

Assignment - 5

1. Let us consider a sample dataset have one input and one o/p and no of samples of develop a SLR 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

Manual Calculations for 2 iterations with $bs=2$

batch -1	\rightarrow	x	y
		0.2	3.4
		0.4	3.8

batch 2	\rightarrow	0.6	4.2
		0.8	4.6

1. (x, y) , $m=1$, $c=-1$, $\eta=0.1$, $epochs=2$, $bs=2$

2. $n_b = \frac{n_s}{bs} = \frac{4}{2} = 2$

3. $iter=1$

4. $batch=1$

5. $\frac{dE}{dm} = \frac{-1}{bs} \sum_{i=1}^{bs} (y_i - mx_i - c)x_i$

$$= \frac{-1}{2} [(3.4 - 1(0.2) + 1)0.2] + [3.8 - 0.4 + 1]0.4 = -1.34$$

$$\frac{\partial E}{\partial c} = \frac{-1}{2} [(3.4 - 0.2) + (3.8 - 0.4 + 1)] = -4.3$$

$$6. \Delta m = - (0.1) (-1.34) = 0.134, \quad \Delta c = - (0.1) (-4.3) = 0.43$$

$$7. m = 1 + 0.134 = 1.13, \quad c = -1 + 0.43 = -0.57$$

$$8. \text{batch} = 2$$

$$9. \text{if } (\text{batch} \geq nb) \quad 2 \geq 2 \quad \text{goto step 10}$$

$$\text{else:} \quad \text{goto step 5}$$

$$5. \frac{\partial E}{\partial m} = \frac{-1}{2} [(4.2 - (1.134)(0.6) + 0.57)0.6 + (4.6 - (1.134)(0.8) + 0.57)0.4]$$

$$= -2.432$$

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

$$= -4.17$$

$$6. \Delta m = - (0.1) (-2.432) = 0.243$$

$$\Delta c = - (0.1) (-4.17) = 0.41$$

$$7. m = 1.134 + 0.24 = 1.42, \quad c = -0.57 + 0.41 = -0.15$$

$$8. \text{Batch} = 3$$

$$9. \text{if } (\text{batch} \geq nb) \quad 3 \geq 2 \quad \text{goto step 10}$$

$$\text{else} \quad \text{goto step 5.}$$

$$10. \text{iter} = 2$$

$$11. \text{if } (\text{iter} \geq \text{epochs}) \quad 2 \geq 2 \quad \text{goto 12}$$

$$\text{else:} \quad \text{goto 4.}$$

$$4. \text{batch} = 1$$

$$5. \frac{\partial E}{\partial m} = \frac{-1}{2} [(3.4 - (1.42)(0.2) + 0.15)0.2 + (3.8 - (1.42)(0.4) + 0.15)0.4]$$

$$= -1.002$$

$$\frac{\partial E}{\partial c} = \frac{-1}{2} [(3.4 - 1.42(0.2) + 0.15) + (3.8 - (1.42)(0.4) + 0.15)] = -3.32$$

$$6. \Delta m = -0.1 (-1.002) = 0.1002$$

$$\Delta c = -0.1 (-3.32) = 0.33$$

$$7. m = 1.42 + 0.100 = 1.52$$

$$c = -0.15 + 0.33 = 0.17$$

$$8. \text{Batch} = 2$$

$$9. \text{if } (\text{batch} \geq nb) \text{ } 2 \geq 2$$

goto step 10

else

goto step 7

$$5. \frac{\partial E}{\partial m} = -\frac{1}{2} [(4.2 - 1.5(0.6) - 0.17)0.6 + (4.6 - (1.5)(0.6) - 0.17)(-0.4)]$$

$$= -2.21$$

$$\frac{\partial E}{\partial c} = -3.15$$

$$6. \Delta m = -0.1 \times -2.21 = 0.221$$

$$\Delta c = -0.1 \times -3.15 = 0.315$$

$$7. m = 1.52 + 0.2 = 1.74$$

$$c = 0.17 + 0.3 = 0.4$$

$$8. \text{Batch} = 3$$

$$9. \text{if } (\text{batch} \geq nb) \text{ goto step 10}$$

$$3 \geq 2$$

else:

goto step 5

$$10. \text{iter} = 3$$

$$11. \text{if } (\text{iter} \geq \text{epochs}) \text{ goto step 12}$$

$$3 \geq 2$$

else:

goto step 4

$$12. \text{print } m, c$$

$$m = 1.74, c = 0.4$$