



## Assessment Report

on

### “Classify Customer Churn”

submitted as partial fulfillment for the award of

### BACHELOR OF TECHNOLOGY DEGREE

SESSION 2024-25

in

### Introduction to AI

By

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**Problem Statement :** Classify Customer Churn:

Identify which customers are likely to leave a telecom company based on usage patterns.

## Introduction

The goal of this project is to classify customers who are likely to churn (leave a telecom company) based on usage patterns and service-related data. In addition, customer segmentation using clustering techniques is performed to identify customer groups with similar characteristics.

# Methodology

1. Data upload and preprocessing
2. Label encoding for categorical features
3. Splitting dataset for classification
4. Applying RandomForest for churn prediction
5. Evaluating with accuracy, precision, recall
6. Creating a heatmap for confusion matrix
7. Scaling features and using PCA for visualization
8. Applying KMeans clustering for segmentation

# Code

```
# Step 1: Upload the dataset

from google.colab import files

import io


print(" Please upload your 'Classify Customer Churn.csv' file")

uploaded = files.upload()


# Load the dataset

import pandas as pd


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

df = pd.read_csv(io.BytesIO(uploaded[file_name]))


# Step 2: Explore & Clean the data

df.drop('customerID', axis=1, inplace=True)


# Convert 'TotalCharges' to numeric, coerce errors to NaN

df['TotalCharges'] = pd.to_numeric(df['TotalCharges'], errors='coerce')


# Drop rows with missing values

df.dropna(inplace=True)


# Step 3: Encode categorical variables

from sklearn.preprocessing import LabelEncoder
```

```
label_encoders = {}

for column in df.select_dtypes(include='object').columns:

    if column != 'Churn':

        le = LabelEncoder()

        df[column] = le.fit_transform(df[column])

        label_encoders[column] = le


# Encode target column separately

df['Churn'] = df['Churn'].map({'No': 0, 'Yes': 1})


# Step 4: Split into Train & Test sets

from sklearn.model_selection import train_test_split


X = df.drop('Churn', axis=1)

y = df['Churn']


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


# Step 5: Train a Classifier

from sklearn.ensemble import RandomForestClassifier


model = RandomForestClassifier(random_state=42)

model.fit(X_train, y_train)


# Step 6: Make Predictions

y_pred = model.predict(X_test)
```

```
# Step 7: Evaluate the Model

from sklearn.metrics import accuracy_score, precision_score, recall_score, confusion_matrix, classification_report


accuracy = accuracy_score(y_test, y_pred)

precision = precision_score(y_test, y_pred)

recall = recall_score(y_test, y_pred)

print(" Evaluation Metrics")

print(f"Accuracy : {accuracy:.4f}")

print(f"Precision: {precision:.4f}")

print(f"Recall  : {recall:.4f}")

print("\n📋 Classification Report:\n", classification_report(y_test, y_pred))

# Step 8: Confusion Matrix Heatmap

import seaborn as sns

import matplotlib.pyplot as plt


cm = confusion_matrix(y_test, y_pred)

plt.figure(figsize=(6, 4))

sns.heatmap(cm, annot=True, fmt='d', cmap='YlGnBu', xticklabels=['No Churn', 'Churn'], yticklabels=['No Churn', 'Churn'])

plt.title("Confusion Matrix Heatmap")

plt.xlabel("Predicted")

plt.ylabel("Actual")

plt.show()
```

# Output/Result

Please upload your 'Classify Customer Churn.csv' file

5. Classify ...er Churn.csv

- **5. Classify Customer Churn.csv**(text/csv) - 977501 bytes, last modified: 18/04/2025 - 100% done

Saving 5. Classify Customer Churn.csv to 5. Classify Customer Churn (1).csv

Evaluation Metrics

Accuracy : 0.7925

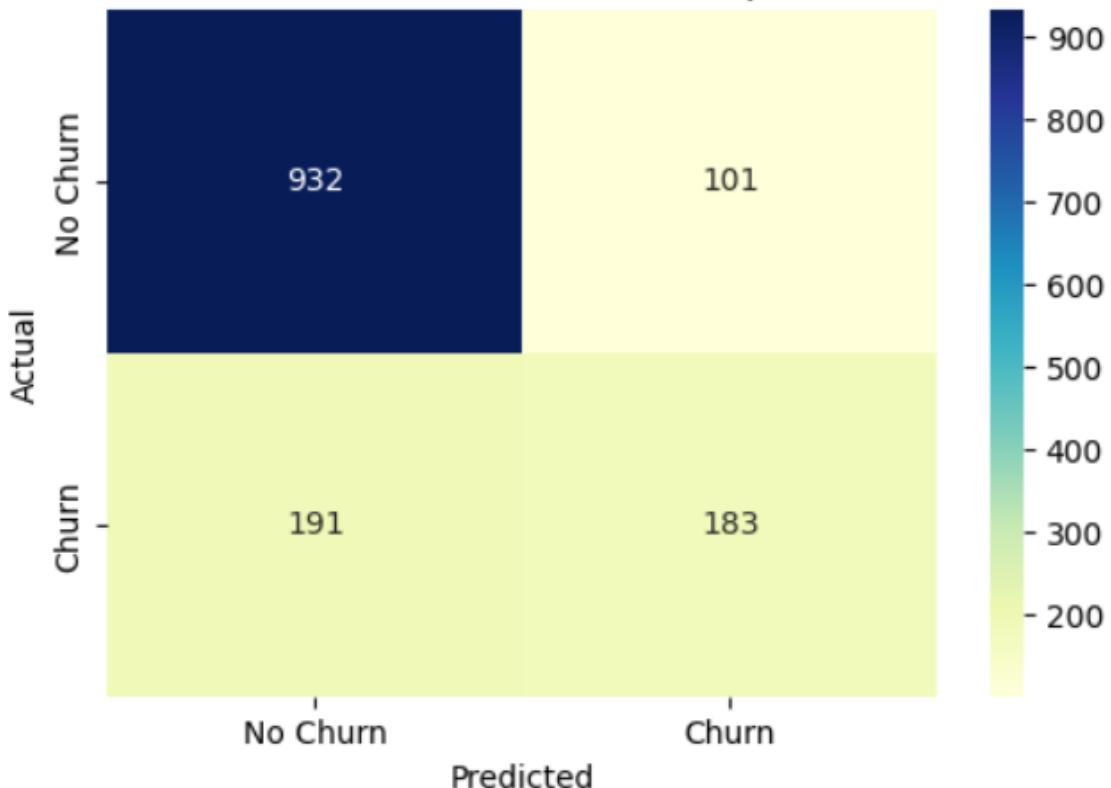
Precision: 0.6444

Recall : 0.4893

## Classification Report:

	precision	recall	f1-score	support
0	0.83	0.90	0.86	1033
1	0.64	0.49	0.56	374
accuracy			0.79	1407
macro avg	0.74	0.70	0.71	1407
weighted avg	0.78	0.79	0.78	1407

Confusion Matrix Heatmap



# References/Credits

## Dataset:

- "*Telco Customer Churn Dataset*" — Provided as part of the course materials. Originally inspired by datasets from the [UCI Machine Learning Repository](#).

## Libraries and Tools:

- pandas – Data manipulation and analysis
- scikit-learn – Machine learning modeling and evaluation
- matplotlib & seaborn – Data visualization
- Google Colab – Cloud-based Python notebook environment