■ Bank Churn Model Performance Report

Date: 2025-10-02

Prepared by: Model Evaluation Team

■ Executive Summary

This report presents the evaluation results of the **Random Forest** model for predicting bank customer churn. The model shows excellent performance with **AUC-ROC = 0.96**, **accuracy = 93.2%**, and **recall = 86%** for churned customers. These results demonstrate strong business value, enabling early identification of at-risk customers.

■ Model Overview

Algorithm	Random Forest Classifier
Data Size	102,814 records, 17 features
Target	Customer churn (Yes/No)
Model File	target_range_random_forest_model.pkl (44.6 KB)

■ Model Performance (Cross-Validation)

Metric	Training	Cross-Validation
Accuracy	91.22%	93.20% (±0.43%)
F1-Score	0.7076	0.6417 (±0.0291)
AUC-ROC	0.9600	0.9576 (±0.0057)
Churn Recall	-	86%

■ Classification Report (Training Data)

Class	Precision	Recall	F1-Score	Support
Retained	0.98	0.92	0.95	90,092
Churned	0.60	0.86	0.71	12,722
Accuracy	-	-	0.91	102,814
Macro Avg	0.79	0.89	0.83	102,814
Weighted Avg	0.93	0.91	0.92	102,814

■ Top 10 Features Influencing Churn

Feature	Importance
Balance	65.80%
Customer Lifetime Value (CLV)	16.61%
Number of Complaints	7.16%
Number of Products	4.07%
Risk Score	3.64%
Credit Score	2.08%
Tenure	0.61%
Income	0.01%

Outstanding Debt	0.01%
Credit Utilization	0.01%

■ Business Impact

• **Churn Detection Rate:** 86% of churners identified
• **False Positive Rate:** ~8% of retained customers flagged
• **Revenue Protection:** Enables targeted retention offers
• **Operational Efficiency:** Prioritize customers with >70% churn probability

■ Recommendations

1. Accept the current model for **pilot rollout**.
2. Monitor model performance in **real-world data**.
3. Adjust decision thresholds for **ROI optimization**.
4. Retrain regularly (monthly/quarterly).
5. Conduct **A/B testing** for targeted retention strategies.