Assessment Report

on

"Predict Employee Attrition"

submitted as partial fulfillment for the award of

BACHELOR OF TECHNOLOGY DEGREE

SESSION 2024-25

By

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May, 2025

Introduction

Employee attrition is a key HR metric for organizations, and being able to predict it can help businesses retain top talent and reduce costs associated with turnover. In this project, we use a classification approach to predict attrition based on various employee features such as environment satisfaction, job level, and years at the company. Visual aids such as a confusion matrix heatmap and feature importance plot are used to interpret the results.

Methodology

1. **Data Loading & Cleaning**: Loaded the dataset and dropped non-informative columns such as EmployeeCount, EmployeeNumber, StandardHours, and Over18.
2. **Encoding**: Label-encoded categorical variables and the binary target Attrition.
3. **Splitting**: Data was split into training and testing sets using an 80-20 split while stratifying on the target.
4. **Model Training**: A Random Forest Classifier with 100 trees was trained.
5. **Evaluation**: Calculated confusion matrix, accuracy, precision, recall, and visualized results using seaborn heatmaps and bar charts.

Code:-

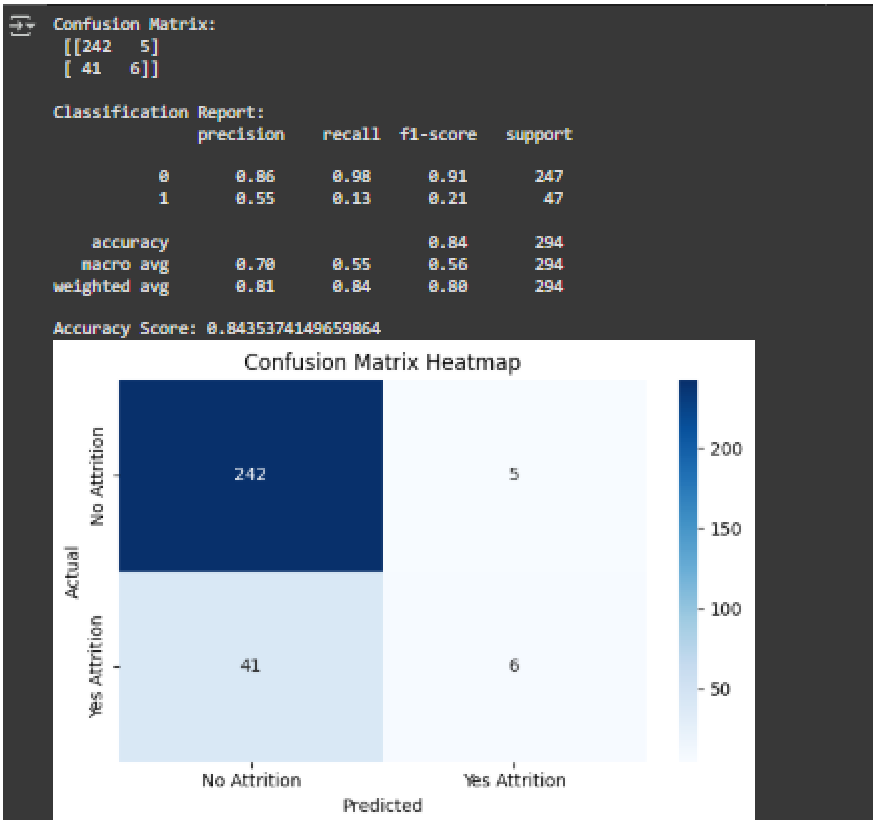
```
import pandas as pd
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import classification_report, confusion_matrix, accuracy_score
import matplotlib.pyplot as plt
import seaborn as sns

# Load the dataset
df = pd.read_csv('6. Predict Employee Attrition.csv')

# Drop irrelevant or constant columns
df.drop(['EmployeeCount', 'EmployeeNumber', 'StandardHours', 'Over18'], axis=1, inplace=True)

# Encode target variable
df['Attrition'] = df['Attrition'].map({'Yes': 1, 'No': 0})
```

```
# Encode categorical features
categorical_cols =
df.select_dtypes(include='object').columns
le = LabelEncoder()
for col in categorical_cols:
    df[col] = le.fit_transform(df[col])

# Split data into features and target
X = df.drop('Attrition', axis=1)
y = df['Attrition']

# Train/test split
X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.2, random_state=42, stratify=y)

# Train Random Forest Classifier
clf = RandomForestClassifier(n_estimators=100,
random_state=42)
clf.fit(X_train, y_train)

# Predictions
```

```
y_pred = clf.predict(X_test)

# Evaluation
conf_matrix = confusion_matrix(y_test, y_pred)
print("Confusion Matrix:\n", conf_matrix)
print("\nClassification Report:\n",
classification_report(y_test, y_pred))
print("Accuracy Score:", accuracy_score(y_test, y_pred))

# Confusion Matrix Heatmap
plt.figure(figsize=(6, 4))
sns.heatmap(conf_matrix, annot=True, fmt='d',
cmap='Blues',
            xticklabels=['No Attrition', 'Yes Attrition'],
            yticklabels=['No Attrition', 'Yes Attrition'])
plt.title('Confusion Matrix Heatmap')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.tight_layout()
plt.show()
```

```
# Feature Importance Plot

importances = pd.Series(clf.feature_importances_,
index=X.columns)

importances.sort_values(ascending=False).head(10).plot
(kind='barh')

plt.title('Top 10 Important Features')

plt.gca().invert_yaxis()

plt.tight_layout()

plt.show()
```

Output:-



```
Confusion Matrix:
 [[242   5]
 [ 41   6]]

Classification Report:
              precision    recall  f1-score   support

           0       0.86      0.98      0.91       247
           1       0.55      0.13      0.21        47

    accuracy                           0.84       294
   macro avg       0.70      0.55      0.56       294
weighted avg       0.81      0.84      0.80       294

Accuracy Score: 0.8435374149659864
```

References/Credits

- Dataset Source: IBM HR Analytics Employee Attrition Dataset
- Libraries Used: pandas, sklearn, seaborn, matplotlib
- Classifier: RandomForestClassifier from scikit-learn