

# Assignment - 4

Sample

Sample	$x_i$	$y_i$
1	7.6	157
2	7.1	174

Iteration = 1

Sample - 1

step 1:  $[7.6, 157]$ ,  $\eta = 0.01$ ,  $m = 1$ ,  $c = -1$

$$\begin{aligned}\text{step 2: } \frac{\partial E}{\partial m} \bigg|_{m=1} &= -(y_i^a - mx_i^a - c) \times (-x_i^a) \\ &= -(157 - 1 \times 7.6 - (-1)) \times (-7.6) \\ &= \cancel{(157 + 1 \times 7.6 + 1)} \times \cancel{(-7.6)} \\ &= \cancel{(158 + 8.6)} = (158 - 7.6)(7.6) \\ &= (150.4)(7.6) \\ &= 1143.04\end{aligned}$$

$$\begin{aligned}\frac{\partial E}{\partial c} \bigg|_{c=-1} &= -(y_i^a - mx_i^a - c) \\ &= -(157 - 1 \times 7.6 - (-1)) \\ &= -(158 - 7.6) \\ &= -150.4\end{aligned}$$

$$\begin{aligned}\text{step 3: } \Delta m &= -\eta \frac{\partial E}{\partial m} = -(0.01)(1143.04) \\ &= -11.430\end{aligned}$$

$$\begin{aligned}\Delta c &= -\eta \frac{\partial E}{\partial c} = -(0.01)(-150.4) \\ &= 1.504\end{aligned}$$



$$\text{step 4: } m = m + \Delta m = 1 + (-11.43) = -10.43$$

$$c = c + \Delta c = -1 + (1.504) = 0.504$$

Sample 2

$$\text{step -1: } [7.01, 174], \eta = 0.01, m = 1, c = -1$$

$$\text{step -2: } \left. \frac{\partial E}{\partial m} \right|_{m=1} = -(y_i^a - mx_i^a - c) \times (-x_i^a)$$

$$= (174 - 1 \times (7.01) - (-1)) \times 7.01$$

$$= (175 - 7.01) \times 7.01$$

$$= 1167.9 \times 7.01$$

$$= 1192.09$$

$$\left. \frac{\partial E}{\partial c} \right|_{c=-1} = -(y_i^a - mx_i^a - c)$$

$$= -(174 - 1 \times (7.01) - (-1))$$

$$= -167.9$$

step -3:

$$\Delta m = -\eta \frac{\partial E}{\partial m} = -(0.01) \times 1192.09$$

$$= -11.9209$$

$$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.01) \times (-167.9)$$

$$= 1.679$$

step -4:

$$m = m + \Delta m = 1 + (-11.920)$$

$$= -10.920$$

$$c = c + \Delta c = -1 + 1.679$$

$$= 0.679$$



Iteration 2 (P.O. = 5 - 4F1)

Sample 1

step 1:  $[7.61, 157]$ ,  $\eta = 0.01$ ,  $m = -10.43$   
 $c = 0.504$

step 2:  $\frac{\partial E}{\partial m} \Big|_{m=-10.43} = -(157 - (-10.43)(7.61) - 0.504)$   
 $\times (-7.61)$   
 $= (157 + (10.43 \times 7.61) - 0.504) \times (7.61)$   
 $= (156.496 + (10.43 \times 7.61)) \times (7.61)$   
 $= (156.496 + 79.372) \times 7.61$   
 $= (235.868) \times 7.61$

$= 1794.955$   
 $\frac{\partial E}{\partial c} \Big|_{c=0.504} = -(157 - (-10.43)(7.61) - 0.504)$   
 $= -235.868$

step 3:  $\Delta m = -\eta \frac{\partial E}{\partial m} = (-0.01 \times 1794.955)$   
 $= -17.949$

$\Delta c = -\eta \frac{\partial E}{\partial c} = (-0.01) \times (-235.868)$   
 $= 2.358$

step 4:  $m = m + \Delta m = -10.43 + (-17.949)$   
 $= -28.379$

$c = c + \Delta c = 0.504 + 2.358$   
 $= 2.862$

Sample 2

step 1:  $[7.1, 177]$ ,  $\eta = 0.01$ ,  $m = -10.92$   
 $c = 0.679$



$$\text{Step 2: } \left. \frac{\partial E}{\partial m} \right|_{m=-10.92} = (174 - (-10.92) \times (7.1) - 0.679 \times (7.1))$$

$$= (173.321 + (10.92 \times 7.1)) \times 7.1$$

$$= 1781.056$$

$$\left. \frac{\partial E}{\partial c} \right|_{c=0.679} = - (174 - (-10.92) \times (7.1) - 0.679)$$

$$= -250.853$$

$$\text{Step 3: } \Delta m = -\eta \frac{\partial E}{\partial m} = -(0.01) \times 1781.056$$

$$= -17.810$$

$$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.01) \times (-250.853)$$

$$= 2.508$$

Step 4:

$$m = m + \Delta m$$

$$= -10.92 - 17.81$$

$$= -28.73$$

$$c = c + \Delta c$$

$$= 0.679 + 2.508$$

$$= 3.187$$