$\hat{y} = mx + b$

Initial $m_0 = 0$

Initial $b_0 = 0$

Learning rate $\alpha = 0.1$

Data points

$(x_1, y_1) = (1, 2)$ and $(x_2, y_2) = (2, 3)$

Loss : MSE , $J(m, b) = \frac{1}{2} \sum_{i=1}^{n} (y - (mx+b))^2$

$\hat{y} = mx + b$

$$\frac{\partial J}{\partial m} = \frac{1}{n} \sum_{i=1}^{n} (y_i^n - y_i) x_i$$

$$\frac{\partial J}{\partial m} = \frac{1}{n} \sum_{i=1}^{n} (\hat{y} - y)$$

$m_{new} = m_{new} - \alpha \frac{\partial J}{\partial m}$, $b_{new} = b_{old} - \alpha \frac{\partial J}{\partial b}$

$\hat{y}$ For $(1,2) = 0(1) + 0 = 0$ } Error $2 - 0 = 2$

Error $3 - 0 = 3$

$$\frac{\partial y}{\partial m} = \frac{2}{2} (2 \cdot 3 + 2 \cdot 3) = -1(2 + 6) - 8$$

$$\frac{\partial y}{\partial b} = \frac{2}{2} (2 + 3) = -1 \cdot 3 = -5$$

update m and b

$m_1 = 0 - 0.1(-8) = 0.8$, $b_1 = 0 - 0.1(-5) = 0.5$

Predicted $\hat{y}_1$ & $\hat{y}_2$ error

$\hat{y}_1 = 0.8(1) + 0.5 = 1.5$ error1 $= 1 - 1.3 = 0.7$

$\hat{y}_2 = 0.8(2) + 0.5 = 2.5$ error2 $= 3 - 2.1 = 0.9$