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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Title: Predicting Employee Attrition

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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"]))
```

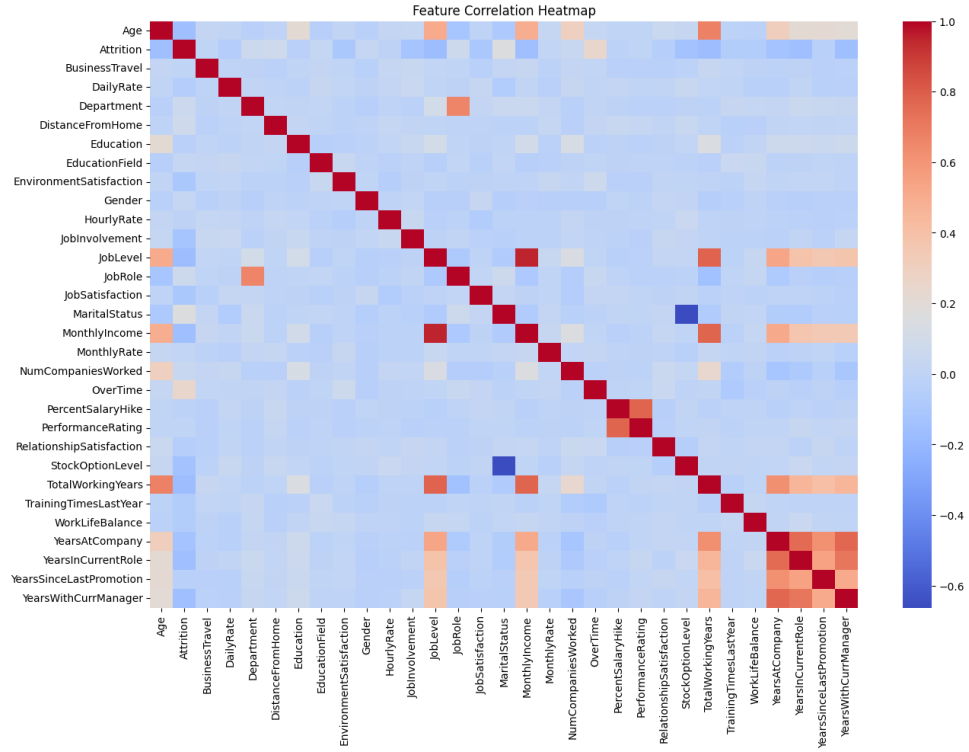
```
# ------------------------------------------------------

# Step 8: Top Important Features

# ------------------------------------------------------

importances = model.feature_importances_

features = X.columns

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

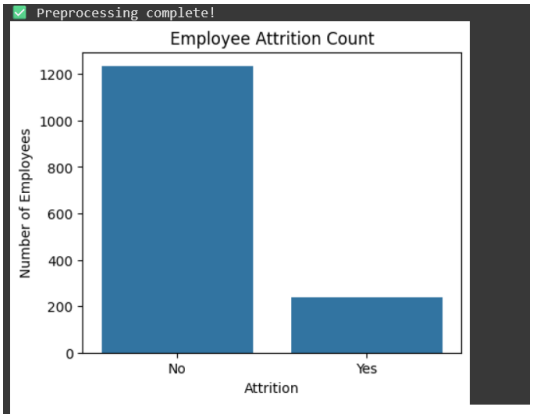
```
plt.figure(figsize=(10, 6))

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

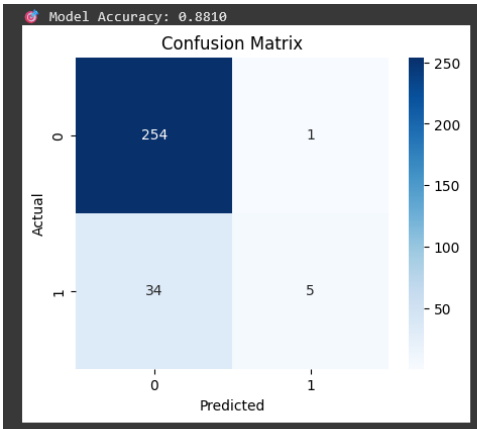
Accuracy Score: ~87% (may vary slightly)

Confusion Matrix: Shows correct and incorrect classifications.



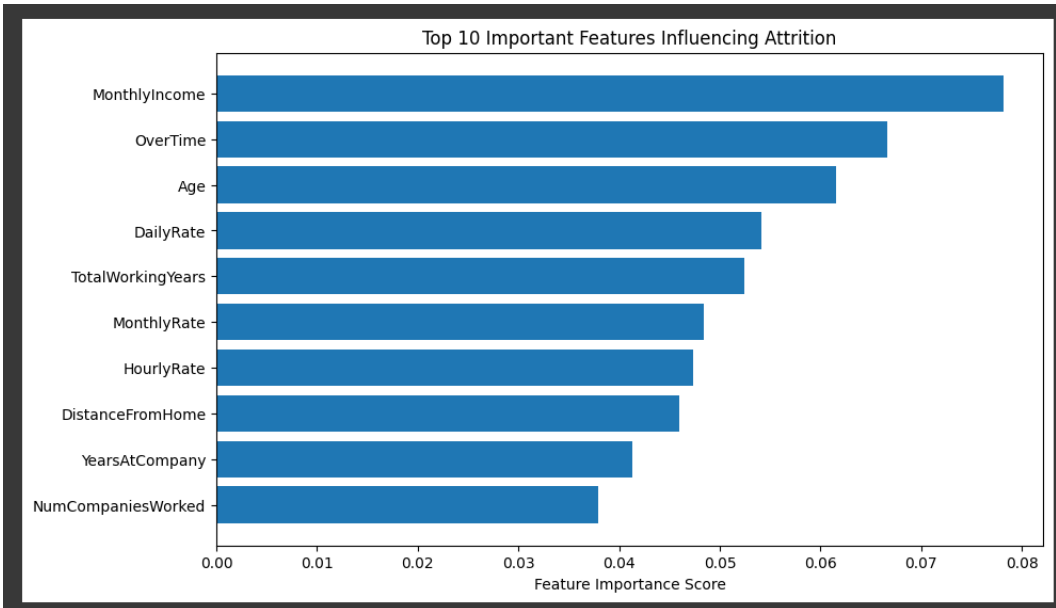


Model Accuracy: 0.8810



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