Telco Customer Churn: AI-Enhanced Predictive Analytics using KNIME

Open for Innovation
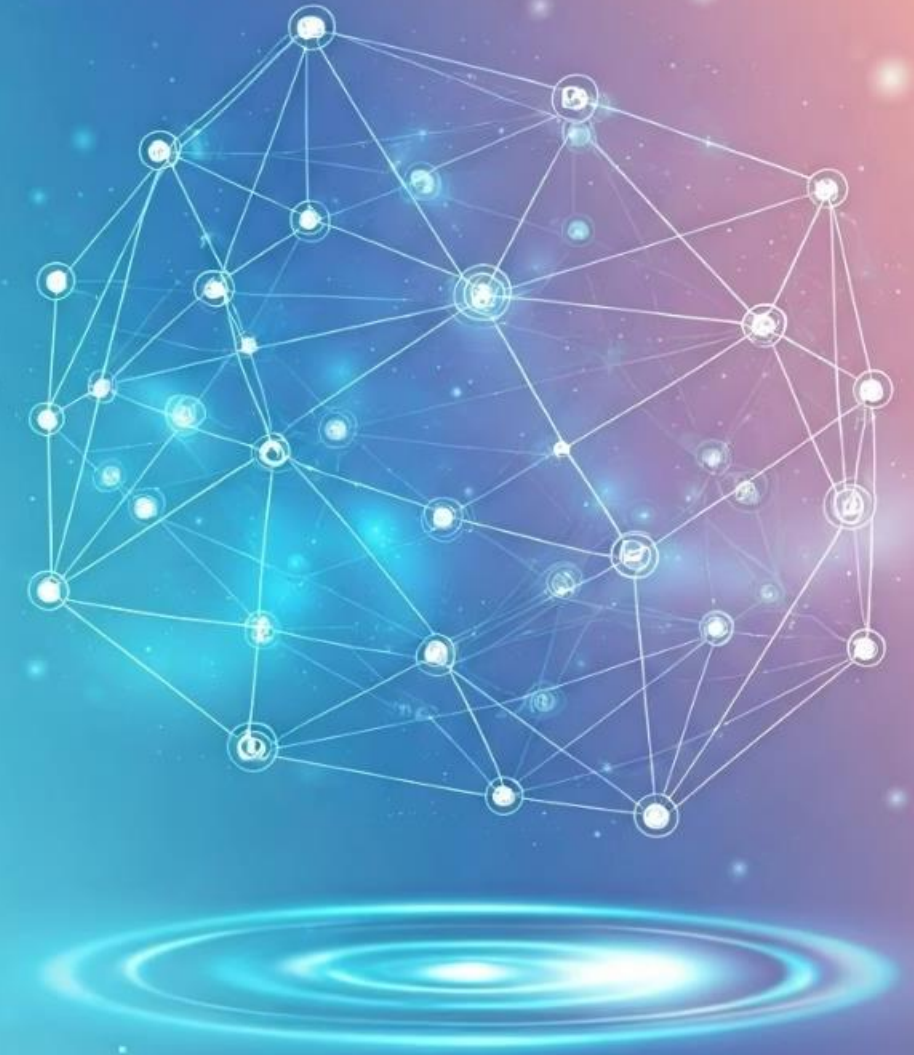## KNIME

Hackathon Challenge Apr '25
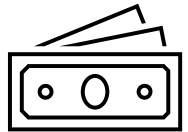
Nagarajan Thandayutham

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Telecom Industry Faces Fierce Competition

