Assignment -13

18K41A0551

Let us consider a sample dataset have 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	2.4
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], epochs = 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: $\Delta m = \frac{-\eta}{\sqrt{G_m + \varepsilon}} g_m = \frac{-(0.1)}{\sqrt{0.7056 + 10^{-8}}} * (-0.84)$

$= 0.09$

$$\Delta c = \frac{-(0.1)}{\sqrt{17.64 + 10^{-9}}} * (-4.2)$$

$$= 0.09$$

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).

$2 > 2$

go to step-10

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

$c = c + \Delta c = -0.9 + 0.07 = -0.84$

step 8 : Sample = sample + 1

$2 + 1 = 3$

Step 9 : if (sample > n.) goto step 10

$3 > 2$

else

go to step-4

Step 10 : itr = itr + 1

$1 + 1 = 2$

Step 11 : if (itr > epoches)

$2 > 2$

go to step 12

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

$G_c = 35.89 + (-4)^2 = 51.89$

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 (2 > 2) > n_s)

go to step 10

else

go to step - 4

Step 4 : $g_m = -(2.8 - (1.20)(0.4) + 0.79) * 0.4$

$= -1.64$

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

$= -4.11$

Step 5 : $G_m = 6.23 + (-1.64)^2$

$= 6.9$

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

$= 68.7$

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 > n_s)

3 > 2

go to Step 10

else

go to step 4

step-10 : itr = itr + 1

= 2 + 1

= 3.

Step 11 : if (itr > epochs)

3 > 2

goto Step-12

else

goto step 8

step 12 : $m = 1.26$, $c = -0.75$.