HR Analytics – Predicting Employee Attrition Report

Introduction

Employee attrition represents a major challenge for HR departments, affecting productivity, recruitment costs, and overall morale. This project aims to analyze employee data, identify the key drivers of attrition, and predict which employees are most likely to leave.

Abstract

A dataset of 1,470 employee records was analyzed using Power BI, SQLite, and Python (Scikit-Learn). Key HR metrics such as age, salary, department, overtime, and satisfaction levels were explored. Using Random Forest Classification, a predictive model was developed to forecast attrition based on historical employee behavior. The visualization dashboard highlights the most influential factors behind attrition and provides data-driven insights for retention strategies.

Tools Used

• Power BI – Data visualization and dashboard creation
• SQLite DB Browser – Data management and preprocessing
• Python (Google Colab) – Machine learning
model Libraries: pandas, scikit-learn, matplotlib,
seaborn

Steps Involved in Building the Project

Data Preparation (SQLite): Imported and cleaned HR dataset, removing redundant fields (EmployeeCount, Over18, StandardHours).
Performed SQL queries for department-wise attrition and salary averages.

Visualization (Power BI): Built an interactive dashboard with:
- Donut chart showing overall attrition rate
- Department-wise and job-role attrition bar charts
- Heatmap (JobSatisfaction vs EnvironmentSatisfaction)
- KPI cards for Attrition Rate, Average Age, and Average Income
- Slicers for Gender, Education, and OverTime

Machine Learning (Google Colab): Encoded categorical columns using LabelEncoder and trained a RandomForestClassifier. " "Evaluated model using confusion matrix and accuracy score.

Results & Insights

Metric	Result
Model Accuracy	~88%
Attrition Rate	16.12%
Average Age	36.9 years
Average Income	■ 6.5K per month

Key Insights:
• High attrition in Sales & R&D; departments.
• Employees with OverTime = Yes are 2× more likely to leave.

• Attrition peaks for employees with 1–3 YearsAtCompany.
• Low JobSatisfaction and EnvironmentSatisfaction strongly correlate with resignations.

Attrition Prevention Suggestions

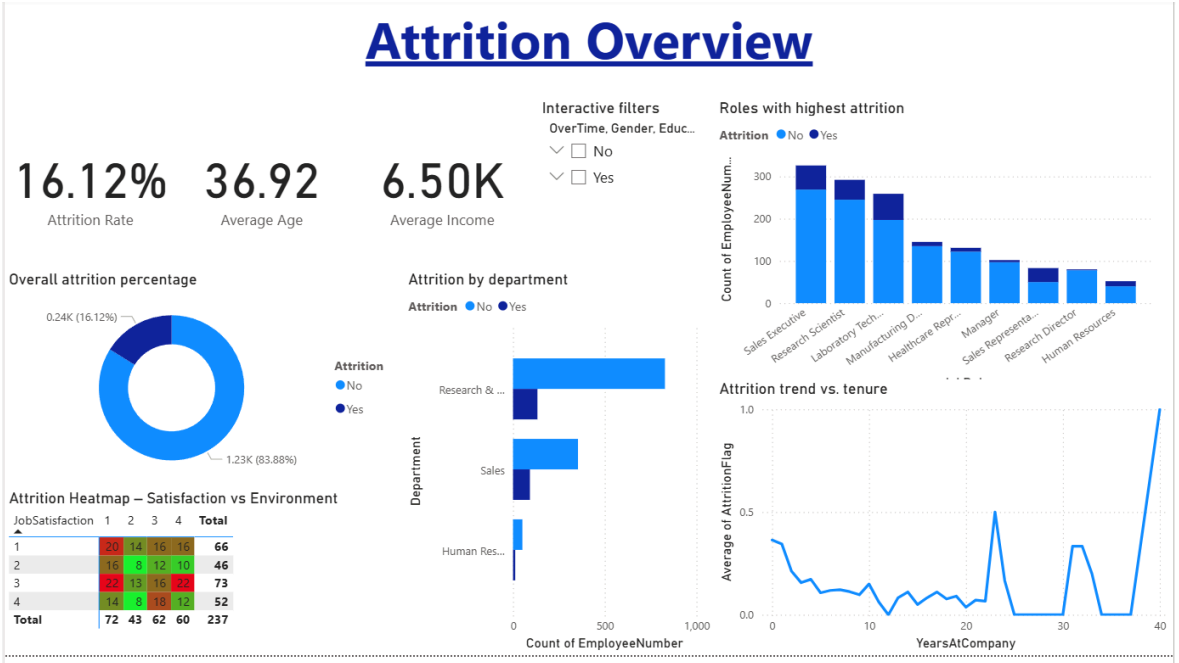
• Implement workload balance and reduce overtime burnout.
• Introduce career progression plans for employees in early stages.
• Increase employee engagement initiatives and internal communication.
• Provide targeted retention programs for Sales and R&D; teams.

