# HR Analytics – Predicting Employee Attrition

## Introduction

Employee attrition, or staff turnover, is a significant challenge for HR departments. Understanding why employees leave can help businesses retain top talent, reduce recruitment costs, and maintain workplace morale. This project aims to analyze employee attrition data to uncover key trends and predict potential resignations using data science tools and visualization platforms.

## Abstract

This project utilizes an HR dataset to analyze and predict employee attrition. We applied Exploratory Data Analysis (EDA) techniques to examine departmental trends, salary bands, promotions, and demographic factors contributing to attrition. A Decision Tree classifier was built to predict future attrition, and SHAP (SHapley Additive exPlanations) values were employed to explain the model's predictions. A Power BI dashboard was created for interactive visualization of attrition insights. The final output includes prevention strategies based on both data analysis and SHAP interpretability.

## Tools Used

**Python Libraries**: Pandas, Seaborn, Matplotlib, Scikit-learn, SHAP

**Visualization**: Power BI

**Modeling**: Decision Tree Classifier

**IDE**: Jupyter Notebook

## Steps Involved in Building the Project

**Data Preprocessing**:

Cleaned null values and encoded categorical data.

Standardized and normalized numerical variables.

**Exploratory Data Analysis (EDA)**:

Analyzed attrition by department, age, income, gender, job role, and overtime.

Identified that overtime, lower income, and specific roles (e.g., Sales, HR) had high attrition rates.

**Model Building**:

Applied Decision Tree Classifier for classification.

Achieved decent accuracy and used a confusion matrix for performance evaluation.

**Model Interpretation using SHAP**:

Identified top features influencing attrition: Overtime, Job Role, Monthly Income, Environment Satisfaction, Years at Company.

**Power BI Dashboard**:

Created interactive visuals (pie charts, bar plots, line graphs).

Included metrics such as Attrition Rate, Monthly Income, Department-wise attrition, etc.

**Attrition Prevention Suggestions**:

**Improve Work-Life Balance**: High overtime correlates strongly with attrition.

**Review Compensation**: Employees with lower salaries tend to resign more.

**Focus on Employee Satisfaction**: Environment Satisfaction and Job Involvement are strong predictors.

**Targeted Retention Programs**: For departments like Sales and Human Resources.

**Monitor Early Tenure**: Attrition peaks within the first 2–3 years.

**Conclusion**

By combining data analytics and predictive modeling, this project identifies the key factors influencing employee attrition. The insights gained from SHAP and Power BI dashboards provide actionable strategies to reduce turnover. Implementing these suggestions can improve employee retention and organizational stability. This integrated approach empowers HR teams to make informed, data-driven decisions.