

# Assignment-7

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Let us consider a sample dataset have one input ( $x_i^a$ ) and one output ( $y_i^a$ ) and no. of sample 4. Develop a simple linear regression model using

BPD.

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 two iterations with first two samples.
- Write the python code to build simple linear regression model using BGD optimizer.

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

step 2:  $itr=1$

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

$$\frac{\partial E}{\partial c} = \frac{1}{2} [(3.4 - 0.2 + 1) + (3.8 - 0.4 + 1)] = -4.3$$

step 4:  $\Delta m = -\eta \frac{\partial E}{\partial m} = -0.1 \times -1.34 = 0.134$

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

step 5:  $m += \Delta m$   
 $1 + 0.134 = 1.134$   
 $C += \Delta C = -0.1 \times 0.3 = -0.43$

step 6:  $itr += 1$   $1 + 1 = 2$

step 7:  $y$  (itr > epochs)  
 goto step-8

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else

goto step-3

step 3:  $\frac{\partial E}{\partial m} = -\frac{1}{2} [(3.4 - (1.134)(0.2) + 0.57)(0.2) +$   
 $(3.8 - (1.134)(0.4) + 0.57)(0.4)]$

$= -1.157$

$\frac{\partial E}{\partial C} = -\frac{1}{2} [(3.4 - (1.134)(0.2) + 0.57)(0.4) +$   
 $(3.8 - (1.134)(0.4) + 0.57)(0.2)] = -3.829$

step 4:  $\Delta m = -0.1 \times -1.157 = 0.1157$   
 $\Delta C = -0.1 \times 3.829 = -0.3829$

step 5:  $m += \Delta m = 1.134 + 0.1157 = 1.2497$   
 $C += \Delta C = -0.57 + 0.3829 = -0.1871$

step 6:  $itr += 1$   
 $2 + 1 = 3$

step 7:  $y$  (itr > epochs)  
 goto step-8

else

goto step-3

step 8:  $m = 1.2497, C = -0.1871$