



MACHINE LEARNING TAKEAWAYS



Chapter:

Model Evaluation & Fine Tuning

Model Evaluation: ROC Curve & AUC

- 1** ROC (Receiver Operating Characteristic) curve: A graph showing the performance of a classification model by plotting the true positive rate against the false positive rate at various threshold settings.
- 2** AUC (Area Under the Curve): A metric that measures the entire two-dimensional area underneath the ROC curve, representing the model's ability to distinguish between classes.
- 3** When dealing with stakeholders with model metrics (ROC, AUC, precision, etc.), they won't understand. As a data scientist, it is an important skill to translate these metrics into business metrics and discuss in those terms to really make them understand what the impact is.

K Fold Cross Validation

- 1** K-fold cross-validation is a method where the dataset is split into k subsets (or folds). The model is trained on k-1 folds and tested on the remaining fold. This process is repeated k times, ensuring each fold is used once as the test set, giving a reliable estimate of model performance.
- 2** Cross-validation can also be used with the same model but with different parameters.

Stratified K Fold Cross Validation

- 1 Stratified K-Fold Cross Validation is a technique that divides data into K subsets while preserving the percentage of samples for each class, ensuring each fold is representative of the entire dataset.

Hyperparameter Tuning: GridsearchCV

- 1** Hyperparameter Tuning with GridSearchCV involves thoroughly searching a specified parameter grid to identify the best hyperparameter combination for a machine learning model. This is done by evaluating performance through cross-validation.
- 2** We should express our gratitude to the open-source contributors who have enhanced scikit-learn, making the work of ML and Data scientists more efficient.

Hyperparameter Tuning: RandomizedSearchCV

- 1 RandomizedSearchCV is a technique that searches over random combinations of hyperparameters to find the best model configuration using cross-validation, making it more efficient than exhaustive methods.
- 2 To optimize computation, we primarily use RandomizedSearchCV.
- 3 By adjusting just the n_iter parameter, it functions identically to GridSearchCV.

Model Selection Guide

- 1** Machine learning is both a science and an art. As an ML practitioner, you need to use your judgment to choose the right model for each situation.

- 2** Since there is no perfect decision tree for model selection, the process can be broadly divided into problem type, column relationships, data type, and data size. Refer to the attached PDF for a detailed guide.

Selecting the Right Evaluation Metric

1 Classification -

- Accuracy: Assesses the overall correctness of the model. Particularly useful when classes are balanced.
- Precision: Indicates the reliability of positive predictions, especially important when false positives are costly.
- Recall: Focuses on capturing as many positives as possible, crucial when missing a positive is costly.
- AUC-ROC: Measures how well the model ranks positive instances higher than negative ones.
- F1 Score: Balances precision and recall, providing a comprehensive performance metric.
- Confusion Matrix: Offers insights into where the model is making errors, aiding in the assessment of accuracy, precision, recall, and other performance metrics.

Selecting the Right Evaluation Metric

2 Regression -

- MSE (Mean Squared Error) - Highlights significant errors and is sensitive to outliers.
- RMSE (Root Mean Square Error) - Offers easier interpretation.
- R² value: Indicates goodness of fit and measures the proportion of variance in the dependent variable predictable from the independent variables.