# Assignment - 13

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Let us consider a sample dataset have one i/p $(X_i^1)$ & 1 o/p $(X_i^2)$ & no. of samples 4. Develop a simple linear regression model using ADAGRAD optimizer.

| Sample (i) | $X_i^1$ | $X_i^2$ |
|---|---|---|
| 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 iteration with 1st 2 samples.

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

2. iter = 1

3. sample = 1

4. $g_m = -(3.4-(1)(0.2)+1)0.2 = -0.84$

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

5. $G_m = 0+(-0.84)^2 = 0.705$

$G_c = 0.1+(-4.2)^2 = 17.64$

6. $\Delta m = \frac{-\eta}{\sqrt{G_m+\varepsilon}} g_m = \frac{-(0.1)}{\sqrt{0.7056+10^{-8}}} \times -0.84$

$= 0.09$

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

4. $m = m + \Delta m = 1 + 0.09 = 1.09$

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

8. sample = sample + 1

$1 + 1 = 2$

9. if (sample > $n_s$) step 10

$2 > 2$

else step 4

10. $g_m = -(3.8 - (1.09)(0.4) + 0.91)\,0.4 = -1.2$

$g_c = -(3.8 - (1.09)(0.4) + 0.91) = -4.27$

5. $G_m = 0.7056 + (1.7)^2 = 3.59$

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

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

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

7. $m = m + \Delta m = 1.17$

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

8. sample = sample + 1 = 2 + 1 = 3

9. if (sample > $n_s$) step 10

$3 > 2$

else goto step 4

10. iter = iter + 1 = 1 + 1 = 2

11. if (iter > epoches) gstep 12

$2 > 2$

else goto step 3

3. sample = 1

4. $g_m = -(3.4 - (1.17)(0.2) + 0.84)0.2 = -0.30$

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

5. $G_m = 3.59 + (-0.8)^2 = 4.23$

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

6. $\Delta m = \frac{-0.1}{\sqrt{4.23 + 10^{-8}}} \times -0.8 = 0.038$

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

7. $m = m + \Delta m = 1.208$

$C = C + \Delta C = -0.79$

8. sample = sample + 1 = 1 + 1 = 2

9. if (sample > ns) step 10

2 > 2

else step 4.

4. $g_m = -(3.8 - (1.20)(0.4) + 0.79) \times 0.4) = -1.64$

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

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

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

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

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

7. $m = m + \Delta m = 1.26$

$C = C + \Delta C = -0.75$

8. sample = sample+1 = 2+1 = 3

9. if (sample > ns) step 10

3 > 2

else

step 4

10. iter = iter+1

2+1

= 3

11. if (iter > epoches) step 12

3 > 2

else

step 3.

12. m = 1.26

c = −0.75 //.