

Regression Metrics

These metrics are used to evaluate models that predict a **continuous numerical value**, such as linear and polynomial regression.

R-squared (R²)

- **R-squared** measures the proportion of the variance in the dependent variable that is predictable from the independent variable(s).
- It ranges from 0 to 1, with a higher value indicating a better fit. A score of 1 means the model perfectly predicts the target variable.

Mean Squared Error (MSE)

- **MSE** measures the average of the squares of the errors between the actual and predicted values.
- It is always non-negative, and a value of 0 means the model has no error. It heavily penalizes large errors, making it sensitive to outliers.

Root Mean Squared Error (RMSE)

- **RMSE** is the square root of MSE.
- It is more interpretable than MSE because it is in the **same units as the target variable**, making it easier to understand the magnitude of the error.

Mean Absolute Error (MAE)

- **MAE** measures the average of the absolute differences between the actual and predicted values.
 - Unlike MSE, it is less sensitive to outliers, as it does not square the errors.
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Classification Metrics

These metrics are used to evaluate models that predict a **discrete category or class**, such as logistic regression. These metrics are all derived from a **confusion matrix**.

Accuracy

- **Accuracy** measures the ratio of correctly predicted instances to the total number of instances.
- It is a good general measure, but it can be misleading on imbalanced datasets (where one class is much more common than the other).

Precision

- **Precision** measures the ratio of true positive predictions to the total number of positive predictions (true positives + false positives).
- It answers the question: "Of all the times the model predicted positive, how many were actually positive?" A high precision means the model has a low rate of false positives.

Recall

- **Recall** measures the ratio of true positive predictions to the total number of actual positives (true positives + false negatives).
- It answers the question: "Of all the actual positives in the data, how many did the model correctly identify?" A high recall means the model has a low rate of false negatives.

F1-score

- The **F1-score** is the harmonic mean of precision and recall.
- It provides a single score that balances both precision and recall, making it a good metric to use when you need to consider both equally.