

# Assignment -7 :-

(18K41A0400)

let consider a sample dataset have one  
inp ( $x_i^a$ ) & one o/p ( $y_i^a$ ), and no. of samples  
4. Develop a simple linear regression model  
using BGD.

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  
first 2 samples.

step 1)  $[x, y]$ ,  $m=1$ ,  $c=-1$ ,  $\eta=0.1$ , epochs=2,  
 $n_s=2$

2)  $iter=1$

$$\begin{aligned} 3) \frac{\partial E}{\partial m} &= \frac{-1}{n_s} \sum_{i=1}^{n_s} (y_i - mx_i - c)x_i \\ &= \frac{-1}{2} [(3.4 - (1)(0.2) + 1)(0.2) + (3.8 - (1)(0.4) + 1)0.4] \\ &= \frac{-1}{2} [0.84 + 1.76] = -1.34 \end{aligned}$$

$$\begin{aligned} \frac{\partial E}{\partial c} &= \frac{-1}{2} [(3.4 - (0.2) + 1) + (3.8 - (0.4) + 1)] \\ &= \frac{-1}{2} [4.2 + 4.4] = -4.3 \end{aligned}$$

$$4) \Delta m = -\eta \frac{\partial E}{\partial m} = -(0.1)(-1.34) = 0.134$$

$$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.1)(-4.3) = 0.43$$

$$5) m = m + \Delta m = 1 + 0.134 = 1.134$$

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

$$6) iter = iter + 1 = 1 + 1 = 2$$

7) if (iters > epochs)

2 > 2 false

goto step 3.

3)

$$\frac{\partial E}{\partial m} = -\frac{1}{2} \left[ (3.4 - (1.134)(0.2) + 0.57)(0.2) + (3.8 - (1.134)(0.4) + 0.57)(0.4) \right]$$

$$= -\frac{1}{2} [0.748 + 1.568] = -1.157$$

$$\frac{\partial E}{\partial c} = -\frac{1}{2} \left[ (3.4 - (1.134)(0.2) + 0.57) + (3.8 - (1.134)(0.4) + 0.57) \right]$$

$$= -\frac{1}{2} [3.743 + 3.916] = -3.829$$

$$4) \Delta m = -(0.1)(-1.157) = 0.1157$$

$$\Delta c = -(0.1)(-3.829) = 0.3829$$

$$5) m = m + \Delta m = 1.134 + 0.1157 = 1.2497$$

$$c = c + \Delta c = -0.57 + 0.3829 = -0.1871$$

$$6) \text{iters} = \text{iters} + 1 = 2 + 1 = 3$$

7) if (iters > epochs)

3 > 2 true

goto next step.

8) print m, c values.

$$m = 1.2497$$

$$c = -0.1871$$