A Assesment Report

on

“Predict Employee Attrition”

submitted as partial fulfillment for the award of

BACHELOR OF TECHNOLOGY DEGREE

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in

CSE(AI&ML)

By

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INDEX

Title Page

Title: Predicting Employee Attrition

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Course: B.Tech CSE (AIML)

Subject: Artificial Intelligence for Engineers

Institute: KIET Group of Institutions

Introduction

Employee attrition refers to the loss of employees through resignation or retirement. Predicting attrition helps companies reduce costs and improve retention. In this project, we use a dataset from IBM HR Analytics to classify whether an employee is likely to leave the company based on factors like job satisfaction, salary, work-life balance, and years at the company.

Methodology

1.Data Loading – Read the HR dataset (WA_Fn-UseC_-HR-Employee-Attrition.csv).

2.Preprocessing – Handle categorical variables using label encoding; drop irrelevant columns.

3.EDA – Used correlation heatmap to find relationships between features.

4.Model Building – Split data into training/testing sets. Trained a Logistic Regression classifier.

5.Evaluation – Evaluated using accuracy score and confusion matrix.

Code

```
# ------------------------------------------------
# Step 1: Import Required Libraries
# ------------------------------------------------
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns

from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder, StandardScaler
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import classification_report, confusion_matrix, accuracy_score

# ------------------------------------------------
# Step 2: Upload and Load the Dataset
# ------------------------------------------------
from google.colab import files
uploaded = files.upload()  # Upload your CSV file here

# Automatically get the uploaded file name
```

```
file_name = list(uploaded.keys())[0]

# Read the dataset
data = pd.read_csv(file_name)
print(f"\n✅Dataset '{file_name}' loaded successfully!")
data.head()

# -----------------------------------------------------
# Step 3: Data Preprocessing
# -----------------------------------------------------
print("\n▯ Checking for missing values...\n")
print(data.isnull().sum())

# Convert 'Attrition' column to 0 (No) and 1 (Yes)
data['Attrition'] = data['Attrition'].map({'Yes': 1, 'No': 0})

# Drop columns that don’t contribute to prediction
columns_to_drop = ['EmployeeCount', 'EmployeeNumber', 'Over18', 'StandardHours']
data.drop(columns=columns_to_drop, axis=1, inplace=True)

# Encode categorical (non-numeric) columns using Label Encoding
label_encoder = LabelEncoder()
for column in data.select_dtypes(include='object').columns:
    data[column] = label_encoder.fit_transform(data[column])

print("\n✅Preprocessing complete!")
data.head()

# -----------------------------------------------------
# Step 4: Exploratory Data Analysis (EDA)
# -----------------------------------------------------
# Countplot of Attrition
plt.figure(figsize=(5, 4))
sns.countplot(x='Attrition', data=data)
plt.title("Employee Attrition Count")
plt.xticks([0, 1], ['No', 'Yes'])
plt.ylabel("Number of Employees")
plt.show()

# Heatmap to show correlations between features
plt.figure(figsize=(15, 10))
sns.heatmap(data.corr(), cmap="coolwarm", annot=False)
plt.title("Feature Correlation Heatmap")
plt.show()

# -----------------------------------------------------
# Step 5: Feature Selection and Train-Test Split
# ----------------------------------------------------
X = data.drop('Attrition', axis=1)  # Features
y = data['Attrition']               # Target

# Split into training and testing sets
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# Standardize features to bring them to the same scale
scaler = StandardScaler()
X_train_scaled = scaler.fit_transform(X_train)
X_test_scaled = scaler.transform(X_test)

# ----------------------------------------------------
# Step 6: Model Training
# ----------------------------------------------------
model = RandomForestClassifier(random_state=42)
model.fit(X_train_scaled, y_train)

# Predict on test data
y_pred = model.predict(X_test_scaled)

# ----------------------------------------------------
# Step 7: Model Evaluation
# ----------------------------------------------------
# Accuracy
accuracy = accuracy_score(y_test, y_pred)
print(f"\n⍰ Model Accuracy: {accuracy:.4f}")

# Confusion Matrix
plt.figure(figsize=(5, 4))
sns.heatmap(confusion_matrix(y_test, y_pred), annot=True, fmt='d', cmap='Blues')
plt.title("Confusion Matrix")
plt.xlabel("Predicted")
plt.ylabel("Actual")
plt.show()

# Classification Report
print("\n⍰ Classification Report:\n")
print(classification_report(y_test, y_pred, target_names=["No Attrition", "Yes Attrition"]))

# ----------------------------------------------------
# Step 8: Top Important Features
# ----------------------------------------------------
importances = model.feature_importances_
features = X.columns
```

