# HR Analytics – Employee Attrition Prediction

## 1. Introduction

## Employee wear is one of the most important issues for the HR department. High variability leads to increased recruitment costs, training, and loss of organizational knowledge. The project focuses on the use of analytics to determine the most important causes of wear and develop prediction models for predictions that employees are likely to leave. This allows for a proactive retention strategy.

## 2. Abstract

## The purpose of this project was to analyze employee wear patterns with the help of actual HR data and predict future resignations using machine learning. Exploration Data Analysis (EDA) was conducted to discover trends related to department, salary level, job satisfaction, and doctoral degrees. Wear was classified using machine learning models such as logistic regression and decision-making. Additionally, the Power BI -Dashboard was created to present the HR team with implementable knowledge. Feature analysis was used for environmental restrictions instead of SHAP

## 3. Tools Used

## Python (Pandas, Matplotlib, Seeborn, Scikit-Learn) for data processing, visualization and modeling -Power bi - «Create dashboard creation and visual analysis creation. Steps to set up your project A. Data preprocessing - Purely missing values ​​and outliers - Coded categorical variables - Share data for training and test sets B. Power BI

## 4. Steps Involved in Building the Project

A. Data Preprocessing  
- Cleaned missing values and outliers  
- Encoded categorical variables  
- Split the data into training and test sets  
  
B. Exploratory Data Analysis (EDA)  
- Analyzed attrition by department, salary band, job satisfaction, and promotion history  
- Built interactive visuals in Power BI  
  
C. Model Building  
- Trained Logistic Regression and Decision Tree models  
- Handled class imbalance using class\_weight='balanced'  
- Evaluated models using precision, recall, and F1-score  
  
D. Model Explainability  
- Used feature\_importances\_ from the Decision Tree  
- Identified key drivers like JobSatisfaction, MonthlyIncome, YearsSinceLastPromotion

## 5. Conclusion

This project successfully used machine learning and visual analytics to uncover hidden patterns in employee attrition. Key insights such as low job satisfaction, long gaps in promotion, and low salary bands emerged as top contributors. The predictive model allows HR teams to anticipate and mitigate attrition risks. SHAP was initially considered for model interpretation, but due to persistent installation issues, we used feature importance analysis from the Decision Tree, which proved effective for identifying critical attrition factors.