= 2 + 1 = 3$

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

else $3 > 2$

go to Step-4

Step-10: itr = itr + 1

$= 1 + 1 = 2$

Step-11: if (itr. > epochs) goto step-12

$2 > 2$

else

go to step-13

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