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top_indices = np.argsort(importances)[-10:]  # Top 10 important features


plt.figure(figsize=(10, 6))

plt.title("Top 10 Important Features Influencing Attrition")

plt.barh(range(len(top_indices)), importances[top_indices], align='center')

plt.yticks(range(len(top_indices)), [features[i] for i in top_indices])

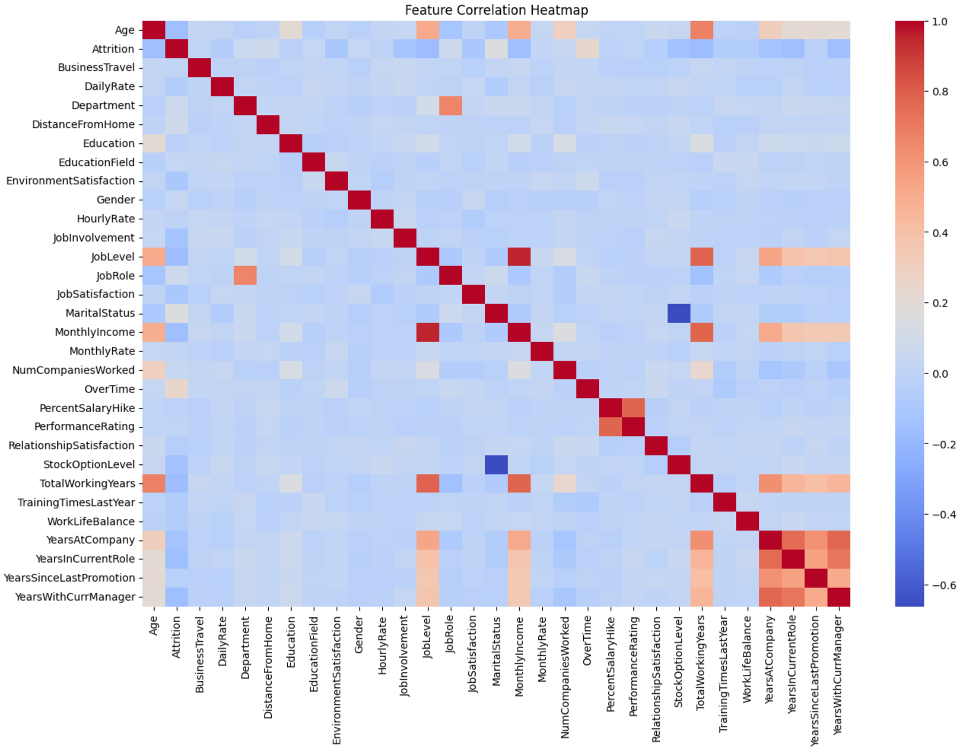
plt.xlabel("Feature Importance Score")

