OneModel Academy

One AI

Classification Model Evaluation

Machine Learning

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Topics Covered

- Classification model evaluation overview
- An introduction to common evaluation metrics
  - Accuracy, Precision, Recall & F1 Score
  - Class Balance Chart
  - Confusion Matrix
  - ROC Curve & AUC
- Feature importance
- Interpretation + iteration

Learning Outcomes

You will:

- Grasp the importance of evaluating classifications to determine their accuracy & effectiveness in making predictions
- Understand how each evaluation metric provides unique insights; using them in conjunction is key
- See the importance of considering the context in which the model will be applied during evaluation
- Recognize that model building is an iterative process, involving refinement based on evaluation, domain knowledge, & stakeholder feedback

Classification Evaluation Overview

Overview

- Evaluating performance to determine if your model is producing accurate results
  - Involves comparing the model's predictions with actual outcomes
  - Allows you to compare different iterations and select the best one
  - Builds trust with stakeholders
- Critical to consider the broader context that the model will be applied
  - What are we using this model for?
  - Characteristics of the dataset

Classification Evaluation Metrics

Classification Evaluation Metrics

- Cross validation allows the accurate measurement of model performance
  - Before running the model, the dataset is split into 2 subsets: training & validation folds
  - Once the model is trained, performance is evaluated on the validation fold
- There are many evaluation tools - each offers unique insight into various aspects of the model
  - Best practice to use several multiple metrics together to see the broader picture of performance

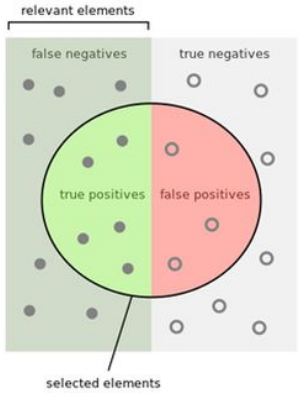
Accuracy

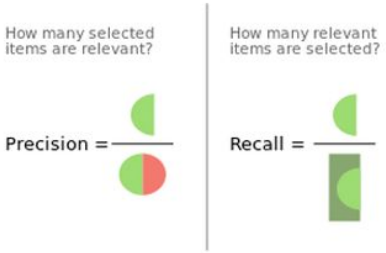
- **Accuracy** measures the proportion of correctly predicted instances out of the total number of predictions in the dataset
  - How often the model was right
  - **Misleading for imbalanced datasets**

$$\frac{TP + TN}{TP + TN + FP + FN}$$

Precision & Recall

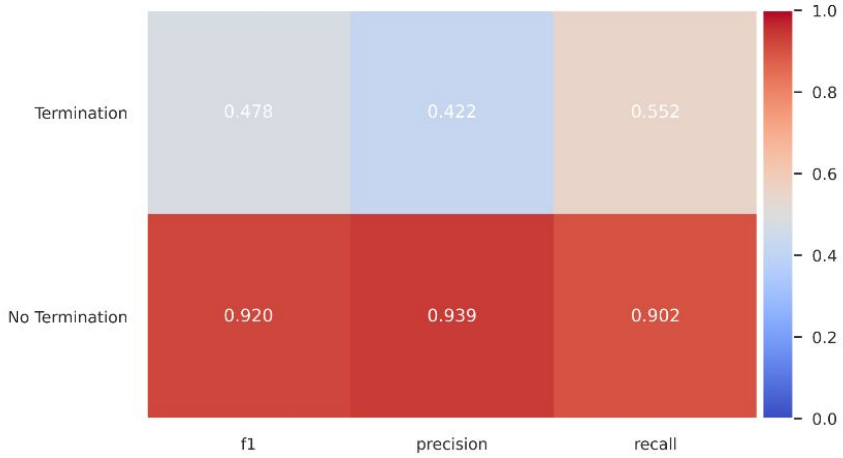
- **Precision** quantifies the accuracy of positive predictions made by the model
  - The number of true positives divided by the total number of positive predictions (true & false positives)
- **Recall** measures how often the model correctly identifies true positives from all the actual positive samples in the dataset





