Assignment – 15:

1. Let us consider a sample dataset have one input $(x_i; a)$ and one o/p $(y_i; a)$ and $\underline{no}$ of samples 2. Develop a SLR model using RMS prop 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 1, 2 samples

1. (x, y), $\eta = 0.1$, epochs = 2, $m = 1$, $c = -1$, $\beta = 0.4$, $E_m = E_c = 0$, $\varepsilon = 10^8$

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

   $E_c = (0.9)(0) + (1-0.9)(-4.2)^2 = +1.76$

6. $\Delta m = \dfrac{-0.1}{\sqrt{0.07 + 10^8}} \times -0.84 = 0.31$

   $\Delta c = \dfrac{-0.1}{\sqrt{1.7 + 10^8}} \times -4.2 = 0.31$

7. $m = m + \Delta m = 1 + 0.31 = 1.31$

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

8. sample = 1 = 2

9. if (sample > ns) goto step 10
   else
      goto step 4.

   4. $g_m = -(3.8 - (1.31)(0.4) + 0.69)\,0.4 = -1.5$

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

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

      $E_c = (0.9)(0.07) + (0.1)(-3.9)^2 = 3.1$

6. $\Delta m = \dfrac{-0.1}{\sqrt{0.28 + 10^{8}}} \times -1.5 = 0.28$

    $\Delta c = \dfrac{-0.1}{\sqrt{8.1 + 10^{8}}} \times -3.4 = 0.22$

7. $m = m + \Delta m = 1.31 + 0.28 = 1.39$

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

8.   sample $+ = 1 = 3$

9.   if (sample > ns) goto step 10

    else

       goto 4

10.   iter = iter + 1 = 2

11.   if (iter > epochs) goto step 12

    else

       goto step 3

3.   sample = 1

4. $g_m = -(3.4 - (1.50)(0.2) + 0.47) \, 0.2 = -0.7$

    $g_c = -(3.4 - (1.50)(0.2) + 0.47) = -3.5$

5. $E_m = (0.9)(0.28) + (0.1)(-0.9)^{2} = 0.3$

    $E_c = (0.9)(3.1) + (0.1)(-3.5)^{2} = 4.0$

6. $\Delta m = \dfrac{-0.1}{\sqrt{0.3 + 10^{-8}}} \times -0.7 = 0.12$

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

7. $m + = \Delta m = -1.59 + 0.12 = -1.71$

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

8.   sample $= 2$

9.   if (sample > ns)   2 > 2

       goto step 10

    else

       goto step 4

4. $g_m = -(3.8 - (1.71)(0.4) + 0.3) \, 0.4 = -1.4$

    $g_c = -(3.8 - (1.71)(0.4) + 0.3) = -3.6$

5. $E_m = (0.9)(0.3) + 0.1(-1.4)^{2} = 0.46$

    $E_c = (0.9)(4.0) + (0.1)(-3.6)^{2} = 4.89$

6. $\Delta m = \dfrac{-0.1}{\sqrt{0.46 + 10^{-8}}} \times -1.4 = 0.2$

$\Delta c = \dfrac{-0.1}{\sqrt{4.89 + 10^{-8}}} \times -3.6 = 0.16$

7. $m+ = \Delta m = 1.71 + 0.2 = 1.91$

$c+ = \Delta c = -0.37 + 0.16 = -0.14$

8. sample $+ = 1 = 3$

9. if (sample $> ns$)

      goto step 10

else

      goto step 4

10. iter $= 3$

11. if (iter $>$ epochs) $3 > 2$

      goto step 12

else

      goto step 3

12. $m = 1.91$

    $c = -0.14$