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EMPLOYEE ATTRITION PREDICTION USING MACHINE LEARNING

Predicting whether an employee will leave the company

B.Tech CSE (AI), 1st Year

INTRODUCTION

- Attrition = Employee leaving the company voluntarily or involuntarily
- Companies face huge costs due to employee turnover
- Predicting attrition helps in proactive employee retention

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PROJECT GOAL

Build a machine learning model that accurately predicts if an employee is likely to leave the company based on their profile details.

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USE CASES

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Stakeholder	Use Case
HR Professionals	Identify at-risk employees early
Managers	Get insights into attrition factors
Data Analysts	Understand which features drive attrition
Executives	Improve retention policies with data-driven decisions

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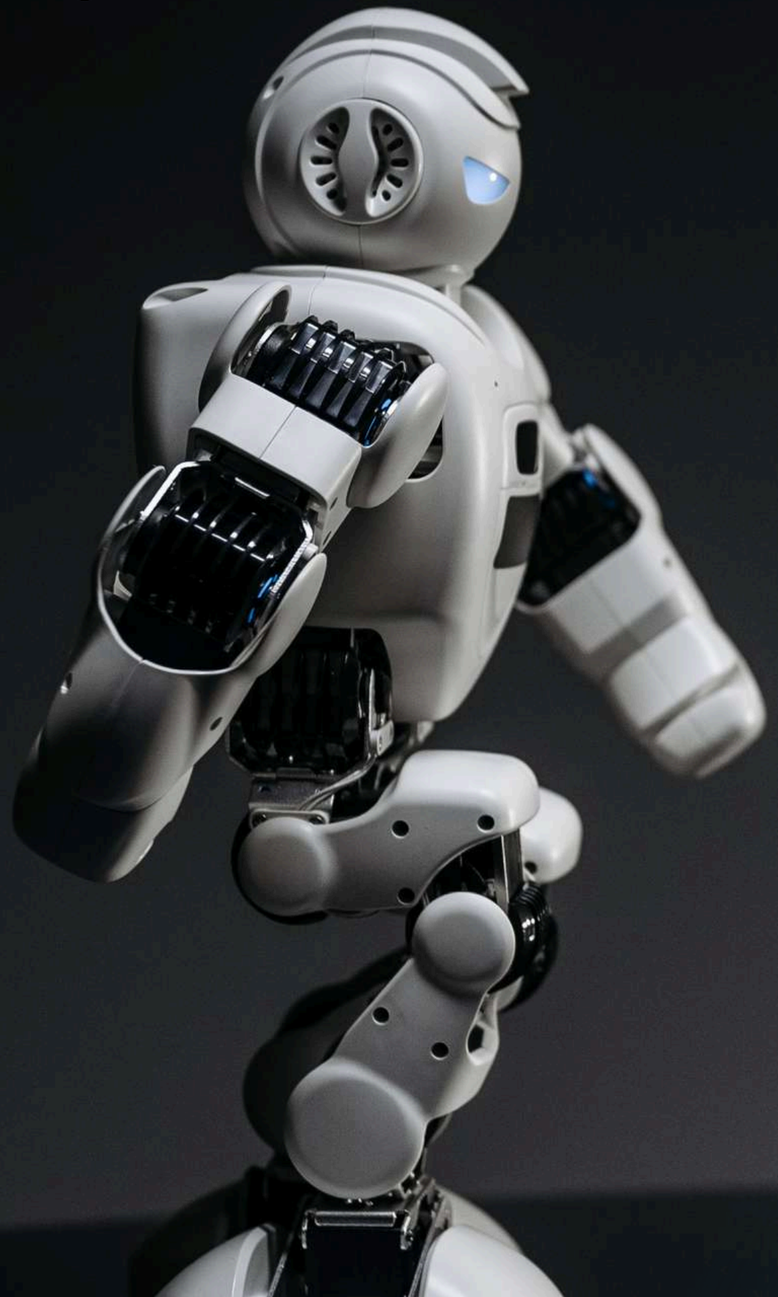
DATASET DETAILS

- Source: IBM HR Analytics on Kaggle
- Total Records: 1470 employees
- Target Column: Attrition (Yes/No)
- Features Used: Age, JobSatisfaction, MonthlyIncome, etc.
- Link: Click to View Dataset



