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Model Evaluation

8 Essential Metrics
YOU NEED TO KNOW!

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Model Evaluation: Metric 01/08

Accuracy

- **Explanation:** Accuracy measures the overall correctness of the model's predictions by calculating the ratio of correctly predicted instances to the total number of instances.

- **Use Case:** Accuracy is commonly used for classification problems when the class distribution is balanced.

- **Range & Interpretation:** The accuracy score ranges from 0 to 1, where 1 indicates a perfect prediction. However, accuracy alone may not be reliable if the dataset is imbalanced.

- **Formula:**

$$\frac{(Number\,of\,Correct\,Predictions)}{(Total\,Number\,of\,Predictions)}$$

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Model Evaluation: Metric 02/08

Precision

- **Explanation:** Precision calculates the proportion of correctly predicted positive instances out of all instances predicted as positive.

- **Use Case:** Precision is useful when the focus is on minimizing false positives.

- **Range & Interpretation:** Precision ranges from 0 to 1, where 1 represents a perfect precision score. A higher precision indicates a lower rate of false positives.

- **Formula:**

$$\frac{(True\ Positives\ )}{(True\ Positives + False\ Positives\ )}$$

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Model Evaluation: Metric 03/08

Recall

• **Explanation:** Recall, also known as sensitivity or True Positive Rate, measures the proportion of correctly predicted positive instances out of all actual positive instances.

• **Use Case:** Recall is valuable when the goal is to minimize false negatives.

• **Range & Interpretation:** Recall ranges from 0 to 1, with 1 indicating perfect recall. A higher recall implies a lower rate of false negatives.

• **Formula:** $$\frac{(True\ Positives\ )}{(True\ Positives + False\ Negatives\ )}$$

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Model Evaluation: Metric 04/08

F1 Score

- **Explanation:** The F1 score combines precision and recall into a single metric, providing a balance between the two. It is the harmonic mean of precision and recall.

- **Use Case:** F1 score is useful when both false positives and false negatives need to be considered equally.

- **Range & Interpretation:** The F1 score ranges from 0 to 1, with 1 being the best possible value. It represents the trade-off between precision and recall.

- **Formula:** $$2 \times \left(\frac{(Precision \times Recall)}{(Precision + Recall)} \right)$$

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Model Evaluation: Metric 05/08

ROC-AUC

Receiver Operating Characteristic - Area Under the Curve

- **Explanation:** ROC-AUC measures the performance of a binary classifier by analyzing the relationship between the TPR and the FPR at different threshold settings.

- **Use Case:** ROC-AUC is suitable for imbalanced datasets, provides a comprehensive evaluation of the classifier's performance.

- **Range & Interpretation:** The ROC-AUC score ranges from 0 to 1, where 1 indicates a perfect classifier.
A higher ROC-AUC score implies better model performance.

- **Formula:**

$$\int_0^1 TPR(FPR)dFPR$$

TPR: True Positive Rate
FPR: False Positive Rate

Swipe to Learn

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Model Evaluation: Metric 06/08

MSE

Mean Squared Error

- **Explanation:** MSE calculates the average squared difference between predicted and actual values, providing a measure of the model's performance for regression problems.

- **Use Case:** MSE is commonly used when the emphasis is on large errors.

- **Range & Interpretation:** The MSE value can range from 0 to positive infinity. A lower MSE indicates better model performance, with 0 being the ideal value.

- **Formula:**

$$\left(\frac{1}{n}\right)\times\sum^{n}\left(y_{true}-y_{pred}\right)^{2}$$

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Model Evaluation: Metric 07/08

RMSE

Root Mean Squared Error

- **Explanation:** RMSE is the square root of MSE, providing a measure of the average magnitude of errors in a regression model.

- **Use Case:** RMSE is useful when the emphasis is on both small and large errors.

- **Range & Interpretation:** RMSE values range from 0 to positive infinity. A lower RMSE indicates better model performance, with 0 being the ideal value.

- **Formula:**

$$\sqrt{MSE}=\sqrt{\left(\frac{1}{n}\right)\times\sum^{n}\left(y_{true}\text{-}y_{pred}\right)^{2}}$$

Model Evaluation: Metric 08/08

R2

R-squared

- **Explanation:** R-squared measures the proportion of the response variable's variance that is captured by the model. It indicates how well the regression model fits the data.

- **Use Case:** R-squared is commonly used to assess the goodness of fit in regression models.

- **Range & Interpretation:** R-squared values range from 0 to 1, where 1 represents a perfect fit. A higher R-squared indicates better model performance.

- **Formula:**

$$1 - \frac{RSS}{TSS}$$

RSS: Residual Sum of Squares
TSS: Total Sum of Squares