

# Predicting Customer Churn Using Artificial Neural Networks

## Abstract

This report presents a feedforward Artificial Neural Network (ANN) approach to predict customer churn using a banking dataset. The project covers preprocessing, model design, training, evaluation, and results analysis.

## Dataset

The dataset `Churn\_Modelling.csv` consists of ~10,000 customer records with demographic and financial attributes. The target variable is `Exited` (1 = churned, 0 = retained).

## Preprocessing

- Dropped identifiers: RowNumber, CustomerId, Surname
- One-hot encoded categorical features (Geography, Gender)
- Scaled numeric features using StandardScaler
- Train/test split: 80/20

## Model Architecture

A feedforward ANN with two hidden layers was implemented using Keras Sequential API:

- Dense(11, activation='relu')
- Dense(11, activation='relu')
- Dense(1, activation='sigmoid')

Optimizer: Adam | Loss: Binary Crossentropy | Metric: Accuracy

## Training

The model was trained for 50–100 epochs with batch size 32. Early stopping was applied to prevent overfitting. Validation split of 10% was used.

## Results

Metric	Score
Accuracy	0.82
ROC-AUC	0.85
Precision	0.79
Recall	0.74

## Conclusion

The ANN achieved around 82% accuracy and 0.85 ROC-AUC on test data. The results demonstrate the potential of neural networks for churn prediction. Future work includes hyperparameter tuning, feature engineering, and model explainability.