TECH STACK

- Language: Python
- Libraries:
- pandas, numpy, scikit-learn, matplotlib, seaborn
- Algorithm: Random Forest Classifier
- Extras: Label Encoding, Feature Scaling

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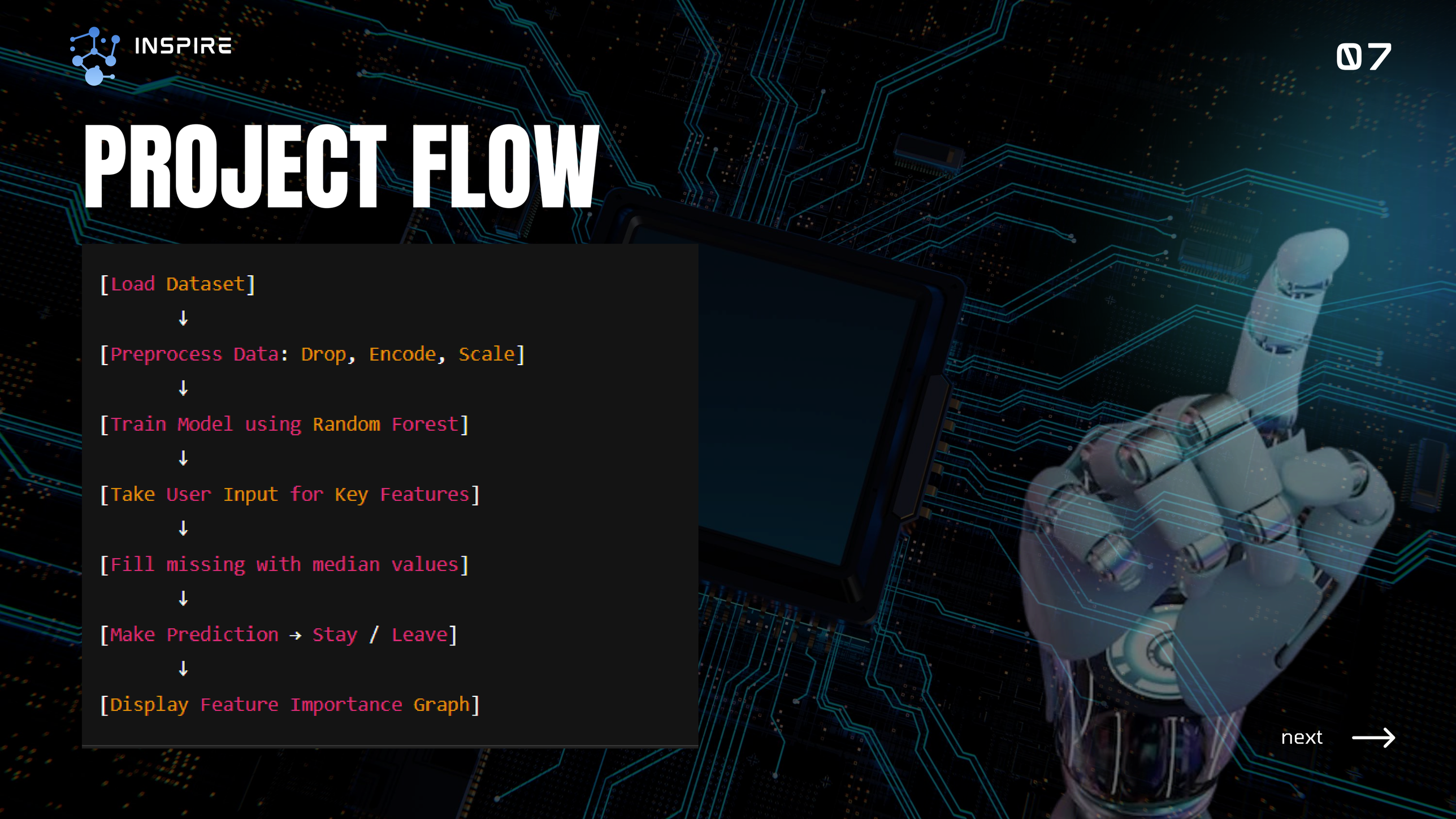
PROJECT FLOW

```
[Load Dataset]
      ↓
[Preprocess Data: Drop, Encode, Scale]
      ↓
[Train Model using Random Forest]
      ↓
[Take User Input for Key Features]
      ↓
[Fill missing with median values]
      ↓
[Make Prediction → Stay / Leave]
      ↓
[Display Feature Importance Graph]
```



