



Customer Churn Prediction Using Machine Learning

A Project Report in Partial Fulfilment of the Academic Requirement
for the Course: Business Insights and Prescriptive Analytics

Submitted To
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Over a quarter of our customer base has churned, representing a massive financial and operational burden.

26.54%

Churn Rate



7,043
Total Customers
Analyzed



1,869
Customers
Lost

Acquiring a new customer is five to seven times more expensive than retaining an existing one. Minimizing churn is essential to maintaining sustainable revenue growth.

Our strategy must shift from analyzing the past to predicting the future.

The Old Way (Backward-Looking)



Reactive Analysis

We analyze why customers left only *after* they are gone. This is a costly, historical exercise that doesn't prevent revenue loss.

The New Way (Forward-Looking)

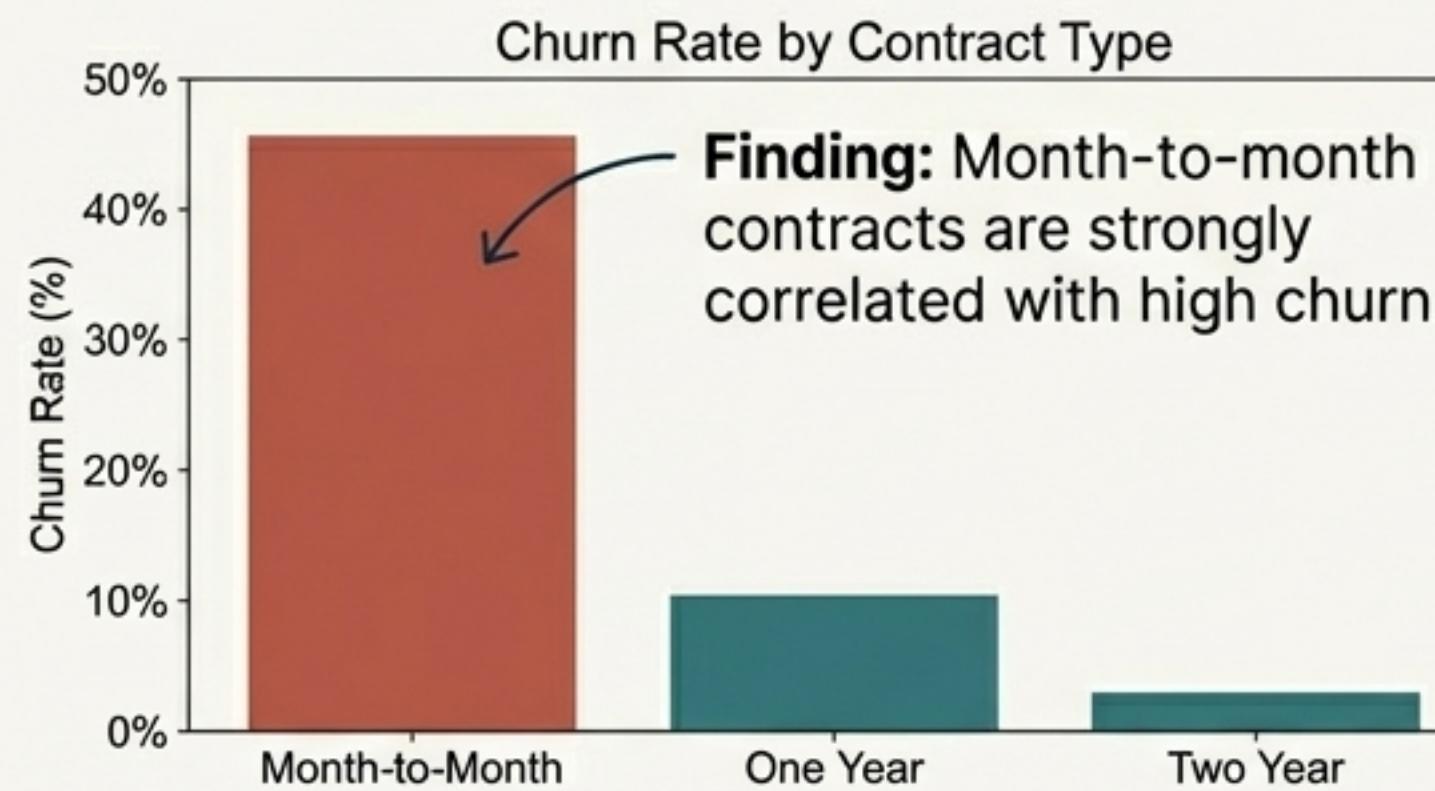


Predictive Intervention

We leverage data to identify at-risk customers *before* they decide to leave, enabling us to intervene and save them.

