

Assignment-5:

Let us consider a sample dataset, have one input (x_i) & one output (y_i) and no. of samples of and develop a SLR model using MBGD.

manual calculations

2 iterations

with

2 samples

sample (i)	x_i	y_i
batch-1 {	1	0.2
	2	0.4
batch-2 {	3	0.6
	4	0.8

Step-1: $m=1, c=-1, \eta=0.1, \text{epochs}=2, bs=2, n_s=4$

S-2: $nb = \frac{n_s}{bs} = \frac{4}{2} = 2$

S-3: iter - 1

S-4: Batch = 1

S-5:
$$\frac{\partial E}{\partial m} = -\frac{1}{bs} \sum_{i=1}^{bs} (y_i - mx_i - c) x_i$$

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

$$= -1.34$$

$$\frac{\partial E}{\partial C} = \frac{-1}{2} [(3.4 - 0.241) + (3.8 - 0.4 + 1)]$$

$$= -4.3$$

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

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

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

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

S-8: Batch + 1
1 + 1 = 2

S-9: if (Batch > n b) $2 > 2$ false
next step
step 5

S-5: $\frac{\partial E}{\partial m} = \frac{-1}{2} [(4.2 - (1.134)(0.6) + 0.57)0.6 +$
 $(4.6 - (1.134)0.8 + 0.57)0.8]$
 $= -2.932$

$$\frac{\partial E}{\partial C} = \frac{-1}{2} [4.2 - (1.134)0.6 + 0.57 +$$
 $(4.6 - (1.134)0.8 + 0.57)]$

$$= -4.1962$$

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

$$\Delta C = -(0.1)(-4.1962) = 0.41962$$

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

$$C = C + \Delta C = -0.57 + 0.41962 = -0.15238$$

S-8: Batch + 1 = 1 $\Rightarrow 2 + 1 = 3$

S-9 if (batch > nb) $3 > 2$ (true)

next step

else

step 5

S-10

$$iter = iter + 1 = 1 + 1 = 2$$

S-11

if (iter > epochs) $2 > 2$ false

next step

step-4

else

step 4

S-14

$$Batch = 1$$

S-15

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

$$= -1.0029$$

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

$$= -3.3241$$

S-16

$$\Delta m = (-0.1) (-1.0029) = 0.1002$$

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

S-17

$$m = m + \Delta m = 1.4272 + 0.1002 = 1.5274$$

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

S-18

$$Batch = 1 = 1 + 1 = 2$$

S-19

if (Batch > nb)

$$2 > 2$$

false

next step

else

step 5

step-5

$$\underline{S-5} \quad \frac{\partial E}{\partial m} = \frac{-1}{2} \left[(4.2 - (1.5274)0.6 - 0.1797)0.6 + (4.6 - (1.5274)0.8 - 0.1797)0.8 \right]$$

$$= -2.21$$

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

$$= -3.151$$

$$\underline{S-6} \quad \Delta m = -0.1 (-2.21) = 0.221$$

$$\Delta c = -0.1 (-3.151) = 0.315$$

$$\underline{S-7} \quad m = m + \Delta m = 1.5274 + 0.221 = 1.748$$

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

$$\underline{S-8} \quad \text{Batch} \neq 1 = 2 + 1 = 3$$

$$\underline{S-9} \quad \begin{array}{ll} \text{if (Batch} > \text{nb)} & 3 > 2 \text{ (true)} \\ \quad \text{next step} & \text{next step} \\ \text{else} & \\ \quad \text{step 5} & \end{array}$$

$$\underline{S-10} \quad \text{iter} + 1 = 2 + 1 = 3$$

$$\underline{S-11} \quad \begin{array}{ll} \text{if (iter} > \text{epochs)} & 3 > 2 \text{ (true)} \\ \quad \text{next step} & \text{next step} \\ \text{else} & \\ \quad \text{step 4} & \end{array}$$

$$\underline{S-12} \quad m = 1.748, \quad c = 0.494$$