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PREPROCESSING STEPS

- Dropped non-informative columns: EmployeeCount, Over18, etc.
- Applied LabelEncoder to all categorical columns
- Used StandardScaler to scale all numerical values
- Selected key features for user input
- Filled remaining with median values from dataset

FEATURE IMPORTANCE VISUALIZATION

- Random Forest calculates which features matter most
- Bar chart shows importance
- Red color highlights features given by user
- Example:
- OverTime
- Age
- MonthlyIncome
- JobSatisfaction
- DistanceFromHome

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https://v0-attrition-prediction-website.vercel.app/

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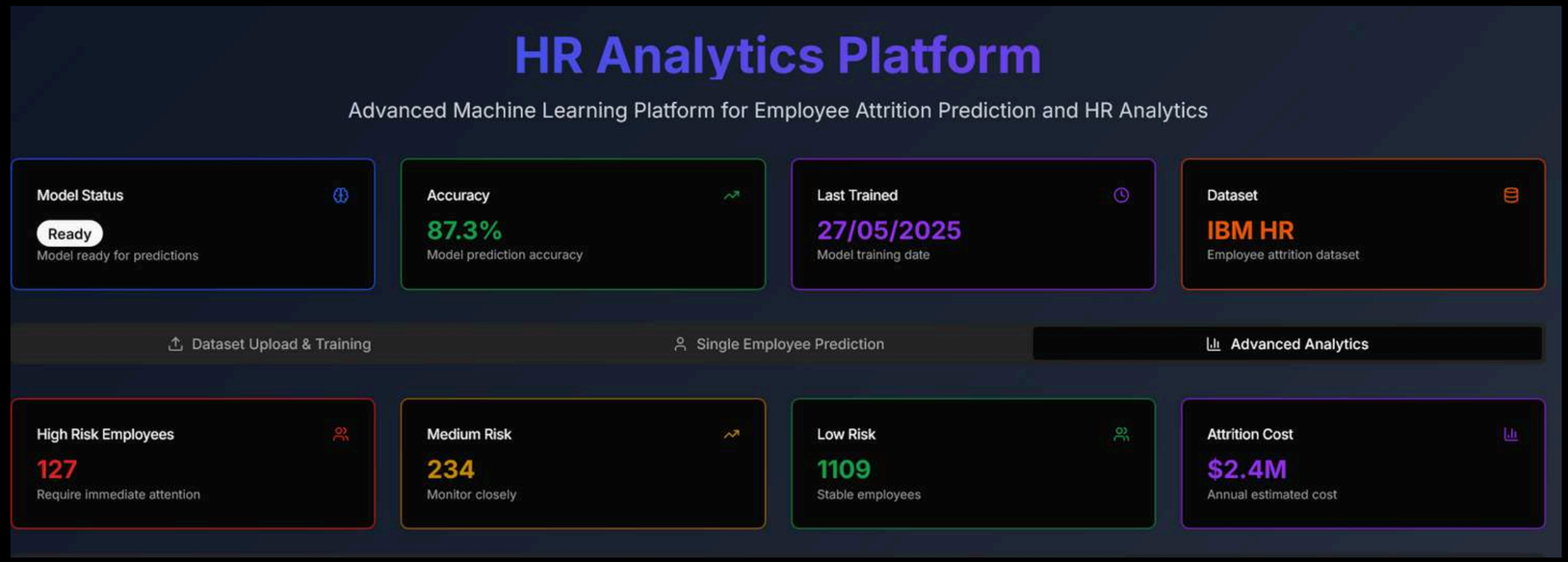
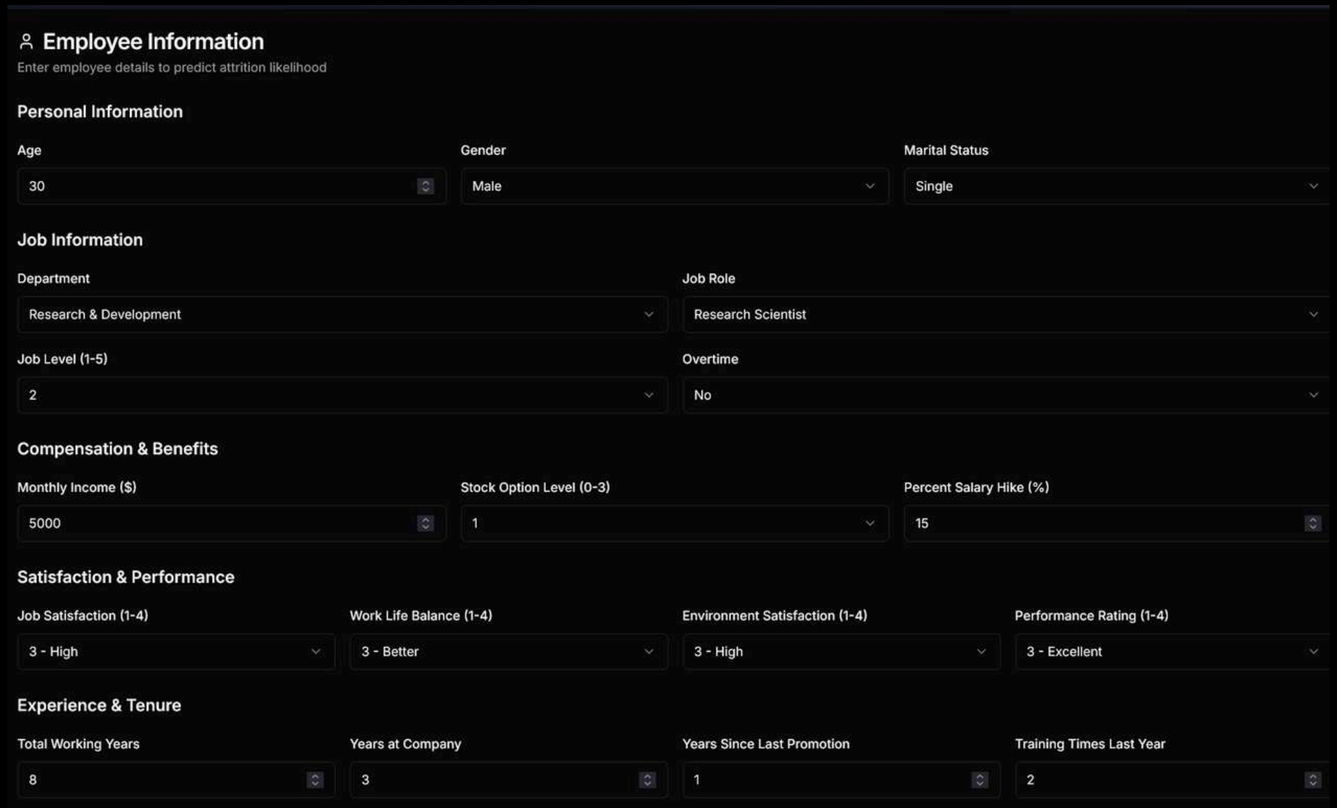
USER INPUT PREDICTION (LIVE)

