

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 number 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 two iterations with first two samples.

- Write the python code to build simple linear regression model using BGD optimizer (consider all 4 samples)

Step-1 : $[X, Y], m = 1, c = -1, \eta = 0.1, \text{epochs} = 2, ns = 2$

Step-2 : $itr = 1$

Step-3 : $\frac{\partial F}{\partial m} = -\frac{1}{ns} \sum_{i=1}^{ns} (y_i - mx_i - c)x_i$

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

$$= -1.34$$

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

$$= -4.3$$

Step-4 : $\Delta m = -\eta \frac{\partial F}{\partial m}$

$$= -0.1 \times -1.34$$

$$= 0.134$$

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

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

Step-5: $m+ = \Delta m$
 $1.134 + 0.134 = 1.134$
 $\Delta C = 0.43$
 $= 0.43$

Step-6: $itr+ = 1$
 $itr = 2$

Step-7: if ($itr > epochs$)
 goto Step-8
 else
 goto Step-3

Step-3: $\frac{\partial E}{\partial m} = -\frac{1}{2} [3.4 - (1.34)(0.2) + 0.57)(0.2) +$
 $(3.8 - (1.134)(0.4) + 0.57)(0.4)]$
 $= -1.154$
 $\frac{\partial E}{\partial C} = -\frac{1}{2} [(3.4 - (1.134)(0.2) + 0.57) + (3.8 -$
 $(1.134)(0.4) + 0.57)] = -3.829$

Step-4: $\Delta m = -0.1 \times -1.154 = 0.1154$
 $\Delta C = -0.1 \times 3.829 = 0.3829$

Step-5: $m+ = \Delta m$
 $1.134 + 0.1154 = 1.2494$
 $= 1.2494$
 $C+ = \Delta C$
 $= -0.57 + 0.3829$
 $= -0.1871$