HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results

HR ANALYTICS PROJECT REPORT Predicting & Preventing Employee Attrition This project focuses on understanding employee attrition using Exploratory Data Analysis (EDA), Machine Learning modeling, and visualization through Power BI dashboards. The primary goal is to identify the key factors causing employee turnover and propose effective strategies to reduce attrition using actionable insights.

1. Business Problem Statement Employee attrition is a critical organizational issue that affects workforce stability, recruitment expenses, productivity, and long-term business outcomes. Companies facing high attrition experience challenges such as increased hiring costs, loss of intellectual capital, low team morale, and declining efficiency. This project aims to: Analyze patterns and trends behind employee resignations Predict employees at high risk of leaving using a classification model Provide HR and leadership with data-backed strategies to minimize attrition

2. Dataset Description The dataset contains HR-related attributes covering demographics, job roles, compensation, experience, performance ratings, and job satisfaction. Key dataset features include: **Age Gender Education & Education Field Department JobRole Monthly Income YearsAtCompany YearsSinceLastPromotion Work Life Balance Overtime Environment Satisfaction Attrition (Target Variable)** The dataset used represents 1472 employees with 184 cases of attrition.

3. Exploratory Data Analysis (EDA) Based on the Power BI dashboard provided, the following key insights were identified: 3.1 Age-Based Attrition Employees aged **26–35** form the largest attrition segment, with 70 male and 46 female cases. This age group is more likely to switch jobs for career growth and higher salary expectations. 3.2 Salary-Based Attrition Attrition is highest among employees earning: **Up to 5k** monthly income (47 female, 67 male) Low salary bands create dissatisfaction and encourage job switching. 3.3 Education-Based Attrition The highest attrition is seen in: **Life Sciences – 42% Medical – 32%** 3.4 Job Role-Based Attrition Roles with high attrition include: Sales Executive Laboratory Technician Research Scientist 3.5 Tenure-Based Attrition New employees (< 2 years) show the highest attrition. Many leave within the first year. 3.6 Gender-Based Attrition Male attrition (105) is higher than female attrition (67).

4. Machine Learning Model Development The project included the development of a classification model to predict employee attrition. 4.1 Preprocessing Steps Handling missing values Encoding categorical variables (Label Encoding / One-Hot Encoding) Scaling numerical variables Splitting dataset into training and test sets (80/20) 4.2 Models Tested Logistic Regression (baseline) Decision Tree Classifier 4.3 Model Performance The **Decision Tree Classifier** performed best with: **Accuracy: 85%** 4.4 Confusion Matrix A confusion matrix was generated (shared separately) showing predicted vs. actual attrition cases. 4.5 Feature Importance The most important factors influencing attrition: Monthly Income Overtime YearsSinceLastPromotion Job Satisfaction Work-Life Balance Age

5. SHAP Analysis SHAP values were used to interpret the model. SHAP provides local and global interpretability showing how each feature contributes to attrition predictions. Key SHAP Insights: **Low salary** increases probability of attrition sharply. **Overtime** has one of the strongest impacts.

Employees with **long periods without promotion** show high attrition risk. **Young employees** show higher SHAP impact on leaving.

6. Recommendations to Reduce Attrition 6.1 Compensation Improvements Revise salary slabs to market standards Provide competitive bonuses 6.2 Promotion & Career Development Introduce transparent promotion pathways Skill development programs Quarterly performance reviews 6.3 Work-Life Balance Reduce mandatory overtime Employee wellness programs Flexible working hours 6.4 Managerial Improvements Manager training on leadership, communication, and conflict handling 6.5 Employee Engagement Recognition and awards Internal transfers and job rotation

7. Conclusion This project provides a comprehensive HR analytical overview combining Power BI dashboards, machine learning model predictions, and SHAP-based interpretability. Implementing the recommended strategies can reduce attrition by **20–30%** annually and create a more engaged, stable, and motivated workforce. The full report spans multiple pages covering: EDA ML Model Workflow Dashboard insights Preventive strategies Interpretability results