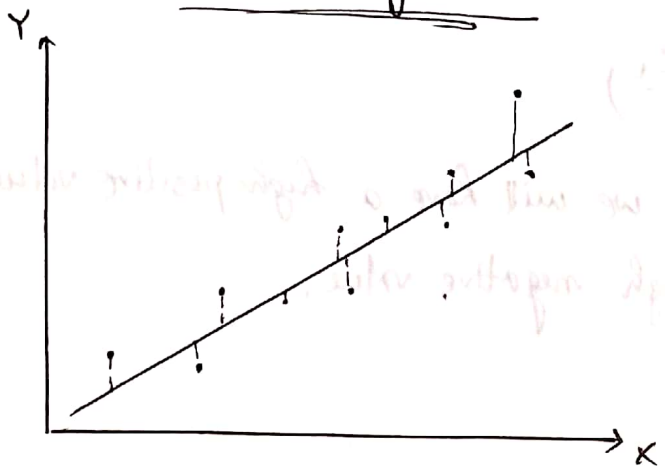
Linear Regression



Approximation!

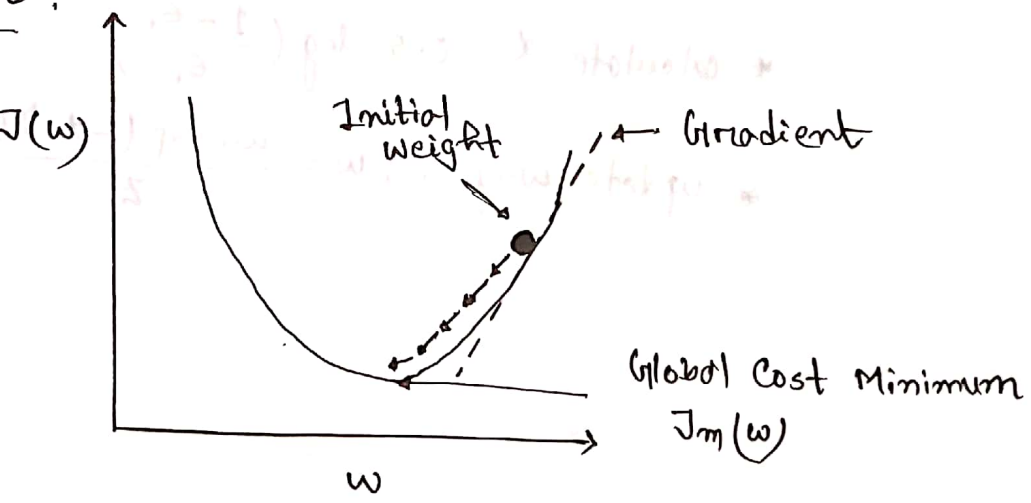
$$\hat{y} = mx + b$$

Cost Function!

$$\text{Mean Square Error (MSE)} = J(w,b) = \frac{1}{N}\sum_{i=1}^{n}(y_i - (wx_i + b))^2$$

$$J'(m,b) = \begin{bmatrix} \frac{df}{dw} \\ \frac{df}{db} \end{bmatrix} = \begin{bmatrix} \frac{1}{N}\Sigma - 2x_i\,(y_i - (wx_i + b)) \\ \frac{1}{N}\Sigma - 2\,(y_i - (wx_i + b)) \end{bmatrix}$$

Gradient Descent!



Update Rules!

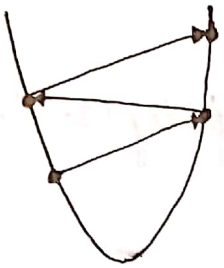
$$w = w - \alpha \cdot dw \qquad [\alpha = \text{learning rate}]$$

$$b = b - \alpha \cdot db$$

$$\frac{dJ}{dw} = dw = \frac{1}{N} \sum_{i=1}^{n} -2x_i (y_i - (wx_i + b)) = \frac{1}{N} \sum_{i=1}^{n} -2x_i (y_i - \hat{y}) = \frac{1}{N} \sum_{i=1}^{n} 2x_i (\hat{y} - y_i)$$

$$\frac{dJ}{db} = db = \frac{1}{N} \sum_{i=1}^{n} -2 (y_i - (wx_i + b)) = \frac{1}{N} \sum_{i=1}^{n} -2 (y_i - \hat{y}) = \frac{1}{N} \sum_{i=1}^{n} 2(\hat{y} - y_i)$$

Learning Rate!



Big Learning Rate

Small Learning Rate