Employee Attrition Risk Analysis

INTRODUCTION

Objective of the Analysis

Identify employees who are at risk of leaving the company.

Approach Used

Random Forest, Decision Tree, and Logistic Regression.
The analysis was conducted on a sample consisting of 33 former employees and a population of 91 current employees.
Variables included: age, tenure in the company, department, and salary.

Note: The model was trained on the full dataset without a train/test split, as the goal was to identify employees at risk using all available data.

COMMON FINDINGS ACROSS ALL THREE MODELS

1. Tenure is the most important risk factor across all three models:

- Random Forest: Most important feature (over 40%)
- Decision Tree: Appears at the first split
- Logistic Regression: Negative coefficient – longer tenure = lower risk
*Conclusion: Employees with shorter tenure are at higher risk of leaving.

2. Salary is also a highly significant variable:

- Random Forest: Second most influential (~25%)
- Decision Tree: Appears in multiple branches
- Logistic Regression: Negative coefficient – higher salary = lower risk
*Conclusion: Lower salary may indicate dissatisfaction and higher risk.

3. Age has moderate impact:

- Random Forest: Third in importance
- Tree and logistic: Present but not dominant
*Conclusion: Younger employees may be less stable, but this is less important than tenure and salary.

4. Department plays a smaller, yet relevant role:

- Logistic Regression: Some departments have positive coefficients → higher risk
- Random Forest: Department is less important than numeric variables

- Decision Tree: Appears less frequently depending on encoding
*Conclusion: Department has some impact, but it's secondary to tenure and salary.

STABLE EMPLOYEE PROFILE

An employee with very low predicted attrition risk across all three models:

- Long tenure: Strong indicator of stability
- Higher salary: Associated with greater satisfaction and loyalty
- Age: Often over 40, but less influential than tenure and salary
- Department: Departments such as Department 1 and 2 – often with negative coefficients
- Prediction: None of the models flags the employee as at-risk
*Conclusion: These are experienced, well-paid, older employees in stable departments. All models predict low attrition risk.

AT-RISK EMPLOYEE PROFILE

An employee flagged as at-risk, especially by the Random Forest model:

- Short tenure (e.g., 0–5 years): Strongest risk indicator across all models
- Low salary (below average): Often a sign of dissatisfaction
- Younger (20–35): More likely to switch jobs
- Department 3 or 4: Have the highest positive coefficients in LR
- Prediction: Flagged by Random Forest and at least one other model
*Conclusion: These are newer, lower-paid, younger employees in more dynamic departments. They are ideal targets for proactive retention strategies.

Risk Group Classification Criteria

Condition (Flagged as Risk)	Risk Level
✓All 3 models	Very High Risk
✓Random Forest + (Tree or LR)	High Risk
✓Only Random Forest	Medium-High Risk
✓Tree + LR (without RF)	Medium Risk
✓Only one model (Tree or LR)	Low Risk
✗No model	Stable