Assignment - 3

1. Let us Consider sample dataset have one i/p and one o/p and number of samples. Develop a sample regression model using stochastic gradient descent optimiser.

Sample	x_i	y_i
1	0.2	3.4
2	0.4	3.8
3	0.6	4.2
4	0.8	4.6

Manual Calculations for 2 iterations, 2 samples:

1. x, y, m = 1, c = -1, η = 0.1, epochs = 2, ns = 2
2. iter = 1
3. sample = 1
4. $\frac{\partial E}{\partial m} = -(8.4 - 1)(0.2) - (-1)0.2 = -0.84$

   $\frac{\partial E}{\partial c} = -(3.4 - (1))(0.2+1) = -4.2$
5. $\Delta m = -(0.1)(-0.84) = 0.084$

   $\Delta c = -(0.1)(-4.2) = 0.42$
6. $m = m + \Delta m$

   $= 1 + 0.084 = 1.084$

   $c = c + \Delta c$

   $= -1 + 0.42 = -0.58$
7. sample = 2
8. if (sample > ns)

   goto step 9

   else

   goto step 4

4. $\frac{\partial E}{\partial m} = -(3.8 - (1.084)(0.4) + 0.58)0.4 = -1.5785$

   $\frac{\partial E}{\partial c} = -(3.8 - (1.084)(0.4) + 0.58) = -3.94$

5. $\Delta m = -(0.1)(-1.57) = 0.15$

$\Delta c = -(0.1)(-3.94) = 0.38$

6. $m = m + \Delta m = 1.084 + 0.15 + 8 = 1.2418$

$c = c + \Delta c = -0.58 + 0.39 = -0.18$

7. sample = 3

8. if (sample > ns)

3 > 2

goto step 9

else

goto step 4

9. iter += 1 = 2

10. if (iter > epochs)

2 > 2

goto step 11

else

goto step 3

3. sample = 1

4. $\frac{dE}{dm} = -(3.4 - (1.2)(0.2) + 0.18)0.2 = -0.668$

$\frac{dE}{dc} = -(3.4 - (1.2)(0.2) + 0.18) = -3.34$

5. $\Delta m = -(0.1)(-0.66) = 0.066$

$\Delta c = 0.33$

6. $m = 1.24 + 0.066 = 1.3$, $c = 0.18 + 0.33 = 0.15$

7. Sample = 2

8. if (sample > ns)

2 > 2

goto step 9

else

goto step 4

4. $\frac{dE}{dm} = -(3.8 - (1.3)(0.4) - 0.15)0.4 = -1.25$

$\frac{dE}{dc} = -(3.8 - (1.3)(0.4) - 0.15) = -3.13$

5. $\Delta m = -(0.1)(-1.25) = 0.12$, $\Delta c = 0.31$

6. $m = 1.3 + 0.12 = 1.42$, $c = 0.15 + 0.31 = 0.46$

7. Sample = 3

8. if (sample > ns)

   3 > 2

   goto step 9

   else

   goto step 4

9. iter = iter + 1 = 3

10. if (iter > epochs)

    3 > 2

    goto step 11

    else

    goto step 3

11. print m, c m = 1.42 , c = 0.46