

### **Task 3: Customer Churn Prediction (Bank Customers)**

#### **Objective**

The objective of this task is to identify bank customers who are likely to leave the bank (customer churn).

Predicting churn helps banks take preventive measures to improve customer retention.

#### **Dataset**

The Churn Modelling Dataset contains customer demographic and financial information such as credit score, geography, gender, age, tenure, balance, number of products, credit card status, active membership, and salary.

The target variable is **Exited**, where 1 indicates churn and 0 indicates retention.

#### **Data Cleaning and Preparation**

The dataset was loaded using Pandas. Missing values were checked and none were found. Irrelevant columns such as RowNumber, CustomerId, and Surname were removed because they do not contribute to churn prediction.

The target variable (Exited) was separated from the feature set.

#### **Encoding Categorical Variables**

Categorical features were converted into numerical form for model compatibility.

Gender was encoded using Label Encoding.

Geography was encoded using One-Hot Encoding to avoid ordinal relationships and dummy variable trap.

#### **Feature Scaling**

Numerical features were scaled using StandardScaler to ensure that all features contribute equally during model training.

This prevents features with large values from dominating the learning process.

#### **Model Training**

The dataset was split into training (80%) and testing (20%) sets.

A Random Forest Classifier was trained using the training data to learn patterns associated with customer churn.

#### **Model Evaluation**

The model performance was evaluated using accuracy score, confusion matrix, and classification report.

These metrics helped measure the effectiveness of the churn prediction model.

#### **Feature Importance Analysis**

Feature importance was extracted from the Random Forest model.

Key influential features included Age, Balance, Number of Products, Geography, and Active Membership.

This analysis helps understand the main factors influencing customer churn.

#### **Conclusion**

The customer churn prediction model was successfully developed using machine learning techniques.

The project demonstrates effective data preprocessing, classification modeling, and feature importance analysis.

The results provide valuable insights for banking decision-making and customer retention strategies.