Classification Metrics and ROC Curve

Evaluation Metrics

Accuracy: Measures the proportion of correct predictions (both true positives and true negatives) among all predictions.

$$\text{Accuracy} = \frac{TP + TN}{TP + FP + TN + FN}$$

Precision: Measures how many of the predicted positive instances are actually positive. It reflects the model's exactness.

$$\text{Precision} = \frac{TP}{TP + FP}$$

Recall (Sensitivity): Measures how many actual positive instances the model correctly predicted. It reflects the model's completeness.

$$\text{Recall} = \frac{TP}{TP + FN}$$

F1 Score: The harmonic mean of precision and recall. It balances both metrics, especially useful with imbalanced classes.

$$\text{F1 Score} = 2 \cdot \frac{\text{Precision} \cdot \text{Recall}}{\text{Precision} + \text{Recall}}$$

AUC (Area Under the ROC Curve): Represents the probability that the model ranks a randomly chosen positive instance higher than a randomly chosen negative one.

$$\text{AUC} = \int_0^1 TPR(FPR^{-1}(x))\,dx$$

Reported Values from JSON:

- Accuracy = 0.788
- Precision = 0.754
- Recall = 0.667
- F1 Score = 0.708
- AUC = 0.835
- Best Threshold = 0.450

ROC Curve (TPR vs FPR)