ASSIGNMEN-7

- 18K41A0502

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).

S-1: [x, y], m=1, c=-1, η=0.1, epoches = 2, ns = 2

S-2: ptr = 1

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

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

$= -1.34$

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

$= -4.3$

S-4: $\Delta m = -\eta \frac{\partial E}{\partial m}$

$= -0.1 \times -1.34$

$= 0.134$

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

$= -0.1 \times -4.3 = 0.43$

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

$1 + 0.134$

$= 1.134$

$c + \Delta c$

$= -0.1 \times 4.3$

$= 0.43$

S-6: $itr + = 1$

$1 + 1 = 2$

S-7: if (itr > epochs)

goto S-8

$2 > 3$

else

goto S-3

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

$= -1.157$

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

$= -3.829.$

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

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

S-5: $m_t = \Delta m$

$1.134 + 0.1157$

$= 1.2497$

$c_t = \Delta c$

$\Rightarrow -0.57 + 0.3829 = -0.187$

S-6: itr = 1

epochs = 3

S-7: If (itr > epochs)

then goto S-8

else

goto S-3

S-8: $m = 1.2497$, $c = -0.187$