

PROJECT REPORT: HR ANALYTICS & ATTRITION PREDICTION

Submitted by: Md Salman Farsi | Internship: Elevate Labs

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1. Introduction

Employee attrition is a critical challenge for organizations, leading to increased hiring costs and loss of institutional knowledge. This project, "HR Analytics," aims to identify the key drivers of employee resignation and predict future attrition using historical data. The objective is to empower the HR department with data-driven insights to improve retention rates.

2. Abstract

This project combines Machine Learning and Business Intelligence to solve workforce retention issues. We utilized a dataset containing employee demographics, job roles, and satisfaction scores. A classification model was built using Python to predict attrition risk. Additionally, an interactive Power BI Dashboard was developed to visualize trends across departments, helping stakeholders monitor workforce health in real-time.

3. Tools & Technologies Used

- **Data Processing:** Python (Pandas, NumPy) for cleaning and EDA.
- **Machine Learning:** Scikit-Learn (Logistic Regression / Decision Tree) for prediction.
- **Visualization:** Power BI for the interactive dashboard and Seaborn for static plots.
- **Explainability:** SHAP analysis to understand feature importance.

4. Steps Involved

1. **Data Preprocessing:** Handled missing values and encoded categorical variables (e.g., converting 'Department' text to numbers).
2. **Exploratory Data Analysis (EDA):** Analysed correlations between attrition and factors like Overtime, Monthly Income, and Age.

3. **Model Building:** Trained a supervised learning model to classify employees as "At Risk" (Likely to leave) or "Safe".
4. **Dashboard Development:** Designed a Power BI dashboard with KPIs like 'Attrition Rate', 'Average Tenure', and 'Department-wise Breakdown'.

5. Model Performance Report

- **Model Used:** Logistic Regression
- **Accuracy Achieved:** 85% (Approx.)
- **Confusion Matrix Summary:** The model successfully identified the majority of high-risk employees with high precision, minimizing false alarms.

6. Project Visuals (Power BI Dashboard)

- **Figure 1:** Power BI Dashboard showing Attrition by Department and Age Group.



7. Conclusion

This HR Analytics project demonstrates how data can transform Human Resource management. By moving from reactive measures to proactive predictions using Machine Learning and Power BI, the organization can significantly reduce talent loss and build a more stable workforce.