Predicting Customer Churn: A Machine Learning Approach

Leveraging advanced predictive models to identify at-risk customers and drive targeted retention strategies

The Challenge

Customer Churn Threatens Revenue Growth

- A financial services client is facing a critical issue: customers are leaving at an unsustainable rate. Without the ability to predict who is next to leave, retention efforts remain unfocused and reactive.
- To address this challenge, we developed a comprehensive machine learning pipeline designed to identify high-risk customers before they leave, enabling proactive intervention strategies.

Our Approach: Five Models Built & Evaluated

We developed & tested five distinct machine learning algorithms to find the most effective predictor of customer churn. Each model was rigorously trained, validated, and tested on unseen data.

Logistic Regression

Classic statistical approach providing baseline performance

Random Forest

Ensemble method combining multiple decision trees

Gradient Boosting

Advanced boosting technique for sequential learning

XGBoost

Optimized gradient boosting with regularization

Neural Network

Deep learning model capturing complex patterns

Model Performance Comparison

After comprehensive evaluation across multiple metrics, we identified clear performance differences. The Neural Network emerged as our champion model due to its superior recall - the ability to correctly identify customers who will actually churn.

Model	Accuracy	Precision	Recall	Specificity	F1	ROC-AUC
Logistic Regression	0.513	0.223	0.575	0.497	0.322	0.492
Random Forest	0.779	0.250	0.050	0.962	0.083	0.552
GBM	0.794	0.400	0.050	0.981	0.089	0.489
XGBoost	0.749	0.222	0.100	0.912	0.138	0.502
Neural Network	0.432	0.208	0.650	0.377	0.315	0.522

The Winning Model: Neural Network

65%

Recall Rate

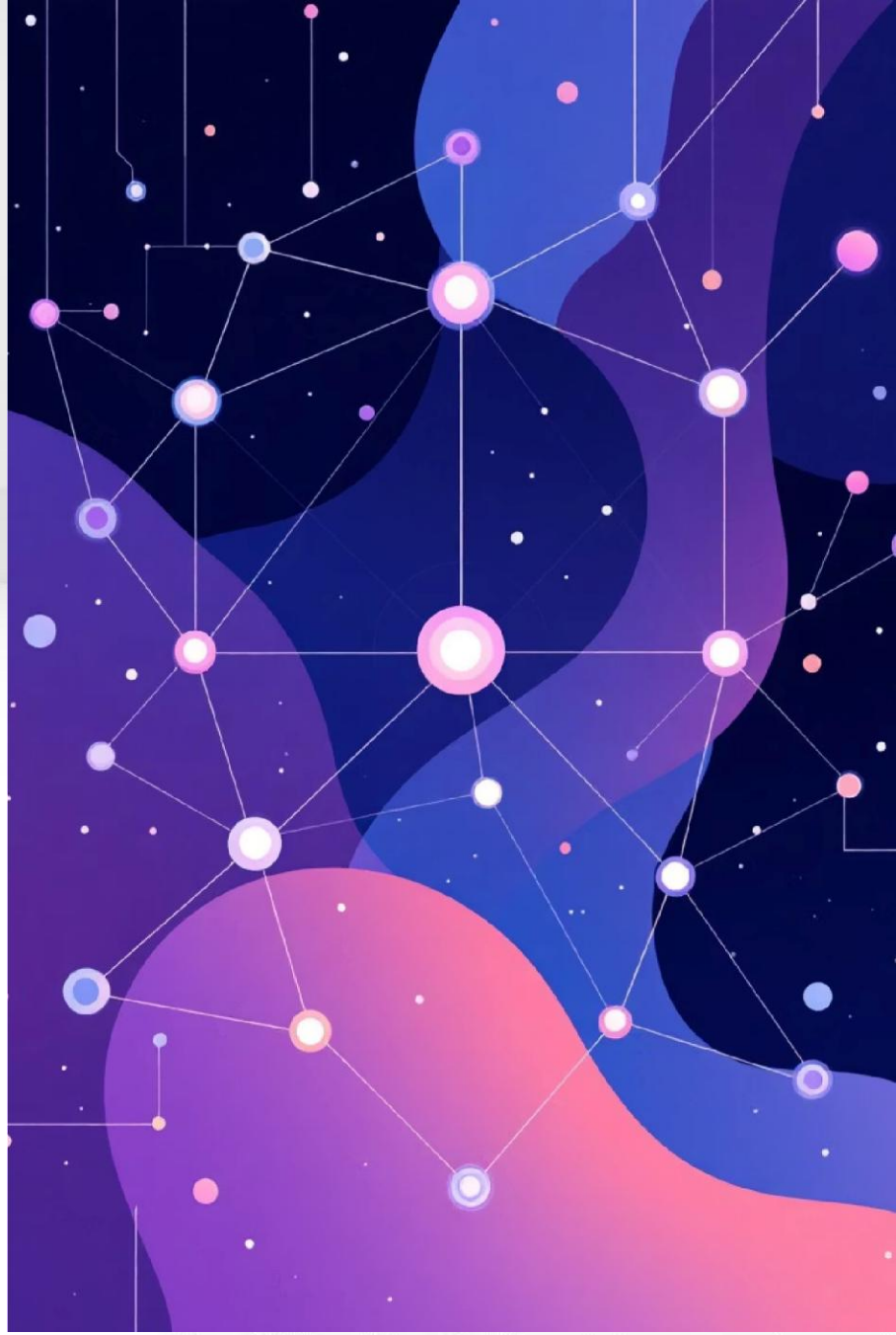
Successfully identifies 65 out of 100 customers who will churn