- Real-time prompt in terminal for:
- Age
- DistanceFromHome
- MonthlyIncome
- JobSatisfaction
- Etc.
- Automatically fills other features using dataset median
- Final output:
- ✅ "NO, the employee is likely to stay."
- ❌ "YES, the employee is likely to leave."


HR Analytics Platform
Advanced Machine Learning Platform for Employee Attrition Prediction and HR Analytics
Model Status
Ready
Model ready for predictions
Accuracy
87.3%
Model prediction accuracy
Last Trained
27/05/2025
Model training date
Dataset
IBM HR
Employee attrition dataset
Dataset Upload & Training
Single Employee Prediction
Advanced Analytics
High Risk Employees
127
Require immediate attention
Medium Risk
234
Monitor closely
Low Risk
1109
Stable employees
Attrition Cost
$2.4M
Annual estimated cost


Employee Information
Enter employee details to predict attrition likelihood
Personal Information
Age
30
Gender
Male
Marital Status
Single
Job Information
Department
Research & Development
Job Role
Research Scientist
Job Level (1-5)
2
Overtime
No
Compensation & Benefits
Monthly Income ($)
5000
Stock Option Level (0-3)
1
Percent Salary Hike (%)
15
Satisfaction & Performance
Job Satisfaction (1-4)
3 - High
Work Life Balance (1-4)
3 - Better
Environment Satisfaction (1-4)
3 - High
Performance Rating (1-4)
3 - Excellent
Experience & Tenure
Total Working Years
8
Years at Company
3
Years Since Last Promotion
1
Training Times Last Year
2

