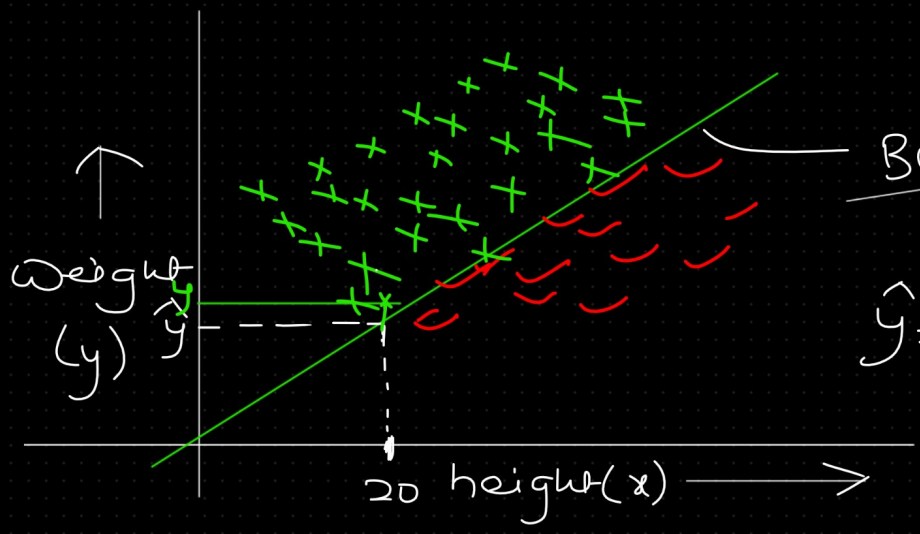
Linear Regression & Gradient Decent



(x) Height	(ŷ) Weight
1 ... 1000	Continous Real number / numeric value

Error or Residual

$(\hat{y} - y)$

- $\hat{y}$ — Predicted value
- y — actual value

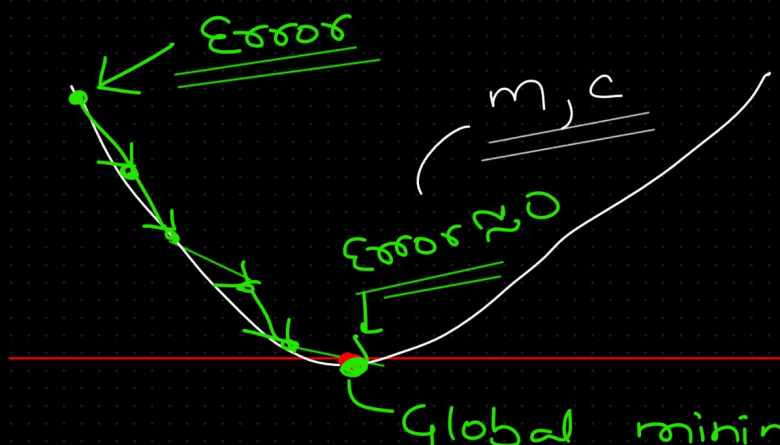
Best fit Line

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

Predicted value

$m, c \rightarrow$ quite accurate

Gradient Decent Optimizer



$\eta = 0.001$

Learning Rate

$$m_{new} = m_{old} - \eta \frac{\delta E}{\delta m}$$

$$c_{new} = c_{old} - \eta \frac{\delta E}{\delta c}$$

$$(a-b)^2 = a^2 + b^2 - 2ab$$

$$\text{Error} = \sum_{i=1}^{n} (y_i - \hat{y})^2 \downarrow\downarrow$$

$$\text{Error} = \sum_{i=1}^{n} (y_i - (mx + c))^2$$

$$\text{Error} = \sum_{i=1}^{n} \left(y_i^2 + (mx+c)^2 - 2y_i(mx+c) \right)$$

$$\frac{\delta E}{\delta m} = \sum_{i=1}^{n} 2(mx+c) \cdot x - 2y_i x$$

$$\frac{\delta E}{\delta m} = \sum_{i=1}^{n} 2x_i (c + mx - y_i)$$

$$\boxed{\frac{\delta E}{\delta m} = \sum_{i=1}^{n} 2x_i (\hat{y} - y_i)}$$

$$\frac{\delta E}{\delta c} = \sum_{i=1}^{n} \left(2(mx+c) - 2y_i \right)$$

$$\frac{\delta E}{\delta c} = \sum_{i=1}^{n} 2(mx + c - y_i)$$

$$\boxed{\frac{\delta E}{\delta c} = \sum_{i=1}^{n} 2(\hat{y} - y_i)}$$

$$\frac{\delta x^2}{\delta x} = 2x^{2-1} = 2x$$