NNDL Assignment-1

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Let 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, η=0.1, epoches=2, ns=2

Step-2: itr=1

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

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

$= -1.34$

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

$= -4.3$

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: $m = m + \Delta m$

$= 1 + 0.134 = 1.134$

$c = c + \Delta c$

$= -0.1 \times -4.3 = 0.43$

Step-6: itr += 1

1+1 = 2

Step-7: if (itr > epochs)

goto step-8

2 > 3

else

goto step-3

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

$= -1.157$

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

$= -3.829$

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

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

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

$= 1.134 + 0.1157$

$= 1.2497$

$c = c + \Delta c$

$= -0.57 + 0.3829 = -0.187$

Step-6: itr += 1

2+1 = 3

Step-7: if (itr > epochs)

3 > 2

goto step-8

else

goto step-3

Step-8: $m = 1.2497, c = -0.1871$