HR Analytics – Predict Employee Attrition

Introduction

Employee attrition is a critical challenge faced by organizations, leading to increased recruitment costs, productivity loss, and reduced morale. This project leverages analytics and machine learning to identify the key factors contributing to employee resignation and provides strategies for preventing attrition.

Abstract

The objective of this project was to analyze HR data, understand attrition trends, and build predictive models to forecast potential employee exits. Using data analytics, visualization, and machine learning, the study identifies major drivers of attrition, such as job role, salary, tenure, and career growth opportunities. Preventive strategies are suggested to help HR departments reduce attrition and retain top talent.

Tools Used

- **Python (Pandas, Seaborn, Scikit-learn, SHAP):** Data preprocessing, EDA, model building, interpretability.

- **Power BI:** Interactive dashboard highlighting key attrition factors.

- **Jupyter Notebook:** Model training and evaluation.

Steps Involved in Building the Project

1. Data Collection & Cleaning – HR dataset was preprocessed by handling missing values and encoding categorical variables.

2. Exploratory Data Analysis (EDA) – Department-wise attrition, salary bands, age distribution, and years at company were visualized.

3. Model Building – Logistic Regression and Decision Tree models were trained. Logistic Regression achieved ~86% accuracy, while Decision Tree provided better interpretability.

4. Model Evaluation – Accuracy, confusion matrix, and classification reports were generated. SHAP analysis explained feature importance.

5. Dashboard Creation – Power BI dashboard visualized attrition by department, salary, age, and job role.

6. Suggestions – Strategies like competitive compensation, career growth opportunities, and improved work-life balance were recommended.

Conclusion

The project demonstrates how analytics and machine learning can effectively predict employee attrition and provide actionable insights for prevention. Key drivers of attrition include salary levels, lack of promotion, and job role dissatisfaction. By addressing these factors with targeted HR policies, organizations can reduce attrition, improve employee satisfaction, and ensure long-term workforce stability.