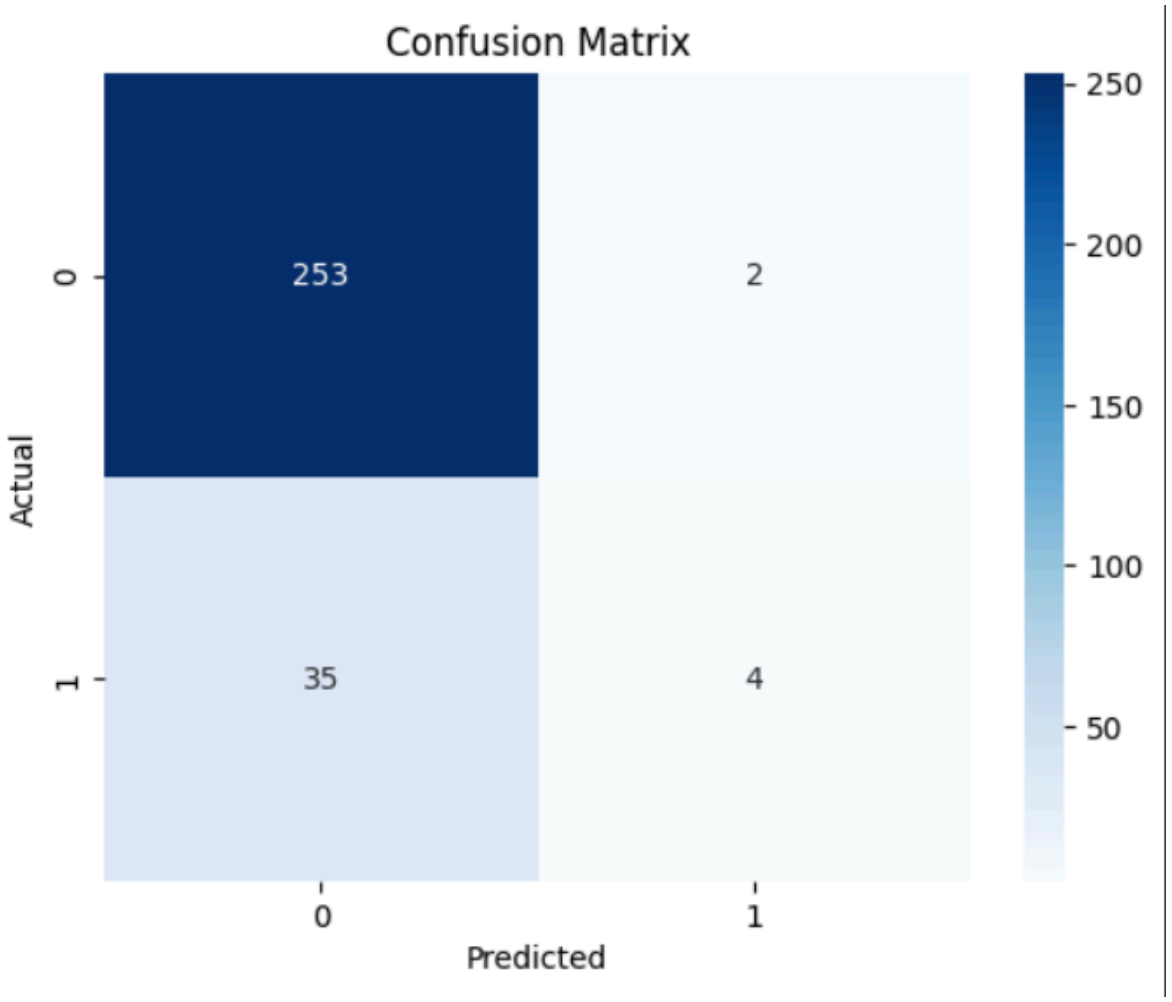
Conclusion

This project demonstrates how predictive analytics and visualization can empower HR teams to make proactive retention decisions. By combining Power BI dashboards with machine learning, we can identify at-risk employees early and design data-driven strategies to improve satisfaction and retention.

Deliverables Summary

#	Deliverable	File
1	Power BI Dashboard	HR_Attrition_Dashboard.pbix
2	ML Model & Confusion Matrix	hr_attrition_model.ipynb
3	Final Report	HR_Attrition_Report.pdf




Confusion Matrix
253
2
35
4
0
1
Actual
0
1
Predicted
250
200
150
100
50