Employee Attrition Prediction - Stakeholder Report

Executive Summary

This report presents findings from a machine learning analysis of employee attrition using organizational HR data. Our objective was to proactively identify employees at risk of leaving the company and support strategic retention planning. By leveraging predictive modeling, we aimed to uncover the key drivers of attrition and offer actionable insights for HR and leadership teams.

Business Problem

Employee turnover leads to productivity loss, increased hiring costs, and disruption of team performance. Understanding the factors that contribute to attrition allows leadership to intervene earlier and reduce avoidable exits.

Data Overview

The analysis was conducted on a structured HR dataset containing 1,470 employee records and 35 features, including:

- Demographics: Age, Gender, MaritalStatus

- Job-related: Department, JobRole, YearsAtCompany, JobSatisfaction

- Compensation: MonthlyIncome, StockOptionLevel, PercentSalaryHike

- Behavioral: OverTime, BusinessTravel, WorkLifeBalance

Key Insights

- **OverTime** was the most significant predictor of attrition. Employees who worked overtime were much more likely to leave.

- **MonthlyIncome** and **StockOptionLevel** were strong retention factors; higher compensation was associated with reduced attrition.

- **JobRole** and **DistanceFromHome** showed varied risk levels. Some roles (e.g., Sales Executive) had higher attrition, while long commutes increased risk.

- **WorkLifeBalance** and **EnvironmentSatisfaction** were influential, suggesting that engagement and well-being impact employee decisions.

Model Overview

We evaluated multiple machine learning models to predict attrition, including Logistic Regression, Decision Trees, Random Forest, and Boosting methods (Gradient Boosting and XGBoost).

- **XGBoost** was the best-performing model with a test accuracy of 87% and a recall of ~67% for the attrition class.

- **Logistic Regression with threshold tuning** and **Gradient Boosting** also demonstrated balanced and interpretable performance.

Recommendations

1. **Address Overtime Culture**: Implement caps or offer compensatory support for frequent overtime workers.

2. **Compensation Reviews**: Consider stock option enhancements or salary reviews for mid-tenure employees in high-risk roles.

3. **Commuting Support**: Provide flexibility or incentives for employees with long travel times.

4. **Retention Dashboards**: Use predictive scores to proactively engage at-risk employees and initiate career development conversations.

5. **Explainability Tools**: Leverage SHAP-based insights to build trust in predictions and tailor retention actions.

Conclusion

Data-driven approaches to attrition prediction enable HR and business leaders to focus retention efforts where they matter most. Our modeling reveals clear drivers of turnover and equips the organization with tools to reduce it strategically. Further integration into HR systems and dashboards will enhance impact.

A detailed technical appendix and model development notebook are available upon request.