

Urlich FUKAZAWA MBUGA

Iteration 4

Current values

$$m_3 = 1.34$$

$$b_3 = 1.916$$

$$n = 2$$

$$\delta = 0.1$$

Predictions

$$\begin{aligned}\hat{y}_1 &= mx + b \\ &= (1.34)(1) + 1.916 \\ &= 3.256\end{aligned}$$

$$\begin{aligned}\hat{y}_2 &= mx + b \\ &= (1.34)(3) + 1.916 \\ &= 5.936\end{aligned}$$

Errors

$$\begin{aligned}e_1 &= \hat{y}_1 - y_i \\ &= 3.256 - 3 = 0.256\end{aligned}$$

$$\begin{aligned}e_2 &= \hat{y}_2 - y_i = 5.936 - 6 \\ &= -0.064\end{aligned}$$

Gradient

$$\frac{\partial S}{\partial m} = \frac{2}{n} \sum_{i=1}^n (mx_i + b - y_i)x_i$$

$$\text{and } \frac{\partial S}{\partial b} = \frac{2}{n} \sum_{i=1}^n (mx_i + b - y_i)$$

$$\frac{\partial S}{\partial m} = \frac{2}{n} [e_1 x_1 + (e_2 x_2)]$$

$$\begin{aligned}\frac{\partial S}{\partial m} &= \frac{2}{2} [(0.256)(1) + (0.064)(3)] \\ &= 0.256 + (-0.192) = 0.064\end{aligned}$$

$$\begin{aligned}\frac{\partial S}{\partial b} &= \frac{2}{n} (e_1 + e_2) \\ &= \frac{2}{2} [0.256 + (-0.064)] \\ &= 0.256 - 0.064 \\ &= 0.192\end{aligned}$$

Updated values

$$\begin{aligned}m_{\text{new}} &= m_3 - \delta \frac{\frac{\partial S}{\partial m}}{f_m} \\ &\approx 1.34 - (0.1)(0.064) \\ &= 1.34 - 0.0064 \\ &= 1.3336\end{aligned}$$

$$\begin{aligned}b_{\text{new}} &= b_3 - \delta \frac{\frac{\partial S}{\partial b}}{f_b} \\ &= 1.916 - (0.1)(0.192) \\ &= 1.916 - 0.0192 \\ &= 1.8968\end{aligned}$$

New value

$$\begin{aligned}m_4 &\approx 1.334 \\ b_4 &\approx 1.897\end{aligned}$$