

# Assignment - 15

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\* Let us consider a sample dataset have one input ( $x_i^a$ ) and one output ( $y_i^a$ ) and no. of samples 3. Develop a sample linear regression model using rms prop 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 of 2 iterations.

Step-1  $[x, y]$ ,  $\eta = 0.1$ , epochs = 2,  $m = 1$ ,  $c = -1$ ,  $\beta = -9$ ,

$$C_m = E_c = 0, \epsilon = 10^{-8}$$

Step-2  $ux = 1$

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  $E_m = (0.9)(0) + (1 - 0.9)(-0.84)^2 = 0.07$

$$E_c = (0.9)(0) + (1 - 0.9)(-4.2)^2 = 1.764$$

Step-6  $\therefore \Delta m = \frac{-0.1}{\sqrt{0.07 + 10^{-8}}} \times 0.84 = 0.31$

$$\Delta c = \frac{-0.1}{\sqrt{1.764 + 10^{-8}}} \times -4.2 = 0.31$$



step-2:  $m = m + \Delta m = 1 + 0.31 = 1.31$

$C = C + \Delta C = -1 + 0.31 = -0.69$

step-3 sample = sample + 1  
 $= 1 + 1 = 2$

step-4 if (sample > n) goto step-10

2 > 0

else

goto step-4

step-4:  $g_m = -(3.8 - (1.31)(0.4) + 0.69)0.4 = -1.5$

$g_c = -(3.8 - (1.31)(0.4) + 0.69) = -3.9$

step-5:  $E_m = (0.9)(0.07) + (0.1)(-1.5)^2 = 0.28$

$E_c = (0.9)(1.76) + (0.1)(-3.9)^2 = 3.1$

step-6:  $\Delta m = \frac{-0.1}{\sqrt{0.28 + 10^{-8}}} \approx -1.5 = 0.28$

$\Delta C = \frac{-0.1}{\sqrt{3.1 + 10^{-8}}} \approx -3.9 = 0.22$

step-7  $m = m + \Delta m = 1.31 + 0.28 = 1.59$

$C = C + \Delta C = -0.69 + 0.22 = -0.47$

step-8 sample = sample + 1

$= 2 + 1 = 3$

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

3 > 2

else

step-4

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Step-10  $itr = itr + 1$

$$= 1 + 1 = 2$$

Step-11 if ( $itr \times epochs$ )

goto step-12

else

goto step-3

Step-3 sample-1

Step-4  $g_m = -(3.4) - (1.59)(0.2) + 0.47(0.2) = -0.7$

$$g_c = (3.4) - (1.59)(0.2) + 0.47(0.2) = -3.5$$

Step-5  $E_m = (0.9)(0.28) + (0.1)(0.7)^2 = 0.3$

$$E_c = (0.9)(3.17) + (0.1)(-3.5)^2 = 4.0$$

Step-6  $\Delta m = \frac{-0.1}{\sqrt{0.3 + 10^{-8}}} * -0.7 = 0.12$

$$\Delta c = \frac{-0.1}{\sqrt{4.0 + 10^{-8}}} * -3.5 = 0.17$$

Step-7  $A_m = m + \Delta m = 1.59 + 0.12 = 1.71$

$$C = c + \Delta c = 0.47 + 0.17 = 0.3$$

Step-8 sample = sample + 1

$$= 1 + 1 = 2$$

Step-9 if (sample > n)

$$2 > 2$$

goto step-10

else

goto step-4



step 5:  $G_m = (0.9)(0.3)(0.7)(-1.4)^2 = 0.46$

$E_c = (0.9)(4.0) + (0.1)(5.6) = 4.89$

step-6  $\Delta m = \frac{-0.1}{\sqrt{0.46 + 10^{-8}}} \approx -0.2$

$\Delta C = \frac{-0.1}{\sqrt{4.89 + 10^{-8}}} \approx -3.6 = -0.16$

step-7  $m = m + \Delta m = 1.71 + 0.2 = 1.91$

$C = C + \Delta C = -0.3 + 0.16 = -0.14$

step-8  $\text{sample} = \text{sample} + 1$   
 $= 2 + 1 = 3$

step 9: if (sample == ns)

3 > 2

goto step-10

else

goto step-4

step 10:  $\text{itr} = \text{itr} + 1$   
 $= 2 + 1 = 3$

step 11 if (itr > epochs)

3 > 2 goto step-12

else

goto step-3

step-12

$m = 1.9$

$e = 0.14$