HR Analytics – Predict Employee Attrition

(Final Project Report – Data Analyst Internship)

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1. Introduction

Employee attrition is one of the most critical challenges faced by organizations today. Losing trained employees increases recruitment costs and affects overall productivity.
This project, *"HR Analytics – Predict Employee Attrition,"* uses data analytics and machine learning to identify the major factors leading to employee resignations and help management take preventive actions.

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2. Abstract

The project analyzes HR data of employees to uncover patterns related to attrition. Using **Python (Pandas, Seaborn, Scikit-learn)** for analysis and modeling, and **Power BI** for visualization, this study develops an interactive dashboard that helps HR teams make data-driven retention decisions.
A **Decision Tree Classifier** was trained to predict employee attrition probability and identify key influencing variables such as overtime, income, and job satisfaction.

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3. Tools & Technologies Used

- **Programming:** Python (Pandas, NumPy, Scikit-learn, SHAP)
- **Visualization:** Power BI
- **Data Handling:** Excel, CSV
- **Libraries:** Matplotlib, Seaborn
- **Techniques:** Exploratory Data Analysis, Feature Encoding, Classification Model, SHAP Explainability

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4. Steps Involved in Building the Project

1. **Data Collection:** IBM HR dataset imported into Python.
2. **Data Cleaning:** Removed redundant columns and handled categorical encoding.
3. **Exploratory Data Analysis:**
    - Attrition distribution by department, age, income, and satisfaction level.
    - Insights such as high attrition in Sales and R&D departments, and among low-salary employees.
4. **Model Building:**
    - Decision Tree model trained to predict attrition (Yes/No).
    - Model achieved ~85% accuracy on test data.
5. **Model Explainability:**
    - SHAP analysis identified `OverTime`, `MonthlyIncome`, and `JobSatisfaction` as key drivers.
6. **Visualization:**
    - Power BI dashboard created with KPIs and interactive charts.
    - Filters for Department, Gender, Job Role, and Age Group.
7. **Insights & Recommendations:**
    - High attrition among employees with low income and poor work-life balance.
    - Recommend employee engagement and incentive programs.

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5. Dashboard Summary

Dashboard Name: HR Attrition Analytics
Key Visuals:

- Attrition by Department and Job Role
- Attrition by Age Group and Gender
- Attrition Probability Gauge

- KPI Cards: Total Employees, Attrition %, Avg Income, Avg Tenure
- Risk Category segmentation

Outcome:
The dashboard visually represents areas with high employee churn, helping HR teams plan retention strategies effectively.

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6. Conclusion

The HR Analytics dashboard successfully provides data-driven insights into employee attrition.
The project demonstrates how analytics supports business decision-making and shows that **overtime, low salary, and job dissatisfaction** strongly influence employee turnover.
Organizations can use these insights to reduce attrition and improve employee satisfaction, creating a healthier workplace culture.