Assignment-13

let us consides 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 optimiser

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 samples

step-1: [X, Y], epochs = 2, m = 1, c = -1, Gm = Gc = 0, $\eta = 0.1$, $\epsilon = 10^{-8}$

step2: iter = 1

step3: sample = 1

step4: $g_m = -(3.4 - (1)(0.2) + 1)\ 0.2 = -0.84$

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

step5: $G_m = 0 + (-0.84)^2 = 0.7056$

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

step6: $\Delta m = \frac{-\eta}{\sqrt{G_m + \epsilon}} g_m = \frac{-0.1}{\sqrt{0.7056 + 10^{-8}}} \times 0.8 = 0.09$

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

step7: $m = m + \Delta m = 1 + 0.09 = 1.09$

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

step8: sample = sample + 1

= 1 + 1

= 2

step9: if (sample > ns) goto ~~as~~ step10

2 > 2

else: step4

step4: $g_m = -(3.8 - (1.09)(0.4) + 0.91)\,0.4 = -1.7$

$g_c = -(3.84 - (1.09)(0.4) + 0.91) = -4.27$

step5: $G_m = 0.7056 + (-1.7)^2 = 3.59$

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

step6: $\Delta m = \frac{-0.1}{\sqrt{3.59 + 10^{-8}}} \times -1.7 = 0.08$

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

step7: $m = m + \Delta m = 1.09 + 0.08 = 1.17$

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

step8: sample += 1 ⇒ 2 + 1 ⇒ 3

step9: if (sample > ns) goto (10)

else: goto (4)

step10: iter += 1 ⇒ 1 + 1 ⇒ 2

step11: if (iter > epoches) goto 12

2 > 2

else goto step3

step3: sample=2

step4: $g_m = (-3.4 - (1.17)(0.2) + 0.84)\,0.2 = -0.80$

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

step5: $G_m = 3.59 + (-0.80)^2 = 4.23$

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

step6: $\Delta m = \frac{-0.1}{\sqrt{4.23 + 10^{-8}}} \times -0.80 = 0.038$

$\Delta c = \frac{-0.1}{\sqrt{51.84 + 10^{-8}}} \times -4.0 = 0.05$

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

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

step8: if (sample>ns) goto step 10

else goto step 4

step4: $g_m = -(3.8 - (1.20)(0.4) + 0.79) \times 0.4 = -1.64$

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

step5: $G_m = 4.23 + (-1.64)^2 = 6.9$

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

step6: $\Delta m = \frac{-0.1}{\sqrt{6.9 + 10^{-8}}} \times -1.64 = 0.06$

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

step7: $m = m + \Delta m = 1.208 + 0.06 = 1.26$

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

step8: sample += 1 ⇒ 3

step9 : if (sample > ns) goto step10

3 > 2

else goto ④

step10 : iter += 1 ⇒ 2+1=3

step11 : if (iter > epochs) goto (12)

else goto (3)

step12 : m = 1.76

c = -0.75