18K41A04C8

Assignment-7:

Let consider a sample dataset have one input (x_i^a) & one output (y_i^a), and no. 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 2 iterations with first 2 samples.

Step 1: $[x,y]$, $m=1$, $c=-1$, $\eta=0.1$, epochs $=2$, $ns=2$

Step 2: iter $=1$

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

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

$$= \frac{-1}{2}(0.84+1.76)$$

$$\frac{\partial E}{\partial m} = -1.34$$

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

$$= \frac{-1}{2}(4.2+4.4)$$

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

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

$= -(0.1)(-1.34)$

$\Delta m = 0.134$

$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.1)(-4.3)$

$\Delta c = 0.43$

Step 5: $m = m + \Delta m = 1 + 0.134 = 1.134$

$c = c + \Delta c = -1 + 0.43 = -0.57$

Step 6: $iter = iter + 1 = 1 + 1 = 2$

Step 7: if (iter > epoche)

$2 > 2 \rightarrow$ false

goto step 3

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

$= -\frac{1}{2}\left[0.748 + 1.566\right]$

$\frac{\partial E}{\partial m} = -1.157$

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

$= -\frac{1}{2}\left[3.743 + 3.916\right]$

$\frac{\partial E}{\partial c} = -3.829$

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

$\Delta c = -(0.1)(-3.829) = 0.3829$

Step 5: $m = m + \Delta m = 1.134 + 0.1157 = 1.2497$

$c = c + \Delta c = -0.57 + 0.3829 = -0.1871$

Step 6: iter = iter + 1 = 2 + 1 = 3.

Step 7: if (iter > epochs)

3 > 2 → True

goto next step.

Step 8:- print m, c values

$m = 1.2497$

$c = -0.1871$