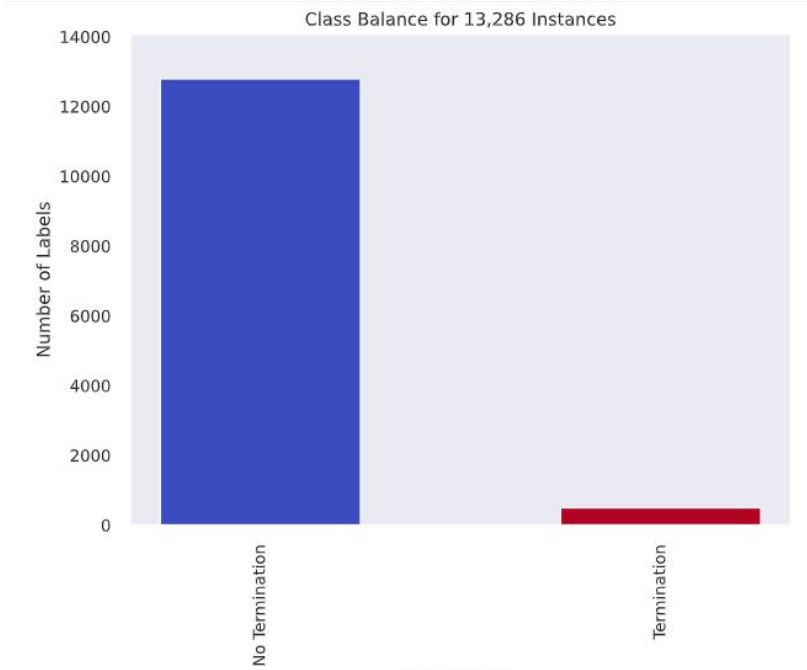
F1 Score

- The **F1 Score** is harmonic mean of precision & recall
  - Considers both false positives & false negatives
  - Helps quantify the value of trade off between precision & recall



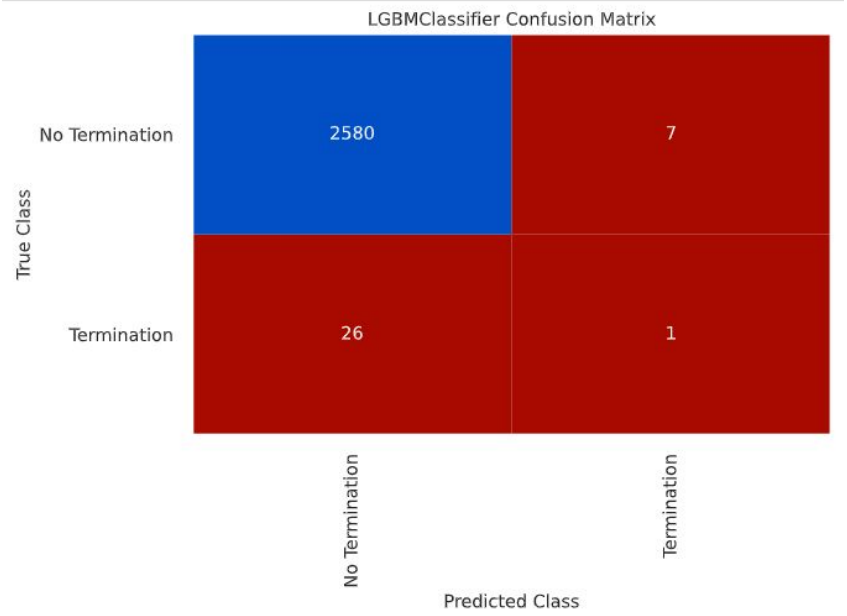
Class Balance

- **Class Balance:** chart offering a visual representation of the distribution of predicted labels
  - Helps identify potential dataset **imbalances**



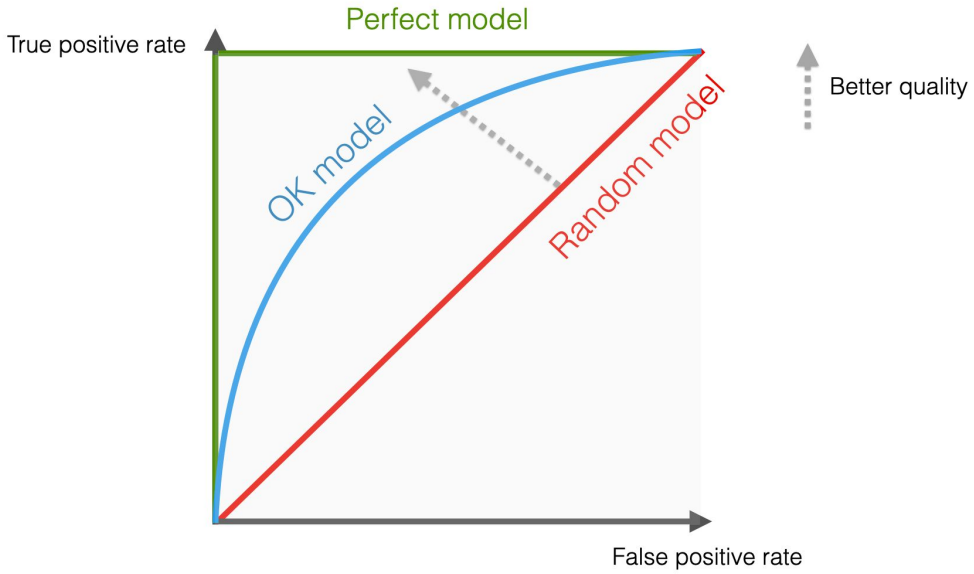
Confusion Matrix

- **Confusion Matrix:** table summarizing the model's predictions compared to the actual labels
  - Shows counts of true positives, true negatives, false positives, & false negatives



