Assignment-4

Iteration-0, sample-1.

x_i	y_i
7.6	157
7.1	174

Step1: $[7.6, 157]$, $\eta = 0.01$, $m = 1$, $c = -1$.

Step2:

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

$$= +(157 - 1 \times 7.6 - (-1)) \times (7.6)$$

$$= (158 - 7.6)(7.6)$$

$$= (150.4) \cdot (7.6)$$

$$= 1143.04$$

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

$$= -(157 - 1 \times 7.6 - (-1))$$

$$= -(158 - 7.6)$$

$$= -150.4$$

Step3:

$$\Delta m = -\eta \frac{\partial E}{\partial m} = -(0.01)(1143.04)$$

$$= 11.430$$

$$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.01)(-150.4)$$

$$= 1.504$$

Step4:

$$m = m + \Delta m = 1 + (-11.43) = -10.43.$$

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

Sample-2

Step1: $[7.1, 174]$, $\eta = 0.01$, $m = 1$, $c = -1$.

Step2: $\left.\frac{\partial E}{\partial m}\right|_{m=1} = -(y_i^a - mx_i^a - c) - x_i^a$

$= (174 - 1*(7.1) - (-1)) * 7.1$

$= (175 - 7.1) * (7.1))$

$= 167.9 \times 7.1 = 1192.09.$

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

$= -(174 - 1(7.1) - (-1))$

$= -167.9.$

Step3: $\Delta m = -\eta \frac{\partial E}{\partial m} = -(0.01)\, 1192.09$

$= -11.920.$

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

$= 1.679.$

Step4: $m = m + \Delta m = 1 + (-11.920)$

$= -10.920$

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

$= 0.679.$

Iteration-2

Sample-1

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

Step 2: $\left.\frac{\partial E}{\partial m}\right|_{m=-10.43} = (157-(-10.43)(7.61)-0.504-(7.61)$

$= (157+(10.43)(7.61)-0.504)(7.61)$

$= (156.496+(10.43\times 7.61))\cdot 7.61$

$= (156.496+79.372)\ 7.61$

$= (235.868)\ 7.61$

$= 1794.955$

$\left.\frac{\partial E}{\partial c}\right|_{c=0.504} = -(157-(-10.43)(7.61)-0.54)$

$= -235.868.$

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, 174] $\eta = 0.01$, $m = -10.92$, $c = 0.679$

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

$= \{173.321) + ((10.92 * 7.1))) 7.1$

$= 1781.056.$

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

$= -250.853$

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

$= -17.810.$

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

$= 2.508.$

Step 4: $m = m + \Delta m$

$= -10.92 - 17.81$

$= -28.73$

$c = c + \Delta c$

$= 0.679 + 2.508$

$= 3.187$