Assignment-5

1) Develop a simple linear regression model using MBGD

Sample	X_i	Y_i
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 batch size 2.

Sol)

Batch-1

X	Y
0.2	3.4
0.4	3.8

Batch-2

X	Y
0.6	4.2
0.8	4.6

Step-1: x, y, m=1, c=-1, η=0.1, epochs=2, bs=2

Step-2: $nb = \frac{ns}{bs} = \frac{4}{2} = 2$

Step-3: iter = 1

Step-4: batch = 1

Step-5: $\frac{\partial E}{\partial m} = -\frac{1}{2}[(3.4-(1)(0.2)+1)0.2] + [3.8-0.4)+1)0.$

$= -1.34$

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

$$= -4.3$$

Step-6: $\Delta m = -(0.1)(-1.34) = 0.134$.

$$\Delta c = -(0.1)(-4.3) = 0.43$$

Step-7: $m = m+\Delta m = 1+0.134 = 1.134$

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

Step-8: if ($E2>2$)

goto step 10

else

goto step 5

Step-5: $\frac{\partial E}{\partial m} = -\frac{1}{2}[(4.2-(1.134)(0.6)+0.57)0.6 +$

$(4.6-(1.134)(0.8)+0.57)0.8]$

$$= -2.932$$

$$\frac{\partial E}{\partial c} = -\frac{1}{2}[(4.2)-(1.134)(0.6)+0.57)+(4.6-$$

$(1.134)(0.8)+0.57)]$

$$= -4.1762$$

Step-6: $\Delta m = -(0.1)(-2.932) = 0.2932$

$$\Delta c = -(0.1)(-4.1762) = 0.4176$$

Step-7: $m = m+\Delta m = 1.134+0.2932 = 1.4272$

$$c = c+\Delta c = -0.57+0.4176 = -0.1523$$

Step-8: Batch = 2+1 = 3

Step-9: if (3>2)
goto step 10

Step-10: iter = 1+1 = 2

Step-11: if (2>2)
goto step 12
else
goto step 4

Step-4: Batch = 1

Step-5: $\frac{\partial E}{\partial m} = -\frac{1}{2}[(3.4-(1.4272)(0.2)+0.1523)0.2+$
$(3.8-(1.4272)(0.4)+0.1523)0.4]$
$= -1.0029$

$\frac{\partial E}{\partial c} = -\frac{1}{2}[3.4-(1.4272)(0.2)+0.1523)+(3.8-$
$(1.4272)(0.4)+0.1523]$

$= -3.3241$

Step-6: $\Delta m = (-0.1)(-1.0029) = 0.1002$

$\Delta c = (-0.1)(-3.3241) = 0.332$

Step-7: $m = m+\Delta m = 1.4272+0.1002 = 1.5274$

$c = c+\Delta c = -0.1523+0.332 = 0.1797$

Step-8: Batch = 1+1 = 2

Step-9: if (2>2)
goto step 10
if else

Step-5: $\frac{\partial E}{\partial m} = -\frac{1}{2}[(4.2-(1.5274)(0.6)-0.1797)0.6 \times (4.6-(1.5274)(0.8)-0.1797)0.8]$

$= -2.21$

$\frac{\partial E}{\partial c} = -\frac{1}{2}[(4.2-(1.5274)(0.6)-0.1797) + (4.6-(1.5274)(0.8)-0.1797)]$

$= -3.151$

Step-6: $\Delta m = -0.1 \times -2.21$

$= 0.221$

$\Delta c = -0.1 \times -3.151 = 0.315$

Step-7: $m = m + \Delta m = 1.5274 + 0.221 = 1.748$

$c = c + \Delta c = 0.1797 + 0.315 = 0.494$

Step-8: Batch = 2+1 = 3

Step-9: if (3>2)

goto step 10

Step-10: iter = 2+1 = 3

Step-11: if (3>2)

goto step 12

Step-12: $m = 1.748$

$c = 0.494$