- Multiple providers battling for market share

- Customer acquisition costs 5-25x more than retention

- Digital transformation with AI creates competitive advantages

AT&T

verizon

Spectrum

T Mobile

uscellular

Current Business Challenge: A Snapshot of the key metrics

26.5% Customer Churn Rate

Customers discontinuing services annually

30.5% Revenue Churn Rate

Loss exceeds customer rate, indicating high-value customer loss

$74.44 Churned ARPU

Average revenue per lost customer

$6.8M Annual Revenue Loss

Requires immediate data-driven intervention

Process Methodology and Approach

1. Data Preparation & Preprocessing

- Missing Value
- Column Filter
- One to Many
- Statistics

2. GenAI enabled Feature Engineering

- LLM Prompting
- Parse Responses
- Feature Creation
- OpenAI Authenticator

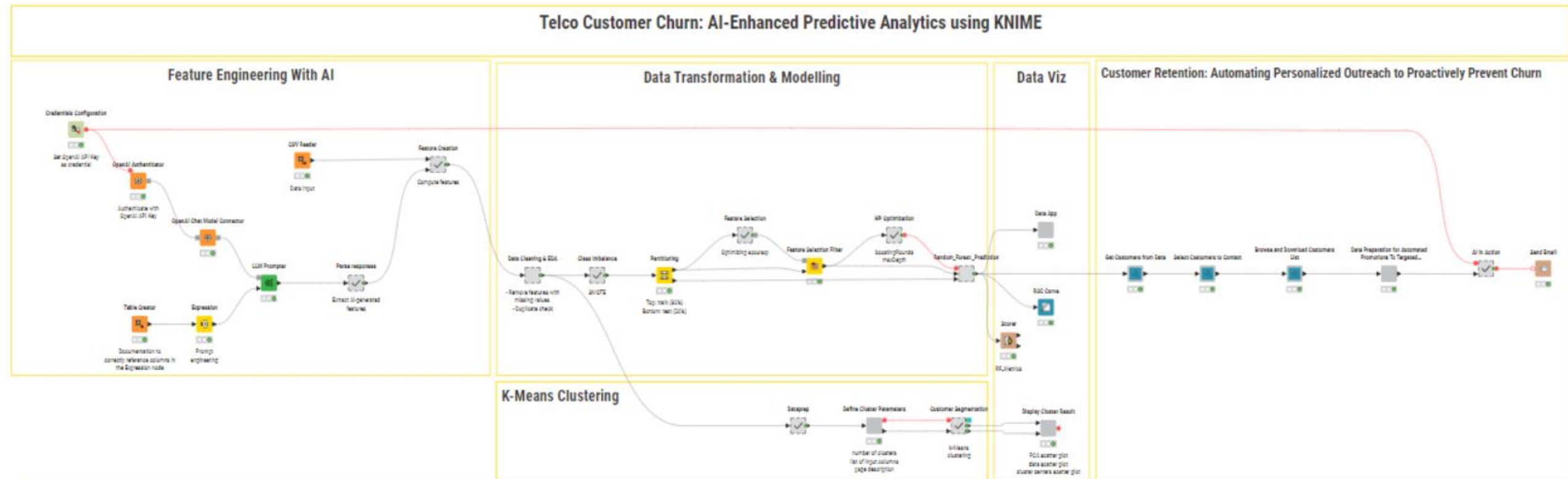### 3. Model Training & Evaluation

- Shuffling
- Partitioning (80/20)
