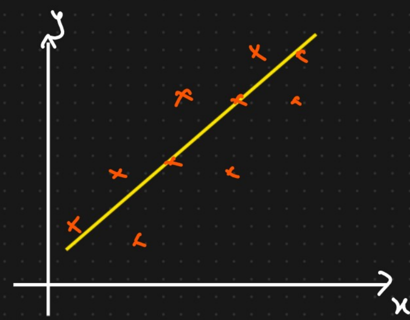
MSE, MAE, RMSE [Cost function]

① Mean Squared Error (MSE) ✓

② Mean Absolute Error (MAE)

③ Root Mean Squared Error (RMSE)



$$J(\theta_0,\theta_1) = \frac{1}{n}\sum_{i=1}^{n}\left(y_i - h_\theta(x)_i\right)^2$$

$\Downarrow$

Mean Squared Error

① Mean Squared Error (MSE)

$$MSE = \frac{1}{n}\sum_{i=1}^{n}\left(y_i - h_\theta(x)_i\right)^2$$

$$\boxed{MSE = \frac{1}{n}\sum_{i=1}^{n}\left(y_i - \hat{y}_i\right)^2} \longrightarrow \text{Quadratic Equation}$$

$\Downarrow$ → Convex function

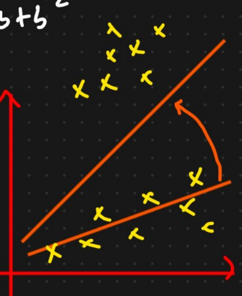
Non Convex function

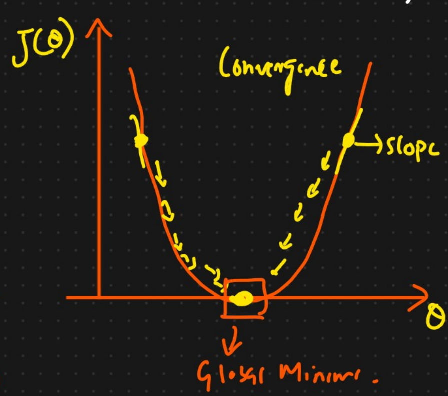
$(a-b)^2 = a^2 - 2ab + b^2$

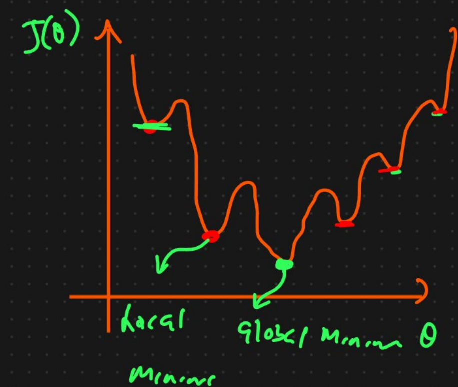
$(ERROR)^2$ ↑↑↑

$\Downarrow$

penalize the Error







Advantage

① Equation is differentiable

② It has only one local or global minima.

Disadvantage

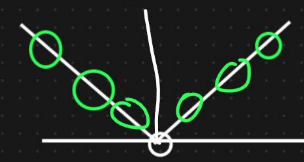
① Not Robust to outliers

② It is not in the same unit

② Mean Absolute Error (MAE)

$$\boxed{MAE = \frac{1}{n} \sum_{i=1}^{n} |y - \hat{y}|}$$

Sub gradient



Advantage

① Robust to outlier

② It will be in the same unit

Disadvantage

① Convergence usually takes more time

③ RMSE (Root Mean Squared Error)

$$RMSE = \sqrt{MSE}$$

$$= \sqrt{\frac{1}{n} \sum_{i=1}^{n} (y_i - h_\theta(x)_i)^2}$$

Advantages

① Same Unit

② Differentiable

Disadvantage

① Not Robust to outliers.

Note: Linear Regression

Performance Metrics = R^2 and Adjusted R^2 ⇒ Acc of model

Cost function ⟶ Error ⟶ MSE, MAE, RMSE