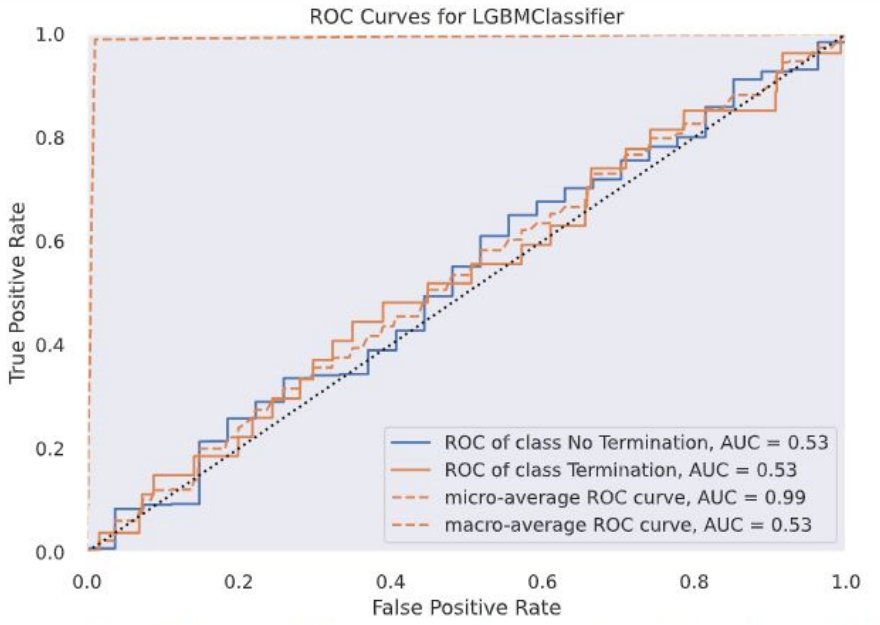
Receiver Operating Characteristics (ROC) Curve

- **ROC Curve:** graphical representation that helps convey how well a model can distinguish between positive & negative instances
  - Plots the true positive rate against the false positive rate across different threshold settings



Area Under the Curve (AUC)

- **AUC:** the area under the ROC curve; provides a value for the overall performance of the model.
    - Values closer to 1 indicate better model performance and better discrimination ability



Feature Importance

Feature Importance

- **Feature importance:** assessment of the contribution of individual features towards making accurate predictions
  - Ranks & scores the selected features to convey how important including each feature in the model is to making accurate predictions
  - Complements other performance metrics
  - Allows users to remove “bad” features

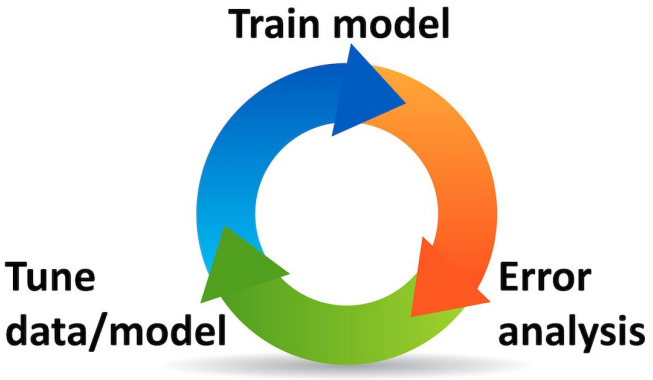
Feature Importances

Feature Name	Values
Average Tenure (EOP)_scaled	991
Department Headcount Null Filled_scaled	711
one.employee.department_scaled	628
one.employee.home_zip_scaled	279
one.employee.eeojob_scaled	168
one.employee.safety_incidents_scaled	121
one.employee.fte_scaled	102

Interpretation + Iteration

Interpretation + Iteration

- Model building is an iterative process
  - Involves refining the model based on insights gained from evaluation results, domain knowledge, & feedback from stakeholders
  - Model should evolve to meet changing needs



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Thanks for watching!

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