- Feature Loop Optimization
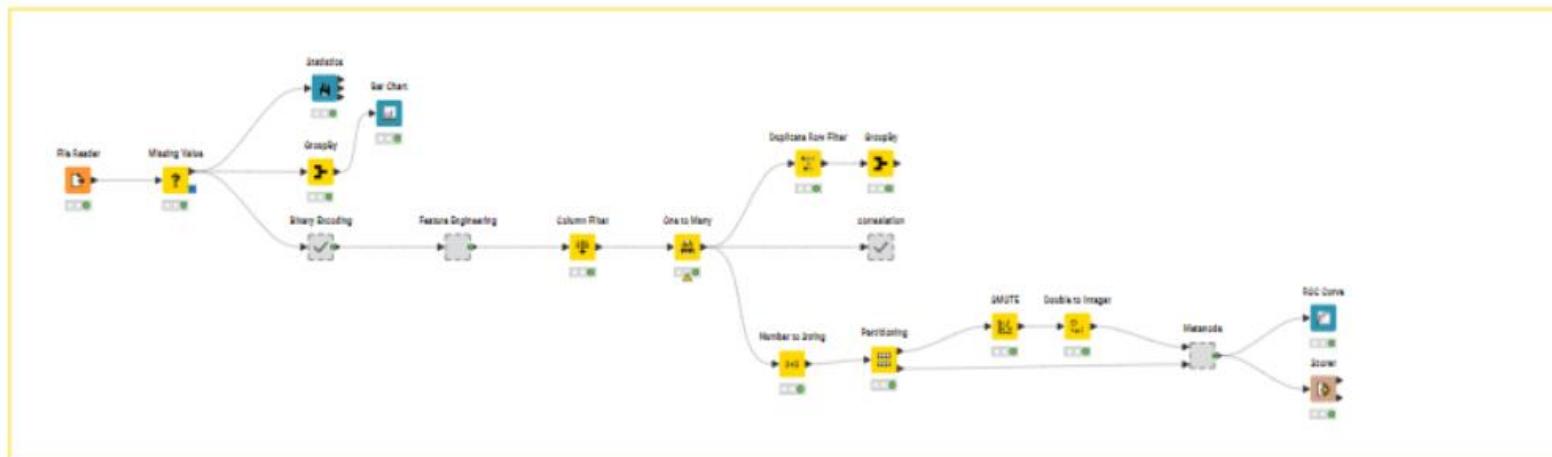- Hyperparameter Optimization

4. Results Visualization & Data App

- Interactive Widgets
- Multiple Visualizations
- Business KPIs

AI Enabled KNIME Workflow for Predicting Churn

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Our workflow begins with AI-driven feature engineering, followed by data transformation and visualization. Next, we optimize churn prediction through feature selection and hyperparameter tuning loops using Random Forest. Results are visualized for actionable business insights, segmented via K-Means clustering, and combined with OpenAI LLM-generated retention strategies to automate personalized email outreach, proactively preventing customer churn.

Three Critical Churn Drivers Requiring Immediate Action
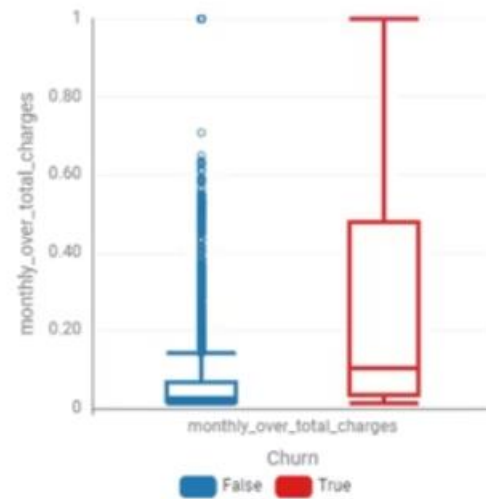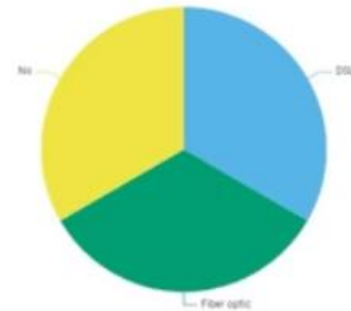
🚀 **Month-to-month contracts**

