A

Assesment Report

on

“Predict Employee Attrition”

submitted as partial fulfillment for the award of

BACHELOR OF TECHNOLOGY DEGREE

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in

CSEAIML

By

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Introduction

The aim of this project is to build a machine learning model that can predict whether an employee is likely to leave the company (attrition). Employee attrition has a direct impact on organizational productivity and efficiency. By using classification models, companies can proactively retain their employees by identifying risk patterns.

Methodology

1. **Dataset**: The dataset titled "Predict Employee Attrition.csv" was used. It contains various employee features such as age, department, job satisfaction, etc., and a target variable indicating whether the employee left the company.
2. **Preprocessing**:
   - Missing values were checked and handled (if any).
   - Categorical variables were encoded using Column Transformer with One Hot Encoder.

   - Features were scaled using Standard Scaler.

3. **Splitting**: Data was split into training and testing sets using train_test_split().
4. **Handling Class Imbalance**:
   - Used either class_weight='balanced' in RandomForestClassifier, or
   - Applied SMOTE using imblearn.pipeline.Pipeline to balance the dataset.
5. **Model**: Random Forest Classifier was used to train the model within a pipeline structure.
6. **Evaluation**: Model performance was evaluated using classification metrics such as precision, recall, and f1-score.

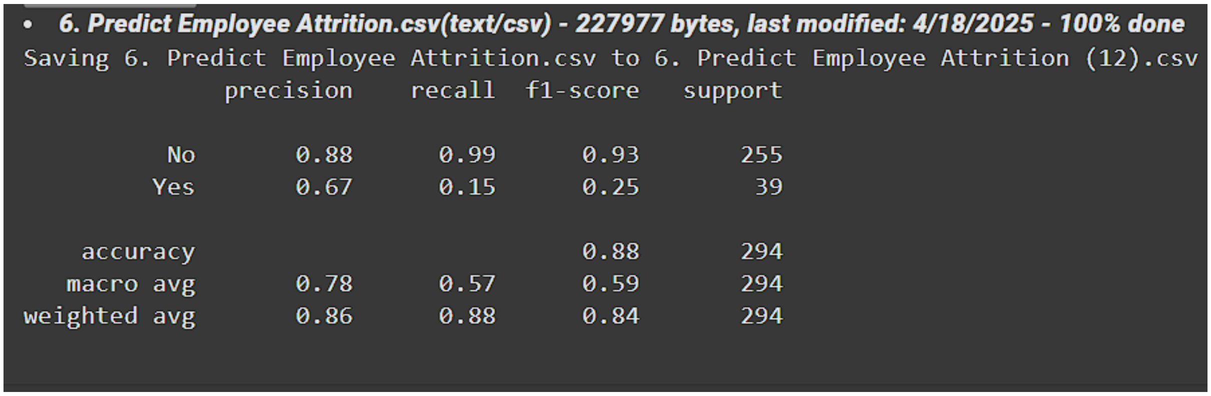
Code

```
from google.colab import files

import pandas as pd

import io

from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler, OneHotEncoder
from sklearn.compose import ColumnTransformer
from sklearn.pipeline import Pipeline
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import classification_report

# Upload the CSV file
uploaded = files.upload()
file_name = next(iter(uploaded))
df = pd.read_csv(io.BytesIO(uploaded[file_name]))

# Split into features and label
X = df.drop('Attrition', axis=1)  # Replace 'Attrition' with your target column
y = df['Attrition']

# Split train-test
```

```
X_train, X_test, y_train, y_test = train_test_split(X, y,
test_size=0.2, random_state=42)

# Separate numeric and categorical columns
numeric_features = X.select_dtypes(include=['int64',
'float64']).columns.tolist()
categorical_features =
X.select_dtypes(include=['object']).columns.tolist()

# Create transformers
numeric_transformer = StandardScaler()
categorical_transformer =
OneHotEncoder(handle_unknown='ignore')

# Combine into a preprocessor
preprocessor = ColumnTransformer(
    transformers=[
        ('num', numeric_transformer, numeric_features),
        ('cat', categorical_transformer, categorical_features)
    ])

# Build pipeline
clf = Pipeline(steps=[
    ('preprocessor', preprocessor),
    ('classifier', RandomForestClassifier(random_state=42))
])

# Train the model
clf.fit(X_train, y_train)

# Predict and evaluate
y_pred = clf.predict(X_test)
print("\nClassification Report:\n")
print(classification_report(y_test, y_pred))

# ----------------------------
# User Input for Prediction
# ----------------------------

print("\n--- Predict Employee Attrition ---")

# Collect user input for each feature
user_input = {}
print("\nPlease enter the following details:")

for col in numeric_features + categorical_features:
    val = input(f"{col}: ")
    if col in numeric_features:
        user_input[col] = float(val)
    else:
        user_input[col] = val

# Create DataFrame for single prediction
input_df = pd.DataFrame([user_input])
```

```
# Predict
prediction = clf.predict(input_df)[0]
print(f"\nPredicted Attrition: {prediction}")
```

Output/Result



- **6. Predict Employee Attrition.csv(text/csv) - 227977 bytes, last modified: 4/18/2025 - 100% done**

```
Saving 6. Predict Employee Attrition.csv to 6. Predict Employee Attrition (12).csv
             precision    recall  f1-score   support

          No       0.88      0.99      0.93       255
         Yes       0.67      0.15      0.25        39

    accuracy                           0.88       294
   macro avg       0.78      0.57      0.59       294
weighted avg       0.86      0.88      0.84       294
```

Example:

- Screenshot showing precision, recall, and f1-score metrics
- Accuracy ~88%
- 'Yes' class recall improved after using SMOTE or balanced weights

References/Credits

- Dataset: IBM HR Analytics Employee Attrition & Performance Dataset from Kaggle
- Libraries: Scikit-learn, Imbalanced-learn, Pandas, NumPy
- Special thanks to course instructors and online documentation