HR Analytics – Predicting Employee Attrition

1. Introduction

Employee attrition is one of the most critical challenges faced by organizations today. When employees leave frequently, companies not only lose talent but also spend additional time and money on hiring and training new staff. This project focuses on understanding the key reasons behind employee attrition and building a predictive model that can help organizations identify employees who may be at risk of leaving.

2. Abstract

In this project, HR data was analyzed using exploratory data analysis techniques to uncover patterns and trends related to employee resignation. Machine learning models such as Logistic Regression and Decision Tree were implemented to predict attrition. The Decision Tree model performed better and helped identify important factors influencing employee turnover. Additionally, a Power BI dashboard was developed to visually present key insights and support data-driven HR decisions.

3. Tools Used

- Python (Pandas, NumPy, Seaborn, Matplotlib) for data analysis and visualization.
- Scikit-learn for building and evaluating machine learning models.
- SHAP for explaining model predictions and identifying important features.
- Power BI for creating an interactive HR analytics dashboard.

4. Steps Involved in Building the Project

- Performed data cleaning and preprocessing including encoding categorical variables.
- Conducted exploratory data analysis to examine attrition trends across department, salary band, age group, job role, and overtime.
- Split the dataset into training and testing sets for model building.
- Built Logistic Regression and Decision Tree classification models.
- Evaluated models using Accuracy, Confusion Matrix, Precision, Recall, and ROC-AUC score.
- Used SHAP analysis and feature importance to understand key attrition drivers.
- Designed a Power BI dashboard to visualize attrition metrics and patterns.

5. Conclusion and Attrition Prevention Suggestions

The analysis revealed that employees working overtime, employees in lower salary bands, and employees with fewer years at the company are more likely to leave the organization. Based on these insights, the following recommendations are suggested to reduce attrition:

- Reduce excessive overtime and balance workload distribution.
- Provide competitive salary increments for lower salary bands.
- Implement structured career growth and promotion opportunities.
- Strengthen employee engagement and feedback programs.
- Monitor high-risk employees using predictive analytics for early intervention.