51.4% churn rate, highest flight risk segment

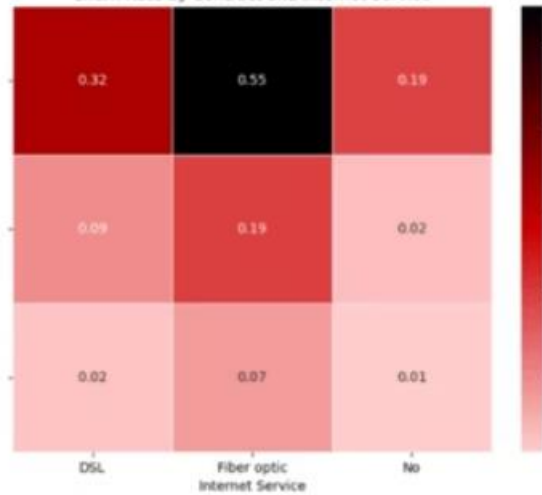⬇ **Fiber without commitments**

49.4% of all customer losses
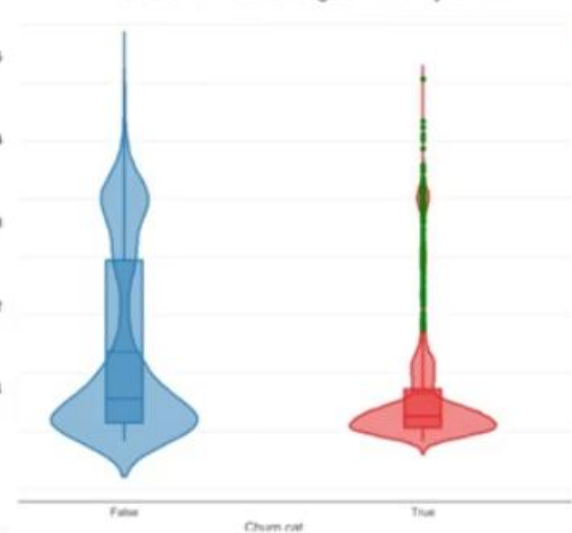
🐳 **Poor support + high charges**

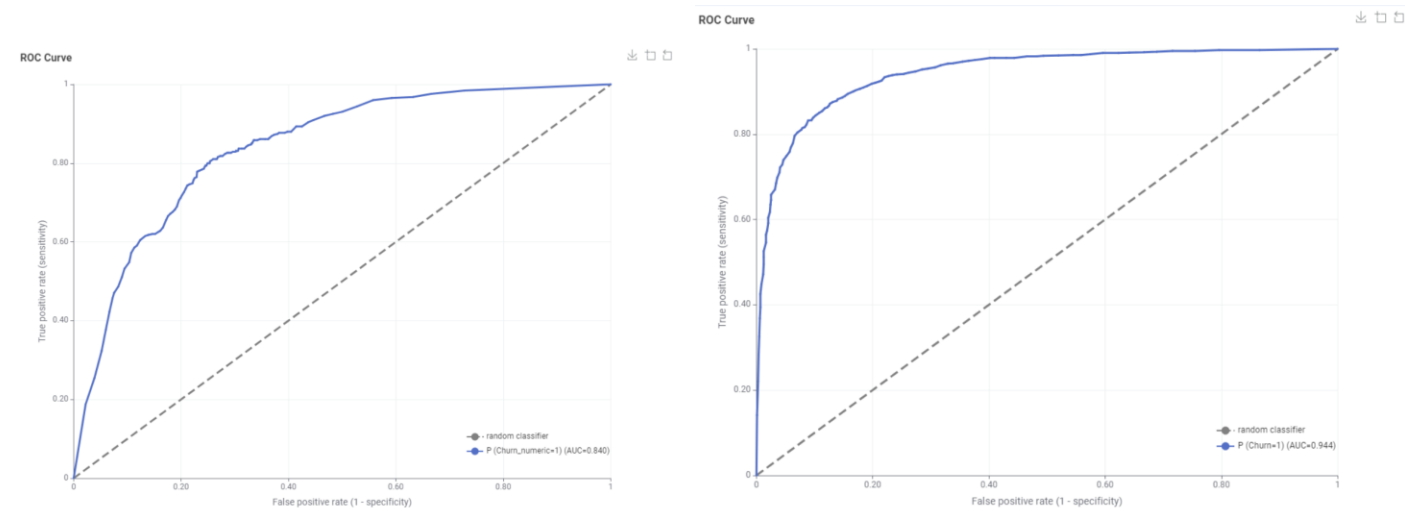Drives 46.7% of exits

These three patterns represent 60% of all churn, creating clear intervention targets

Model Performance & Feature Importance

Metric	Baseline I	AI Enhanced	Improvement
Accuracy	74.9%	87%	+12.1%
Precision	51.8%	86.4%	+34.6%
Recall	82.4%	87.8%	+5.4%

Our AI-enhanced Random Forest model revealed hidden insights into how service efficiency drives customer retention beyond traditional analytics.

