HR Analytics Project Report

1. Introduction

Employee attrition-when employees leave an organization-is a major concern for HR departments. High attrition rates can lead to increased recruitment costs, lower team morale, and a loss of skilled talent. This project uses data analytics and machine learning to understand key factors behind employee turnover and to predict which employees are at risk of leaving.

2. Abstract

This project analyzes HR data to detect patterns and risk factors that contribute to attrition. It includes Exploratory Data Analysis (EDA), machine learning-based classification, model interpretation using SHAP, and actionable recommendations based on results. Visualizations created in Power BI highlight trends by department, salary band, promotions, and more. The result is a reliable model that assists HR professionals in identifying high-risk employees for proactive engagement.

3. Tools Used

- Python: Data processing and modeling (pandas, seaborn, scikit-learn)
- Power BI: Interactive visual dashboard
- SHAP: Model interpretability for feature impact
- Jupyter Notebook: Development environment
- Excel: Data preparation and formatting

4. Steps Involved in Building the Project

1. Data Cleaning - Removed missing values, corrected data types, and ensured consistency.

2. Exploratory Data Analysis (EDA) - Analyzed attrition across job roles, departments, salaries, and satisfaction scores.

3. Model Building - Used Logistic Regression and Decision Tree Classifier to predict attrition.

4. Model Evaluation - Evaluated performance with metrics: Accuracy (77%), Precision, Recall, F1-score. Analyzed confusion matrix to assess prediction balance.

5. Model Explainability (SHAP) - Identified top features contributing to attrition: OverTime, JobSatisfaction,

MonthlyIncome, YearsAtCompany.

6. Dashboard Visualization (Power BI) - Created interactive dashboards showing attrition by department, salary band, years at company, etc.

7. Recommendations - Actionable tips provided to reduce attrition and retain talent.

5. Conclusion

The HR Attrition project demonstrates how data-driven decision-making can help organizations retain employees. By combining predictive modeling with SHAP insights and dashboard visualizations, HR teams can proactively address attrition risks. With this model, businesses can implement targeted retention strategies to improve employee satisfaction and reduce turnover.