MODEL TRAINING & ACCURACY

- Model: Random Forest Classifier
- Test Size: 20%
- Accuracy: ~87% (example output)
- Evaluation Metrics:
- Confusion Matrix
- Classification Report (Precision, Recall, F1 Score)

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Prediction Results

Attrition Risk: LOW

Probability: 25.0%

Confidence: 75.0%

Identified Risk Factors:

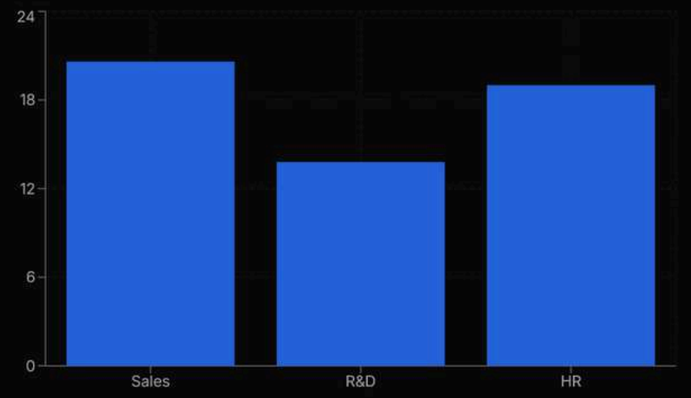
- Below market salary

Recommendations:

- Employee shows low attrition risk - continue current engagement
- Consider this employee for mentoring or leadership opportunities

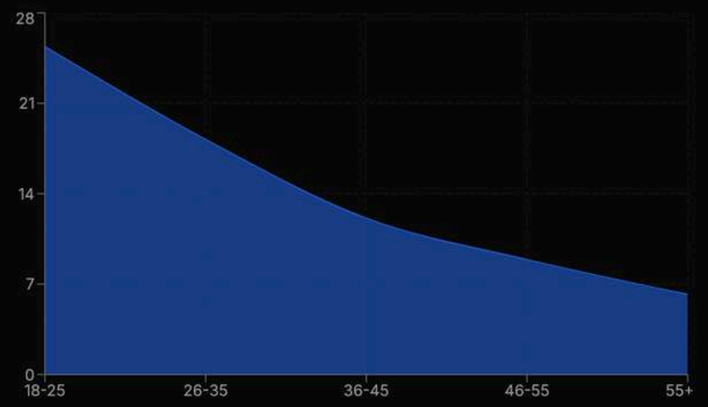
Attrition by Department

Department-wise attrition rates and employee counts



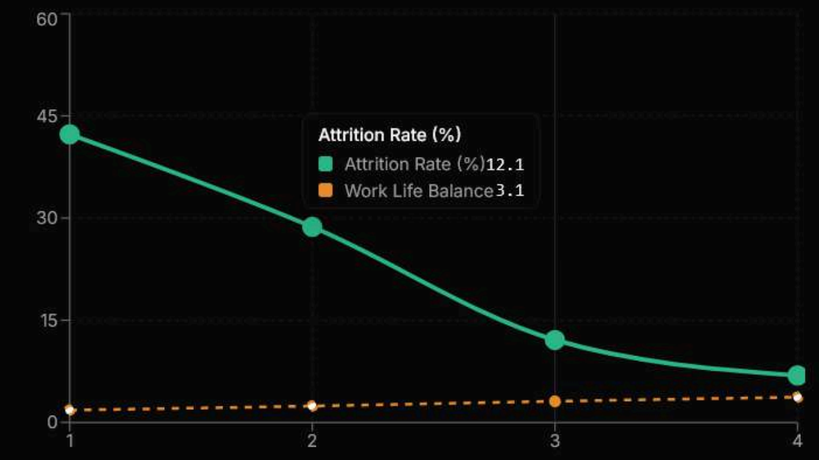
Age Group Analysis

Attrition rates, salary, and satisfaction by age groups



Job Satisfaction vs Attrition

Correlation between satisfaction levels and attrition rates



CONCLUSION

- ML model predicts attrition with good accuracy
- Feature importance reveals true causes
- Can be used to optimize HR strategies
- Scalable and deployable project

THANK YOU!

GET IN TOUCH WITH US!

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