Top Features

1) Contract type

Importance: 100.0

2) Service Efficiency Index

Importance: 87.3

3) Tenure

Importance: 83.1

4) Contract Progress Indicator

Importance: 76.2

5) Tech Support

Importance: 67.5

Random Forest: Superior Performance Across All Metrics

Model	Recall	Precision	F-Mean	Accuracy	Cohen-Kappa
Gradient Boost	0.818	0.828	0.82	0.824	0.648
XG Boost	0.852	0.853	0.853	0.853	0.705
Random Forest	**0.878**	**0.864**	**0.871**	**0.87**	**0.74**

Random Forest delivers 87% accurate churn prediction by analyzing contact patterns and lifecycle stages. With balanced recall/precision metrics, it identifies at-risk customers while minimizing false alarms. KNIME enables automated scoring and tailored retention strategies.

Service Efficiency: The Key to Customer Retention
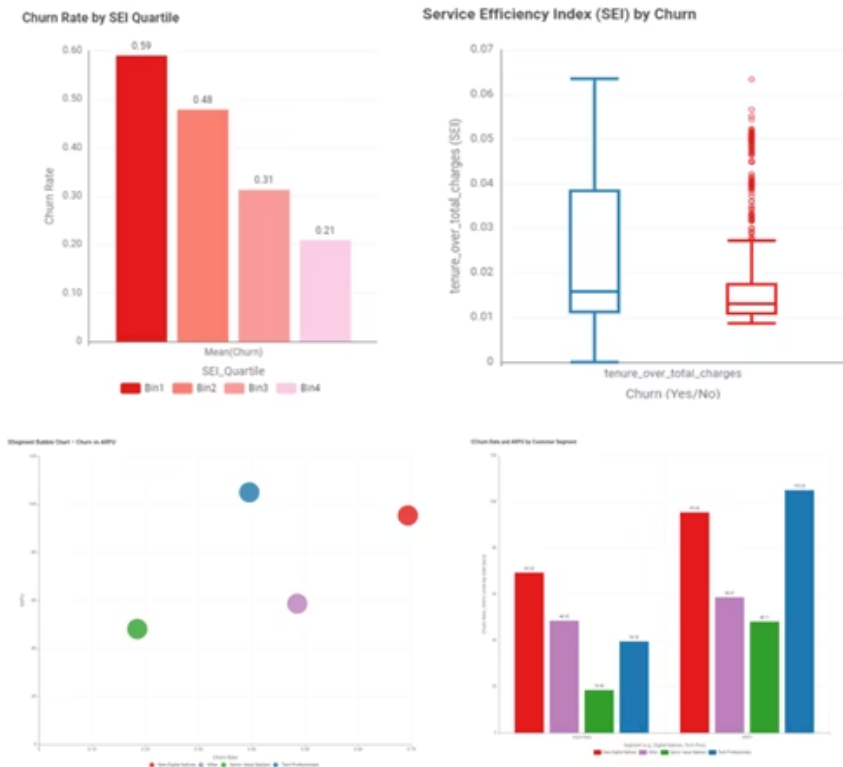
1. Our analysis reveals a strong correlation between Service Efficiency Index and customer retention.

2. Customers with high SEI scores are **3x more likely to stay**. The lowest quartile shows an alarming 60% churn rate.

3. Blue and red segments significantly outperform others. This clear segmentation demands targeted approaches.

Q1 Rescue Plan

Implement immediate service improvements for lowest SEI quartile.

Segment Strategies

Develop tailored retention plans for each customer segment.

SEI Monitoring

Create dashboards with intervention triggers when scores drop.

