

# Assignment 7

let consider a sample dataset have one  $x_i$  and  $y_i$  and no. of samples. develop a sample linear regression model by BGD

sample	$x_i$	$y_i$
1	0.2	3.4
2	0.4	3.8
3	0.6	4.2
4	0.8	4.4

step 1:- Read  $[x, y]$ ;  $m=1, c=1, \eta=0.1, \text{epochs}=2, ns=2$

step 2:- iter=1

$$\text{step 3:- } \frac{\partial \epsilon}{\partial m} = -\frac{1}{n_s} \sum_{i=1}^{n_s} (y_i - mx_i - c)x_i$$

$$= -\frac{1}{2} [(y_1 - mx_1 - c)x_1 + (y_2 - mx_2 - c)x_2]$$

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

$$= -\frac{1}{2} [(4.2)0.2 + (4.4)0.4]$$

$$= -\frac{1}{2} [0.84 + 1.76]$$

$$\frac{\partial \epsilon}{\partial m} = -1.3$$

$$\frac{\partial \epsilon}{\partial c} = -\frac{1}{2} [(y_1 - mx_1 - c) + (y_2 - mx_2 - c)]$$

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

$$= -\frac{1}{2} [4.2 + 4.4]$$

$$\frac{\partial \epsilon}{\partial c} = -4.3$$

$$\text{step 4!- } \Delta m = -\eta \times \frac{\partial \epsilon}{\partial m}$$

$$= -0.1 \times 1.3$$

$$\Delta m = 0.13$$

$$\Delta c = -\eta \times \frac{\partial \epsilon}{\partial c}$$

$$= -0.1 \times 4.3$$

$$\Delta c = -0.43$$

$$\text{step 5!- } m = m + \Delta m$$

$$= 1 + 0.13$$

$$m = 1.13$$

$$c = c + \Delta c$$

$$= -1 + 0.43$$

$$c = -0.57$$

$$\text{step 6!- } \text{iter} = 1 + 1 = 2$$

$$\text{step 7!- } \text{if } (\text{iter} > \text{epochs})$$

$$2 > 2$$

goto steps

else

goto step 3

$$\text{step 3!- } \frac{\partial \epsilon}{\partial m}$$

$$= -\frac{1}{2} [(y_1 - mx_1 - c)x_1 + (y_2 - mx_2 - c)x_2]$$

$$= -\frac{1}{2} [(3.4 - 1.13 \times 0.2 + 0.57)0.2 + (3.8 - 1.13 \times 0.4 + 0.57)]$$

$$= -\frac{1}{2} [(3.744)0.2 + (3.918)0.4]$$

$$= -\frac{1}{2} [0.7488 + 1.5672]$$

$$\frac{\partial \epsilon}{\partial m} = -1.158$$

$$\frac{\partial \epsilon}{\partial c} = -\frac{1}{2} [(y_1 - mx_1 - c) + (y_2 - mx_2 - c)]$$

$$= -\frac{1}{2} [(3.4 - 1.13 \times 0.2 + 0.57) + (3.8 - 1.13 \times 0.4 + 0.57)]$$

$$= -\frac{1}{2} [3.744 + 3.918]$$



$$\frac{\partial C}{\partial c} = -3.831$$

step 4 :-  $\Delta m = -\eta \times \frac{\partial C}{\partial m}$

$$\Delta C = -\eta \times \frac{\partial C}{\partial c}$$

$$= -0.1 \times 1.158$$

$$= -0.1 \times -3.831$$

$$\Delta m = 0.1158$$

$$\Delta C = 0.3831$$

step 5 :-  $m = m + \Delta m$

$$C = C + \Delta C$$

$$= 1.13 + 0.1158$$

$$= -0.57 + 0.3831$$

$$m = 1.24$$

$$C = -0.18$$

step 6 :-  $iter = 2 + 1 = 3$

step 7 :- if (iter > epochs)

$$3 > 2$$

goto step 8

else

goto step 3

step 8 :- print m, c

$$m = 1.24, C = -0.18$$