Mean Squared Error, Mean Absolute Error and RMSE

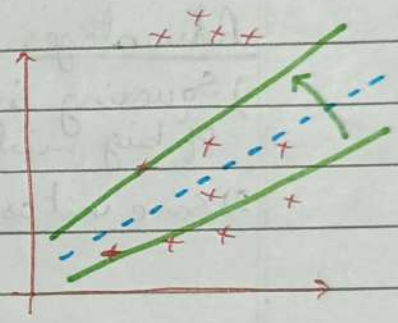
1. **Mean Squared Error (MSE)** is a metric used in ML and statistics to measure how far predictions and are from actual data. It tells us on average, how much our model is wrong, by squaring the errors.

Smaller MSE = better model.

larger MSE = worse predictions.

$$MSE = \frac{1}{n} \sum_{i=1}^{n} (y_i - \hat{y}_i)^2$$

Advantages	Disadvantages
1) Differentiable	Not Robust to outliers
2) It has one local and global minima	It changes its unit



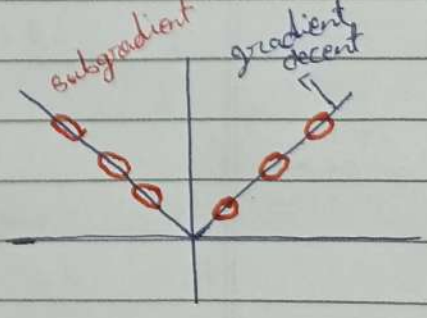
2. **Mean Absolute Error (MAE)** is used to measure how close predictions are to actual values.
It tells us the average absolute difference btw predicted values and actual values.

Lower MAE = better model

Higher MAE = more error

$$\text{Cost for } MAE = \frac{1}{n} \sum_{i=1}^{n} |y_i - \hat{y}_i|$$

Advantage	Disdvantages
1) It is robust to outliers	1) Convergence usually take more time
2) It will be same unit	2) Optimization is complex process



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3. Root Mean Squared Error (RMSE) is used to measure how far predictions are from actual values
It tells us the average size of the prediction error, in the same unit as the target value.

Lower RMSE = better model
Higher RMSE = more error

$$RMSE = \sqrt{\frac{1}{n}\sum_{i=1}^{n}(y_i - \hat{y}_i)^2}$$

Advantages

1) Squaring increases impact of big mistakes.
2) Same unit as output variable.

Disadvantages

1) Sensitive to outliers.
2) Error increases rapidly for large deviations.