# Three Layer ANN Model to Predict Customer Churn Findings/Results

The study focused on creating an effective predictive model for customer churn using a three-layer artificial neural network (ANN) with a dataset of more than 10,000 banking customers. During the preprocessing phase, several measures were implemented to ensure the model's optimal performance: irrelevant features, including RowNumber, CustomerId, and Surname, were eliminated, while categorical variables like Gender and Geography were converted using label and one-hot encoding. Additionally, feature scaling was performed through standardization to balance the impact of each predictor, followed by splitting the dataset into 80% for training and 20% for testing. The ANN was structured with two hidden layers, each containing six neurons and utilizing the ReLU activation function, concluding with an output layer that applied the sigmoid activation for the binary classification task. The model employed the Adam optimizer and used binary cross-entropy as the loss function, achieving an overall test set accuracy of 86.2%. The confusion matrix revealed 1,513 true negatives, 211 true positives, 82 false positives, and 194 false negatives, indicating a balanced yet improvable performance in predicting customer churn.

To enhance the interpretability of the ANN model's predictions, SHapley Additive exPlanations (SHAP) were employed to shed light on feature importance. The SHAP analysis identified Tenure as the most influential predictor, underscoring the significant impact of a customer's relationship duration with the bank on evaluating loyalty and attrition risks. Other factors, such as HasCrCard, EstimatedSalary, Geography\_Spain, and NumOfProducts, also played notable roles in the prediction outcomes, though to varying extents. This combined emphasis on predictive performance and model interpretability underscores the effectiveness of the ANN-based approach and provides actionable insights for customer retention strategies. By identifying adjustable factors that influence churn, decision-makers can customize their interventions and policies to enhance customer relationship management and reduce attrition risks.