

$x_i$   $y_i$

7.6 157

7.1 174

Iteration - 1

Sample - 1

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

$$\begin{aligned} \text{Step 2: } \frac{\partial E}{\partial m} \Big|_{m=1} &= -(y_i^a - mx_i^a - c)(-x_i^a) \\ &= (157 - 1(7.6) - (-1))(7.6) \\ &= (150.4)(7.6) \\ &= 143.04 \end{aligned}$$

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

$$\text{Step 3: } \Delta m = -\eta \frac{\partial E}{\partial m} = -(0.01)(143.04) = -1.430$$

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

$$\text{Step 4: } m = m + \Delta m = 1 + (-1.43) = -10.43$$

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

Iteration - 2

$$S_1: [7.6, 157], \eta = 0.01, m = -10.43, c = 0.504$$

$$\begin{aligned} S_2: \frac{\partial E}{\partial m} &= (157 - (-10.43)(7.61) - 0.54)(7.61) \\ &= (157 + (10.43)(7.61) - 0.54)(7.61) \\ &= (156.496 + 79.372)(7.61) \\ &= 1794.955 \end{aligned}$$

$$\begin{aligned} \frac{\partial E}{\partial c} &= - (157 - (-10.43)(7.61) - 0.54) \\ &= -235.868 \end{aligned}$$

$$S_3: \Delta m = -\eta \frac{\partial E}{\partial c} = (-0.01 \times 1794.955) = -17.949$$

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

$$\begin{aligned} S_4: m &= m + \Delta m = -10.43 + (-17.949) \\ &= -28.379 \end{aligned}$$

$$\begin{aligned} c &= c + \Delta c = 0.504 + 2.358 \\ &= 2.862. \end{aligned}$$

Sample - 2 Iteration - 1

$$S_1: (7.1, 174) \quad \eta = 0.01, m = 1, c = -1$$

$$\begin{aligned} S_2: \frac{\partial E}{\partial m} &= -(y_i^a - mx_i^a - c) - x_i^a \\ &= (174 - (7.1) - (-1)) + 7.1 \\ &= (175 - 7.1)(7.1) \end{aligned}$$

$$\begin{aligned}\frac{\partial E}{\partial c} \Big|_{c=1} &= -(y_i - mx_i - c) \\ &= -(174 - (7 \cdot 1) - (-1)) \\ &= -167.9\end{aligned}$$

$$S3: \Delta m = -\eta \frac{\partial E}{\partial m} = -(0.01)(1192.09) \\ = -11.920$$

$$\Delta c = -\eta \frac{\partial E}{\partial c} = -(0.01)(-167.9) \\ = 1.679$$

$$S4: m \approx m + \Delta m = 1 + (-11.920) = -10.920$$

$$c = c + \Delta c = -1 + 1.679 = 0.679$$

Iteration - 2

$$S1: [7.1, 174] \quad n=0.01 \quad m = -10.92 \\ c = 0.67$$

$$S2: \frac{\partial E}{\partial m} \Big|_{m=-10.92} = (174 - (-10.92)(7.1) - \\ 0.67(7.1)) \\ = (173.321 + (10.92 + 7.1))(7.1) \\ = 1781.056$$

$$\frac{\partial E}{\partial c} \Big|_{c=0.679} = -(174 - (-10.92)) (7.1) \\ - 0.679)) \\ = -250.853$$

$$S3: \Delta m = -n \frac{\partial E}{\partial m} = (-0.01) \times (1781.056) \\ = -17.810$$

$$\Delta c = -n \frac{\partial E}{\partial c} = -(0.01) (-250.853) \\ = 2.508$$

$$S4: m = m + \Delta m = -10.92 - 17.81 \\ = -28.73$$

$$c = c + \Delta c$$

$$= 0.679 + 2.508 \\ = 3.187$$