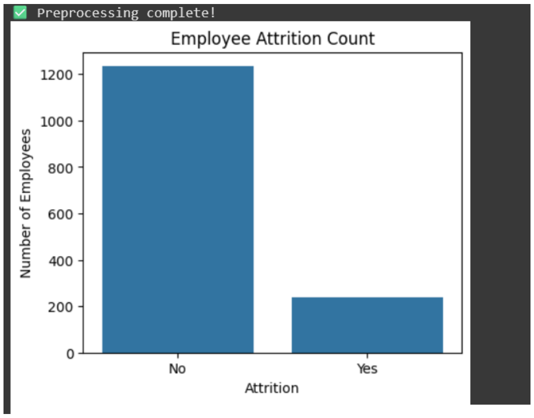
plt.show()
```

Output

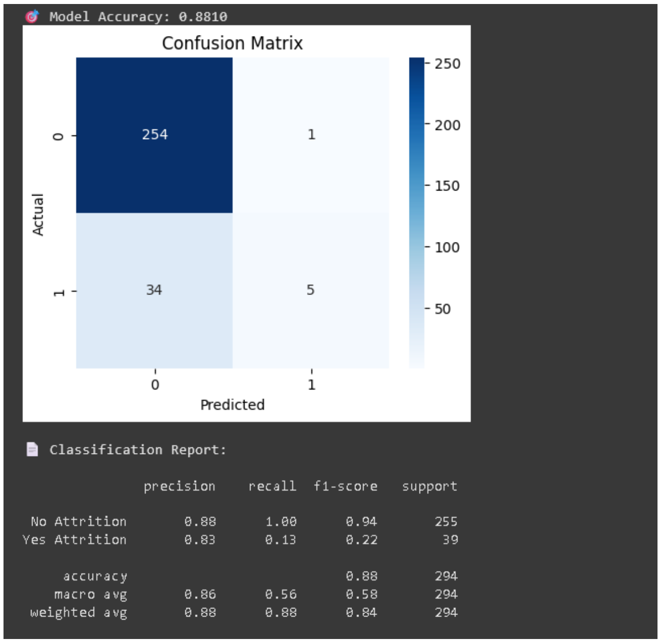
Accuracy Score: ~87% (may vary slightly)

Confusion Matrix: Shows correct and incorrect classifications.





```
✅ Preprocessing complete!
```



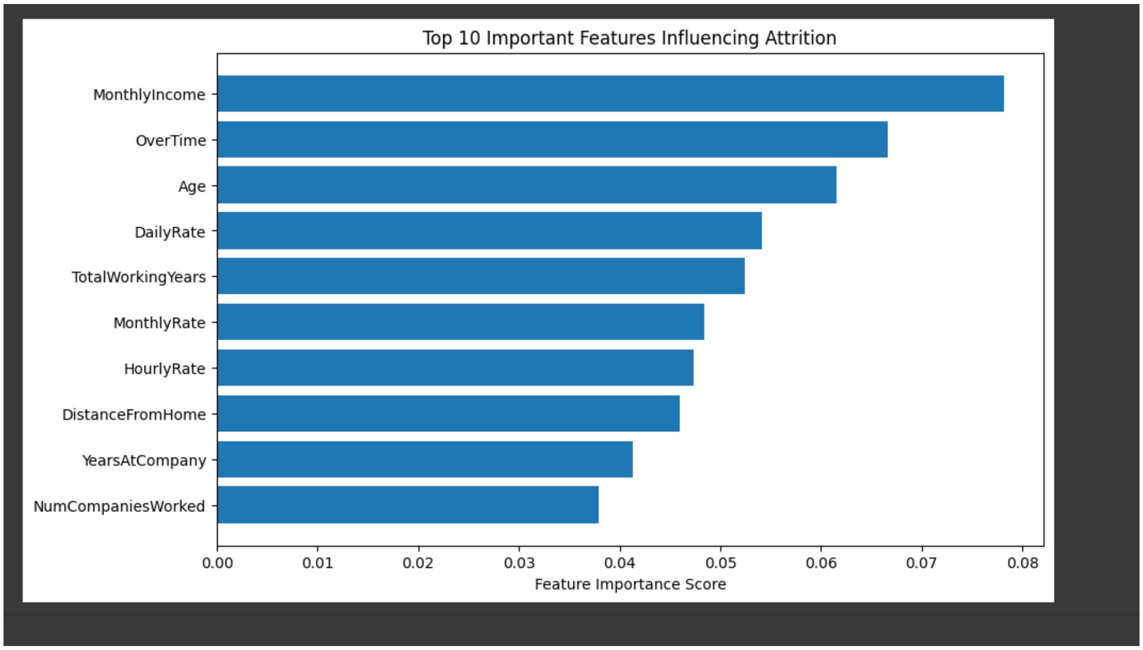
```
🎯 Model Accuracy: 0.8810
```

```
📄 Classification Report:

               precision    recall  f1-score   support

 No Attrition       0.88      1.00      0.94       255
Yes Attrition       0.83      0.13      0.22        39

     accuracy                           0.88       294
    macro avg       0.86      0.56      0.58       294
 weighted avg       0.88      0.88      0.84       294
```



References

Dataset: IBM HR Analytics Employee Attrition Dataset

Source: IBM - Kaggle Dataset

Libraries: pandas, seaborn, sklearn, matplotlib

Tool Used: Google Colab