

# Assignment - 4

19K41A0450

## Simple Linear Regression:

sample(i)	$x_i^a$	$y_i^a$
1	7.6	157
2	7.1	174

Step 1: Read dataset,  $\eta = 0.1$ , epochs = 1,  $m = 1$ ,  $c = -1$

Step 2: Set iteration = 1

Step 3: set sample  $i = 1$

Step 4:  $Y = mx + c$

$$Y = (1)(7.6) - 1 = 6.6$$

Step 5:  $E = \frac{1}{2} (Y_i^a - mx_i^a - c)^2$

$$E = \frac{1}{2} (157 - (1)(7.6) - (-1))^2 = \frac{22620.16}{2} = 11310.08$$

Step 6:  $\frac{\partial E}{\partial m} = -(Y_i^a - mx_i^a - c)x_i^a = -(157 - 6.6)(7.6) = -1143.04$

$$\frac{\partial E}{\partial c} = -(Y_i^a - mx_i^a - c) = -(157 - 6.6) = -150.4$$

Step 7:  $\Delta m = -\eta \frac{\partial E}{\partial m} = -(0.1)(-1143.04) = 114.304$

$$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.1)(-150.4) = 15.04$$

Step 8:  $m = m + \Delta m = 1 + 114.304 = 115.304$

$$c = c + \Delta c = -1 + 15.04 = 14.04$$

Step 9: sample  $i = i + 1 = 2$  &  $i \leq n_s \rightarrow$  Step (4)

Step 4:  $Y = (115.304)(7.1) + 14.04 = 832.69$

Step 5:  $E = \frac{1}{2} (174 - 832.69)^2 = \frac{433872.5}{2} = 216936.25$

Step 6:  $\frac{\partial E}{\partial m} = -(174 - (115.304)(7.1) - 14.04)(7.1)$

$$= -(174 - 832.69)(7.1)$$

$$= (658.69)(7.1) = 4676.69$$

$$\frac{\partial E}{\partial c} = -(174 - 832.69) = 658.69$$

$$\text{Step 7: } \Delta m = -\eta \frac{\partial E}{\partial m} = -(0.1)(4676.69) = -467.669$$

$$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.1)(658.69) = -65.869$$

$$\text{Step 8: } m = 115.304 + (-467.669) = -352.36$$

$$c = 14.04 + (-65.869) = -51.829$$

$$\text{Step 9: Sample } i = i + 1 = 2 + 1 = 3 \quad i \leq \frac{n_s}{2} \quad F \rightarrow \text{next step}$$

$$\text{Step 10: } iter = iter + 1 = 1 + 1 = 2, \quad iter > \frac{epochs}{2} \quad T \rightarrow \text{next step}$$

Step 11: Stop.