Employee Turnover Analysis — Model Evaluation Report

Salifort Motors • HR Attrition Project

ISSUE / PROBLEM

- HR needs a validated, reliable model for predicting employee turnover.
- Even with strong performance in prior stages, the model must be tested using advanced evaluation metrics.
- Must confirm performance on imbalanced data, especially recall for minority class (employees who left).
- Must ensure no overfitting and verify how the model behaves across different decision thresholds.

RESPONSE

- Assessed the final Random Forest model using both basic and advanced ML evaluation tools:
  - ✓ Train/Test Accuracy
  - ✓ Precision, Recall, F1-score
  - ✓ Confusion Matrix
  - ✓ ROC Curve + AUC
  - ✓ Precision–Recall Curve + Average Precision
  - ✓ Threshold Analysis (Precision–Recall–F1 across 200 thresholds)
- Verified model stability and generalization.
- Saved performance graphs for leadership review.

KEY INSIGHTS

- The model is both **highly accurate** and **highly reliable** across evaluation metrics.
- No signs of overfitting — train accuracy 1.00 matches test performance closely.
- Precision remains extremely high (>0.90) across nearly all thresholds.
- Recall stays strong until threshold ≈0.70, after which it declines sharply.
- Best threshold for balanced HR decision-making = **0.35 (recommended default)**.
- Model is ready for **deployment, dashboard integration, and real-time employee risk scoring**.

IMPACT

- Model achieves **98.3% test accuracy**, indicating strong predictive power.
- High **recall (92%)** ensures most at-risk employees are correctly identified.
- Very low false-positive rate reduces unnecessary HR intervention workload.
- ROC-AUC = **0.977**, confirming excellent discrimination ability.
- Precision–Recall AUC = **0.962**, strong performance on imbalanced data.
- Threshold testing shows best balance at **0.35**, but can be adjusted for HR need:
- Lower threshold → catch more leavers
- Higher threshold → fewer false alarms