Assignment - 13

→ Develop a simple linear regression 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 2 sample.

Step-1: [x, y], epochs = 2, m = 1, c = -1, Gm = Gc = 0, $\eta = 0.1$, $\varepsilon = 10^{-8}$.

Step-2: iter = 1

Step-3: sample = 1

Step-4: $gm = -(3.4 - (1)(0.2) + 1)0.2 = -0.84$

$gc = -(3.4 - (1)(0.2) + 1) = -4.2$

Step-5: $Gm = 0 + (-0.84)^2 = 0.7056$

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

Step-6: $\Delta m = \frac{-\eta}{\sqrt{Gm + \varepsilon}} gm = \frac{-0.1}{\sqrt{0.7056 + 10^{-8}}} \times 0.8 = 0.09$

$\Delta c = \frac{-0.1}{\sqrt{17.64 + 10^{-8}}} \times -4.2 = 0.09$

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)

$2 > 2$ (false)

go to 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: $Gm = 0.7056 + (-1.7)^2 = 3.59$

$Gc = 17.64 + (-4.27)^2 = 35.37$

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

$\Delta c = \frac{-0.1}{\sqrt{35.37 + 10^{-8}}} \times -4.27 = 0.07$

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 = 2 + 1 = 3

Step-9: if (sample > ns)

$3 > 2$ (True)

next step

(step-10)

Step-10: iter = iter + 1 = 1 + 1 = 2

Step-11: if (iter > epochs)

2 > 2 false

go to 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: $\Delta m = \frac{-0.1}{\sqrt{4.23 + 10^{-8}}} \times -0.80 = 0.038$

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

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 + = 1 + 1 = 2

Step-9: if (sample > ns)

2 > 2 false (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: $m = 1.208 + 0.06 = 1.26$

$c = -0.78 + 0.04 = -0.75$

Step-8: sample += 1 = 2+1 = 3

Step-9: if (sample > ns)

3 > 2 true

next step (step-10)

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

Step-11: if (ite > epochs)

3 > 2 true

next step step-12

Step-12: $m = 1.26$

$c = -0.75$