Premium Tier

Launch enhanced offering for high-value segments to reduce 21% churn.
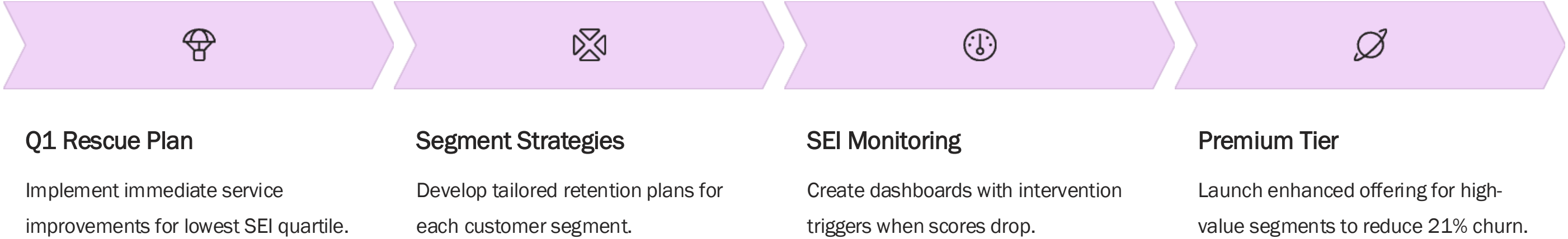
Strategic Churn Reduction Recommendations

Proactive Monitoring

Real-time dashboards for retention teams

8.5% annual churn reduction

90-Day Onboarding Program

Structured follow-ups and feedback

31.4% decrease in early-stage churn

Customized Service Bundles

Target high-risk segments

20%+ churn decrease in problem areas

ML-Driven Intervention

Predictive outreach via CRM
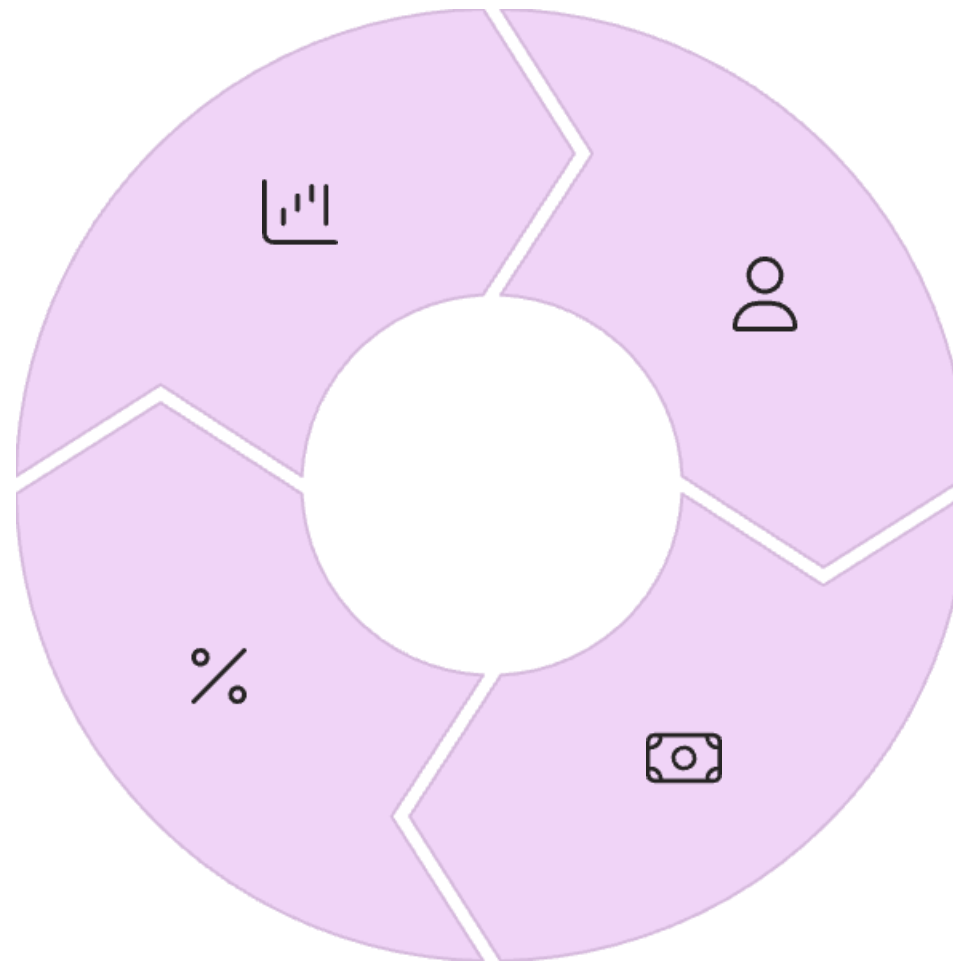
$1.25M+ annual revenue saved

