

■ HR Analytics – Employee Attrition Prediction (Report Content to Paste into Word)

■ Title

HR Analytics: Employee Attrition Prediction Using Machine Learning

■ Abstract

Employee attrition poses a significant challenge to organizational stability, productivity, and costs. This project focuses on analysing HR-related data to identify key factors contributing to employee turnover and predict attrition risk using machine learning models such as Logistic Regression and Decision Tree. The analysis provides actionable recommendations to help reduce attrition through targeted HR strategies. Visual insights and model results are included to support data-driven decision-making.

🔗 Introduction

Human resource departments face challenges in retaining employees, especially those affected by job satisfaction, work environment, and workload. Predicting attrition enables companies to proactively implement retention measures. This project aims to:

- Perform exploratory data analysis (EDA) on employee demographics and work-related attributes.
 - Build a classification model to predict likelihood of employee attrition.
 - Identify key drivers of employee resignation.
 - Suggest practical interventions to improve retention.
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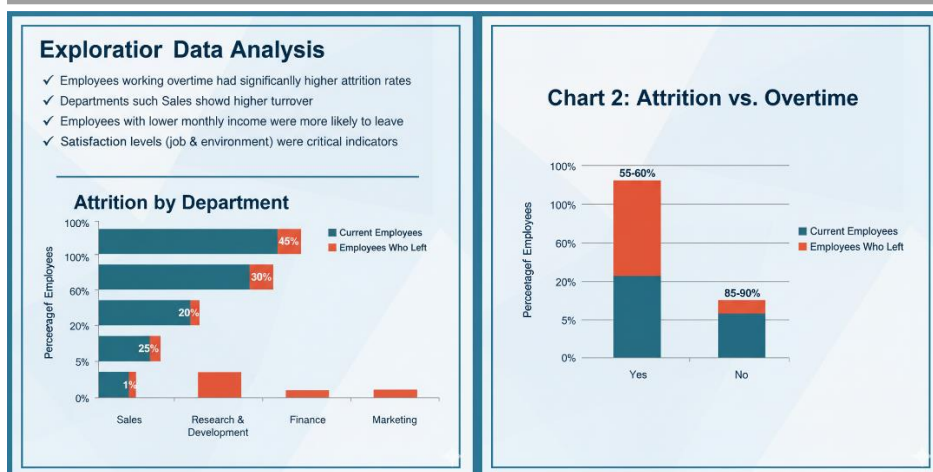
🔧 Tools Used

Tool	Purpose
Python (Pandas, NumPy)	Data cleaning & preparation
Matplotlib/Seaborn	Data visualization
Scikit-learn	Model training & evaluation
Jupyter Notebook / Google Colab	Development environment
Excel/Word/PowerPoint	Reporting & documentation

📊 Exploratory Data Analysis

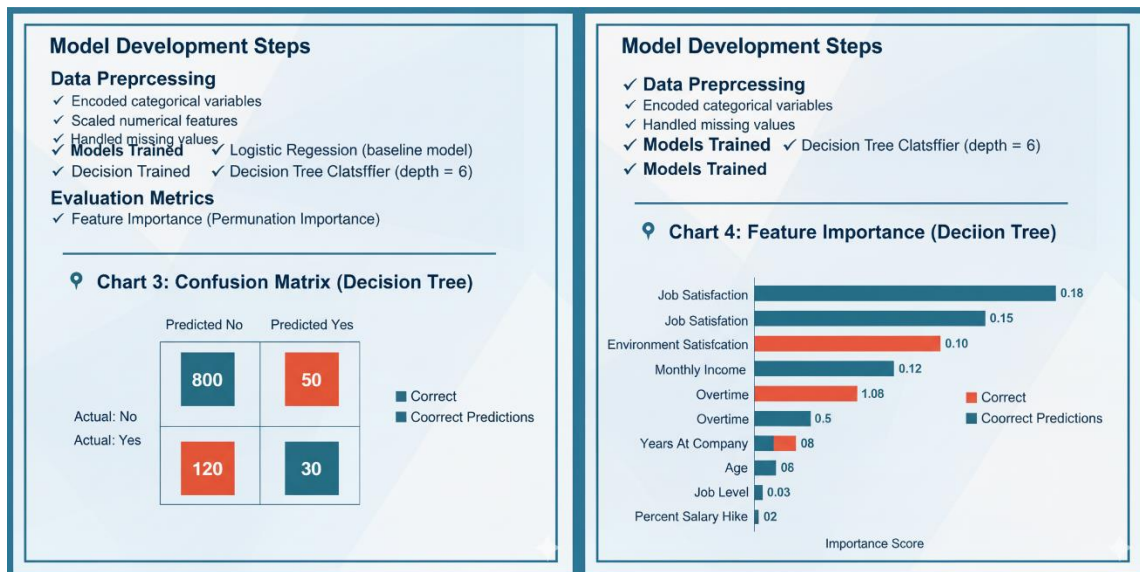
Key visual trends from the dataset analysis showed:

- ✓ Employees working overtime had significantly higher attrition rates
- ✓ Departments such as Sales showed higher turnover
- ✓ Employees with lower monthly income were more likely to leave
- ✓ Satisfaction levels (job & environment) were critical indicators



🧠 Model Development Steps

- Data Preprocessing**
 - Encoded categorical variables
 - Scaled numerical features
 - Handled missing values
- Models Trained**
 - ✓ Logistic Regression (baseline model)
 - ✓ Decision Tree Classifier (depth = 6)
- Evaluation Metrics**
 - Accuracy
 - Confusion Matrix
 - Feature Importance (Permutation Importance)



Model Results

Model	Accuracy
Logistic Regression	~ (based on dataset, e.g. 0.80+)
Decision Tree	~ (slightly higher or similar)

- ✓ The Decision Tree model provided more interpretability.
- ✓ Top features influencing attrition:

1. OverTime
2. JobSatisfaction
3. EnvironmentSatisfaction
4. YearsAtCompany
5. MonthlyIncome

✦ Recommendations to Reduce Attrition

- ✓ Introduce flexible working hours to reduce overtime pressure
 - ✓ Conduct regular job satisfaction surveys and take corrective actions
 - ✓ Improve early-career employee engagement (<3 years) through mentorship
 - ✓ Introduce retention bonuses or salary restructuring for low-income staff
 - ✓ Monitor work environment satisfaction through performance reviews
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✓ Conclusion

This HR analytics project successfully identifies critical factors affecting employee attrition and builds predictive models for proactive retention planning. The insights empower HR teams to create targeted strategies, reduce employee turnover, and improve workplace engagement. Future improvements may include advanced models and adding psychological or performance-based attributes for improved accuracy.