Assignment-13

– 18K41A05A5

Let us consider a sample dataset have one input (x_i^a) and one input (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, 4), epochs = 2, m = 1, c = -1, Gm = 0, Gc = 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: $Gm = 0 + (-0.84)^2 = 0.7056$

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

Step-6: $\Delta m = \frac{-\eta}{\sqrt{Gm + \varepsilon}} gm$

$= \frac{-(0.1)}{\sqrt{0.7056 + 10^{-3}}} \times -0.84$

$= 0.09.$

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

$= 0.09.$

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) goto step-10

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: $Gm = -(3.8 - (1.09)(0.4) -$

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

$Gc = 17.64 + (-4.22)^2 = 35.87$

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

$\Delta c = \frac{-0.1}{\sqrt{3.59 + 10^{-8}}} \times -4.27 = 0.07$

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 = sample + 1

= 2 + 1 = 3

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

3 > 2

else

goto step-4.

step-10: itr = itr + 1

= 1 + 1 = 2

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

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

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

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

-0.80
4.0

9

0.4
-1.64
-4.11

Step-6: $\Delta m = \frac{-0.1}{\sqrt{6.9+10^{8}}} \times (-1.64) = 0.06$

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

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
Goto 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