ASSIGNMENT - 13

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Let us consider a sample dataset have one input ($x_{i=a}$) and 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	3.9
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, $G_m = G_c = 0$,

$\eta = 0.1$, $\epsilon = 10^{-8}$

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

$= 0.09$

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

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) go to step 10

$2 > 2$

else : step 4

Step 4:- $gm = -(3.5 - (1.09)(0.4) + 0.91)0.4 = -1.7$

$gc = -(3.84 - (1.08)(0.4) + 0.91) = -4.27$

Step 5:- $Gm = 0.7056 + (-1.7)^2 = 3.54$

$Gc = 17.64 + (-4.27)^2 = 35.57$

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

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

Step 7:- $m = m+\Delta m = 1.09+0.08 = 1.17$

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

Step8:- sample + =1 => 2+1 =3

Step9:- if (sample > ns) go to (10)

else : goto (4)

Step10:- iter = iter+1 => 1+1 = 2

Step11:- if (iter > epoches) goto (12)

2 > 2

else goto step (3)

Step3:- sample = 1

Step4:- gm = (-3.4 - (1.17)(0.2) + 0.84) 0.2

= -0.80

gc = - ((3.4 - (1.17)(0.2) + 0.84)

= -4.0

Step5:- Gm = 3.59 + (-0.80)^2 = 4.23

Gc = 35.89 + (-4.0)^2 = 51.89

Step6:- $\Delta m = \frac{-0.1}{\sqrt{4.23+10^{-8}}} \times 0.80 = 0.038$

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

Step7:- m = m + Δm = 0.038 + 1.17 = 1.208

c = c + Δc = -0.84 + 0.05 = -0.79

Step8:- if (sample > ns) goto step (10)

else

go to step (4)

Step 4:- $gm = -(3.8 - (1.20)(0.4) + 0.79) \times 0.4 = -1.64$

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

Step 5:- $Gm = 4.23 + (-1.64)^2 = 6.9$

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

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:- $m = m + \Delta m = 1.208 + 0.06$

$= 1.26$

$c = c + \Delta c = -0.79 + 0.09$

$= -0.75$

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

Step 9:- if (sample > ns) go to step (10)

$3 > 2$

else: go to (4)

Step 10:- iter + = 1 $\Rightarrow$ 2+1 = 3

Step 11:- if (iter > epochs) goto (2)

else

goto (3)

Step 12 :- $m = 1.76$

$c = -0.75$