Assignment - 13

18K41A05E4

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 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 iteration with first 2 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 :- 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 :- $g_m = 0 + (-0.84)^2 = 0.7056$

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

Step 6 : $\Delta m = \frac{-\eta}{\sqrt{g_{mm} + \varepsilon}} g_m$

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

$= 0.09$

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

$= 0.09$

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 step10

$2 > 2$

else step 4

step 4 :- $gm = -(3.8 - (1.09)(0.4) + 0.91)\ 0.4 = -1.7$

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

step 5 :- $Gm = 0.7056 + (-1.7)^2 = 3.59$

$Gc = 17.64 + (-4.27)^2 = 35.87$

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 :- iter = iter + 1 = 1 + 1 = 2

step 11 :- if (iter > 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 :- $q_m = 3.59 + (-0.80)^2 = 4.23$

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

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 :- $q_m = 4.23 + (-1.64)^2 = 6.9$

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

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) goto step 10
3 > 2

else goto step 4

Step 10 :- itu = itu + 1 = 2 + 1 = 3

Step 11 :- if (itu > epoches) goto step 12
3 > 2

else goto step 3

Step 12 :- m = 1.26

c = -0.75