## Assignment - 7:

let consider a sample dataset have one Input $(x_i)$ & one output $(y_i)$ and no. of samples a develop a sample linear regression model by using BGD.

| sample(i) | $x_i$ a | $y_i$ a | |
|-----------|---------|---------|---|
| 1 | 0.2 | 3.4 | manual |
| 2 | 0.4 | 3.8 | Calculations. |
| 3 | 0.6 | 4.2 | 2-iterations |
| 4 | 0.8 | 4.6 | 2-samples. |

Step-1: $x, y$, $m = 1$, $C = -1$, $\eta = 0.1$, epochs $= 2$, $n_s = 2$

Step-2: iter $= 1$

S-3
$$\frac{\partial E}{\partial m} = \frac{-1}{n_s} \sum_{i=1}^{n_s} (y_i - m x_i - c) x_i$$

$$= \frac{-1}{2} \left[ (3.4 - 1(0.2) + 1)0.2 + (3.8 - 1(0.4) + 1)0.4 \right]$$

$$= -1.34$$

$$\frac{\partial E}{\partial c} = -\frac{1}{2}\left[(3.4 - 0.2 + 1) + (3.8 - 0.4 + 1)\right]$$

$$= -4.3$$

S-4    $$\Delta m = -\eta \frac{\partial E}{\partial m}$$

$$= -0.1 \times -1.34 = 0.134$$

$$\Delta c = -\eta \frac{\partial E}{\partial c}$$

$$= -0.1 \times -4.3 = 0.43$$

S-5    $$m = m + \Delta m = 1 + 0.134 = 1.134$$

$$c = c + \Delta c = -1 + 0.43 = -0.57$$

S-6    $$iter = iter + 1 = 1 + 1 = 2$$

S-7    if (iter > epochs)

        nent step     $2 > 2$   false

    else

      step-3             step-3

S-3    $$\frac{\partial E}{\partial m} = -\frac{1}{2}\left[(3.4 - (1.134)0.2 + 0.57) 0.2 + \right.$$

$$\left. (2.8 - (1.134)(0.4) + 0.57)(0.4)\right]$$

$$= -1.157$$

$$\frac{\partial E}{\partial c} = -\frac{1}{2}\left[(3.4 - (1.134)(0.2) + 0.57) + \right.$$

$$\left. (3.8 - (1.134)(0.4) + 0.57)\right]$$

$$= -3.829$$

S-4:    $$\Delta m = -0.1 \times -1.157 = 0.1157$$

$$\Delta c = -0.1 \times -3.829 = 0.3829$$

S-5:    $$m = m + \Delta m = 1.134 + 0.1157 = 1.2497$$

$$c = c + \Delta m = -0.57 + 0.3829 = -0.187$$

S-6:  iter = iter + 1 = 2 + 1 = 3

S-7:  if (iter > epochs)          3 > 2   (true)
          next step                next step
      else
          step 3

S-8

      m = 1.2497 ,  c = -0.1821