Business Impact

Churn Reduction

Traditional: 25% → GenAI: 32%

Customers Retained

598 additional per 10,000

Improvement

27.9% over traditional approach

Revenue Impact

$1,253,408 additional revenue

Advantages of our AI Enabled Model

Predictive Dashboard

Interactive tool for identifying at-risk customers.

Auto Email Generator

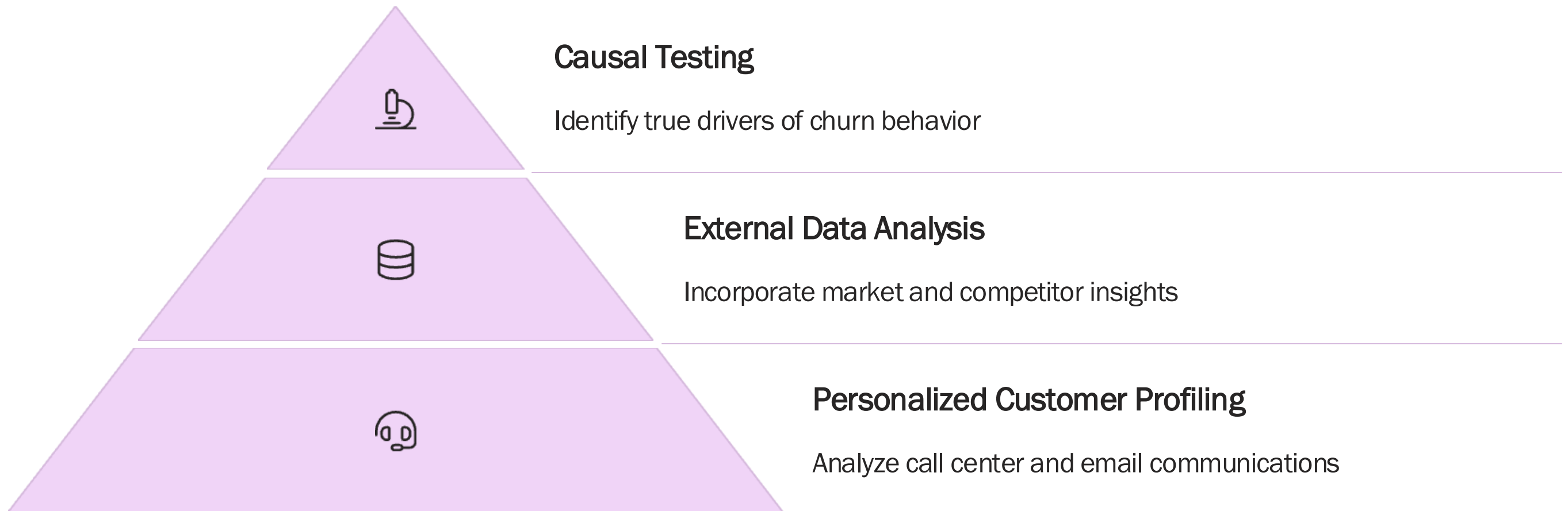Customized offer emails for those predicted to churn.

Expected Outcomes

8.5% reduction in churn rate.

$3.2M+ increase in annual revenue.

Future Considerations & Summarize

Causal Testing

Identify true drivers of churn behavior

External Data Analysis

Incorporate market and competitor insights

Personalized Customer Profiling

Analyze call center and email communications

Expanding our analysis will provide deeper insights into customer behavior patterns with a phased approach