Assignment 7

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

$\Rightarrow$ Do manual calculations for 2 iterations with 1st 2° samples.

Step1 :- $[x, y]$, $m=1$, $c=-1$, $\eta=0.1$, epoches $=2$, ns $=2$

Step2 :- iter $=1$

Step3 :- $\dfrac{\partial E}{\partial M} = -\dfrac{1}{ns} \overset{ns}{\underset{i=1}{\sum}} (y_{j_i} - m x_i - c) x_i$

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

$$= -1.34$$

step 0:

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

$$= -4.3$$

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

$$= -0.1 \times -1.34 = 0.134$$

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

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

step 5:- $\quad m = m + \Delta m$

$$= 1 + 0.134 = 1.134$$

$$c = c + \Delta c$$

$$= -1 + 0.43 = -0.57$$

step 6:- $\quad$ iter $=$ iter $+1$

$$= 1 + 1 = 2$$

step 7:- $\quad$ if (iter $>$ epoches), goto step 8

else goto step 3

step 3:-

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

$$= -1.157$$

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

$$= -3.829$$

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

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

step r :- $\quad m = m + \Delta m = 1.134 + 0.1157 = 1.2497$

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

step 6 :- $\quad itu = itu + 1$
$\quad\quad\quad\quad = 2 + 1 = 3$

step t :- if $(itu > epochs)$ goto step 8
$\quad\quad\quad\quad\quad\quad\quad 3$
$\quad\quad\quad\quad$ else $\quad$ step 3

step 8 :- $\quad m = 1.2497 \quad c = -0.1871$