Employee Attrition Analysis Report

Introduction

This report analyzes employee attrition using the IBM HR Analytics dataset. The goal is to identify key factors contributing to attrition and develop a predictive model.

Data Description

The dataset contains 1,470 employee records with 35 features, including demographic information, job-related details, and satisfaction levels. The target variable is Attrition, a binary variable indicating whether an employee left the company.

Exploratory Data Analysis (EDA)

- **Univariate Analysis**: Histograms and bar plots were used to visualize the distribution of numerical and categorical features.
- **Bivariate Analysis**: Grouped bar charts, box plots, and heatmaps revealed relationships between features and attrition. Key observations:
  - Certain departments have higher attrition rates.
  - Employees with lower job satisfaction are more likely to leave.
  - Longer tenures with the current manager correlate with lower attrition.
- **Multivariate Analysis**: Pair plots showed interactions between age, income, years at company, and attrition.

Model Building and Evaluation

- **Models**: Logistic Regression and Random Forest were used to predict attrition.
- **Hyperparameter Tuning**: Grid Search was used to optimize Random Forest parameters.
- **Evaluation Metrics**:
  - Logistic Regression: Accuracy: 0.83, ROC-AUC: 0.76
  - Random Forest: Accuracy: 0.86, ROC-AUC: 0.88
  - Random Forest outperformed Logistic Regression, demonstrating a better ability to distinguish between employees with high and low attrition risk.

Key Factors Contributing to Attrition

The most important factors influencing employee attrition, as identified by the Random Forest model, are:

1. **Monthly Income**: Employees with lower monthly incomes are more likely to leave the company.
2. **Age**: Younger employees are more prone to attrition.

3. **Years at Company**: Employees with shorter tenures at the company have a higher likelihood of leaving.
4. **Job Role**: Certain job roles experience higher attrition rates.
5. **Job Satisfaction**: Lower job satisfaction is a significant predictor of attrition.

Implications for HR and Management

The findings suggest that attrition can be mitigated by addressing factors related to compensation, age, company tenure, job roles, and job satisfaction. Recommendations include:

- **Compensation Review**: Ensure competitive salaries and offer opportunities for pay raises.
- **Retention Programs**: Develop targeted programs for younger employees and those with shorter tenures.
- **Job Role Enhancement**: Evaluate and improve job roles with high attrition rates.
- **Improve Job Satisfaction**: Implement strategies to boost employee morale and satisfaction, such as:
  - Regular feedback and recognition
  - Opportunities for growth and development
  - Work-life balance initiatives
  - Positive work environment