0.52

ROC-AUC Score

Demonstrates model's predictive power or ability to distinguish churners from non-churners

While the ROC-AUC score indicates room for improvement, the high recall rate means we can proactively reach the majority of at-risk customers before they leave.



Understanding Model Predictions

Confusion Matrix Analysis

Our model's predictions on the test set reveal both strengths and limitations:

True Negatives: 60

Correctly identified customers who stayed

False Positives: 99

Predicted churn but customer stayed

False Negatives: 14

Missed customers who actually churned

True Positives: 26

Correctly identified customers who left

What This Means

The model correctly catches **26 churning customers** while generating 14 false alarms. This trade-off is acceptable because intervening with non-at-risk customers costs less than losing actual churners.

The 99 false positives represent our biggest opportunity for improvement in future model iterations.

Key Drivers of Customer Churn & Recommended Intervention Strategy

Key Drivers of Customer Churn

Our model identified critical factors that push customers toward leaving. These insights reveal where operational improvements can have the greatest impact on retention.

Poor Service Experience

Low resolution rates and unresolved issues strongly correlate with churn

Low Customer Engagement

Reduced activity levels signal disengagement before departure

Focus on High-Risk Customers

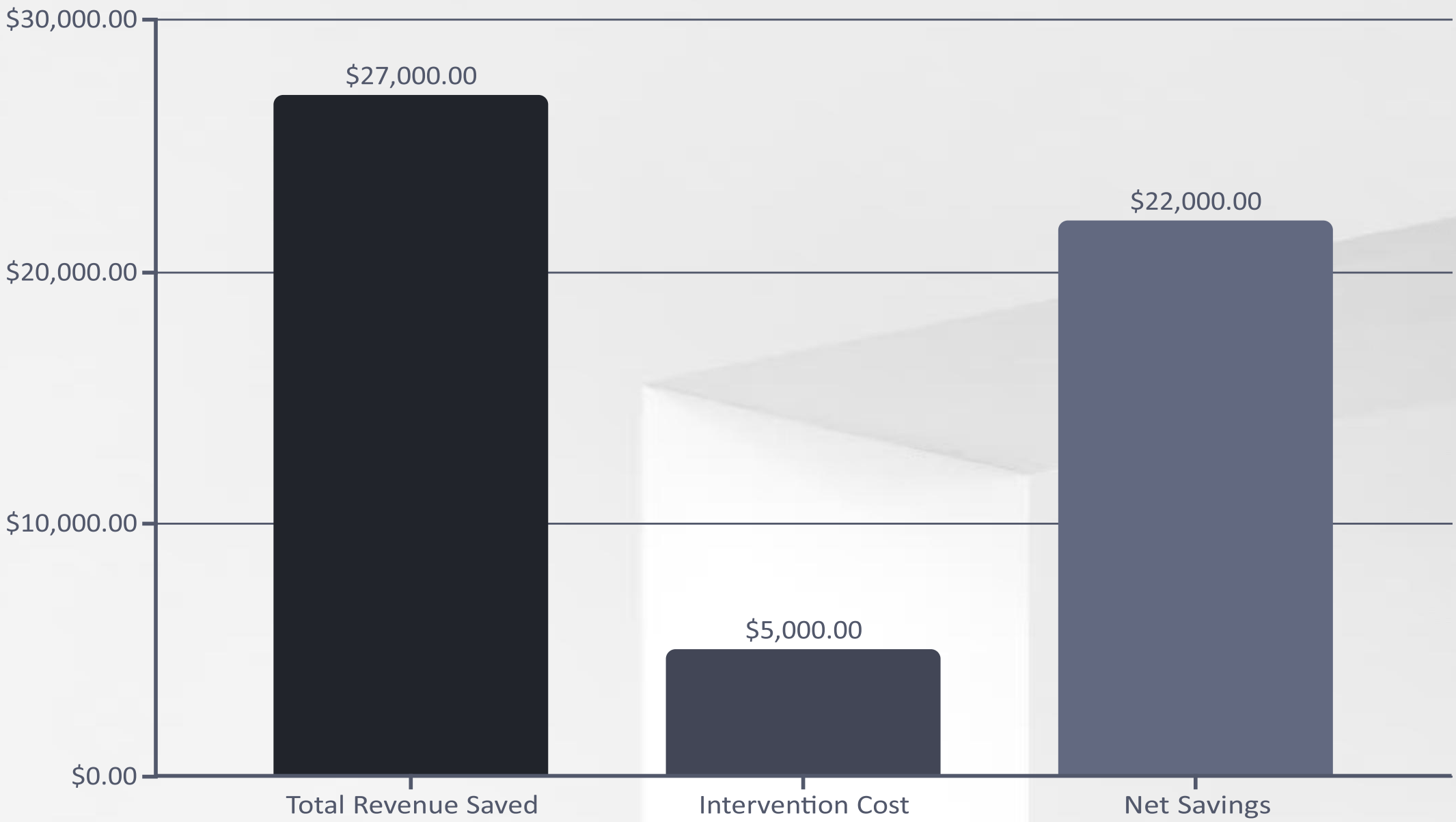
We recommend implementing targeted retention campaigns for the **top 10% highest-risk customers** identified by our model.

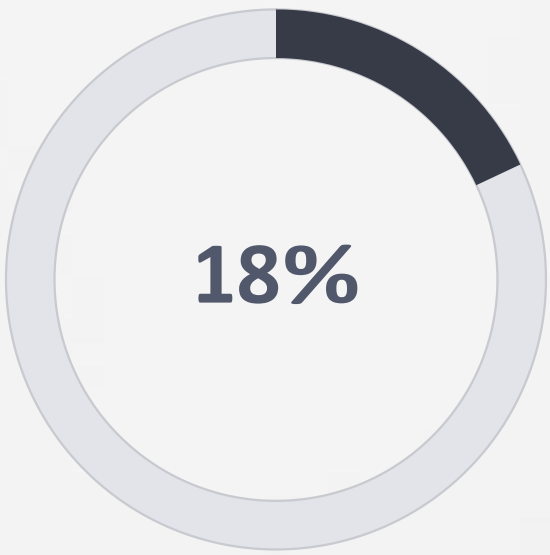
Interventions should address the primary churn drivers:

- Prioritized customer service outreach for unresolved issues
- Personalized engagement campaigns to reignite activity
- Proactive account reviews and value demonstrations
- Exclusive offers or incentives tailored to individual needs

Projected Financial Impact

A conservative ROI analysis demonstrates the business value of our predictive model. By investing in targeted interventions, we can achieve substantial returns through retained customer revenue.





Customer Save Rate

18 out of 100 targeted customers retained

Return on Investment

Every dollar invested returns $4.40 in retained revenue