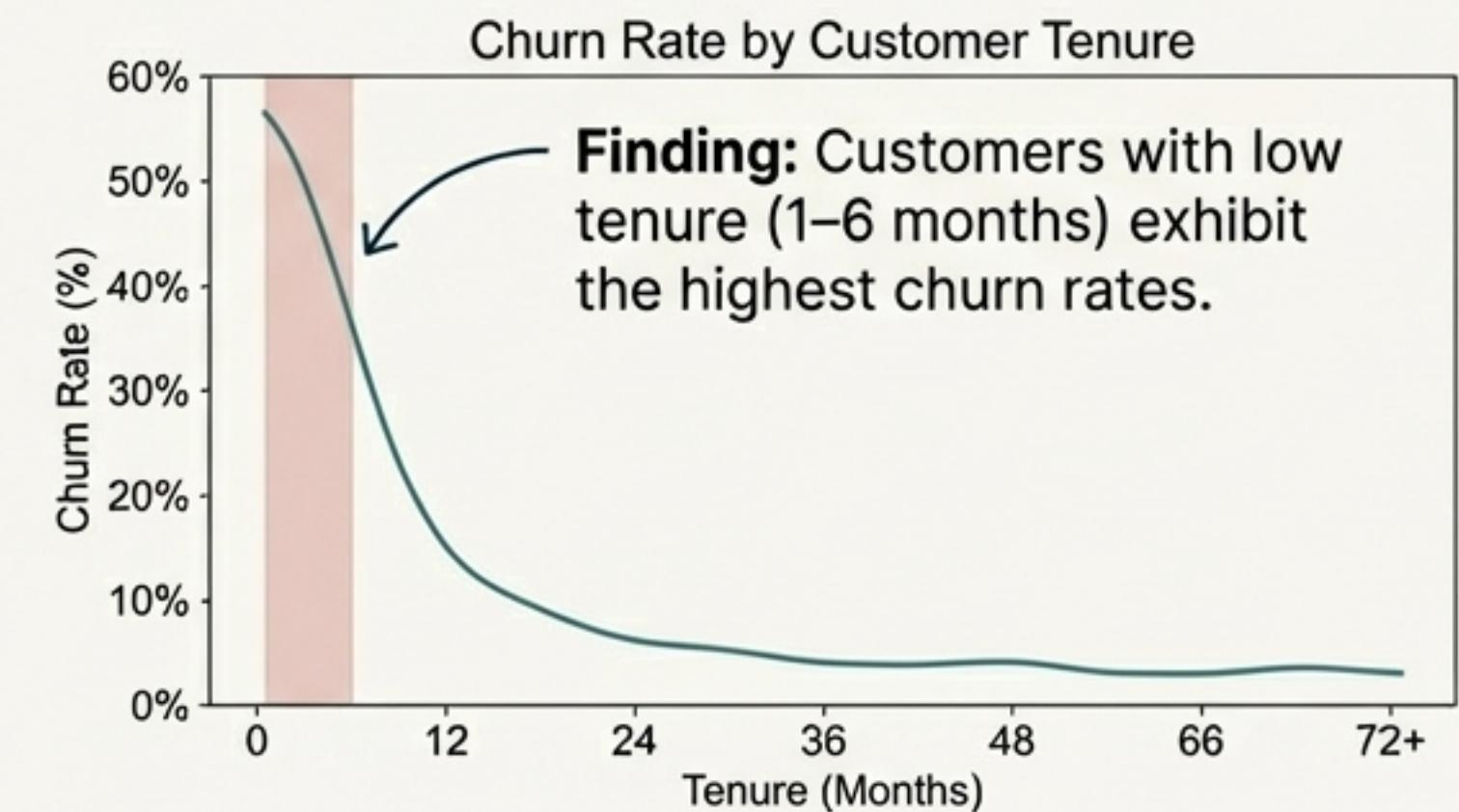
The data reveals new and non-committal customers are the most vulnerable.

Insight 1: Contract Type



Implication: Long-term contracts create essential customer stability and are a powerful retention tool.

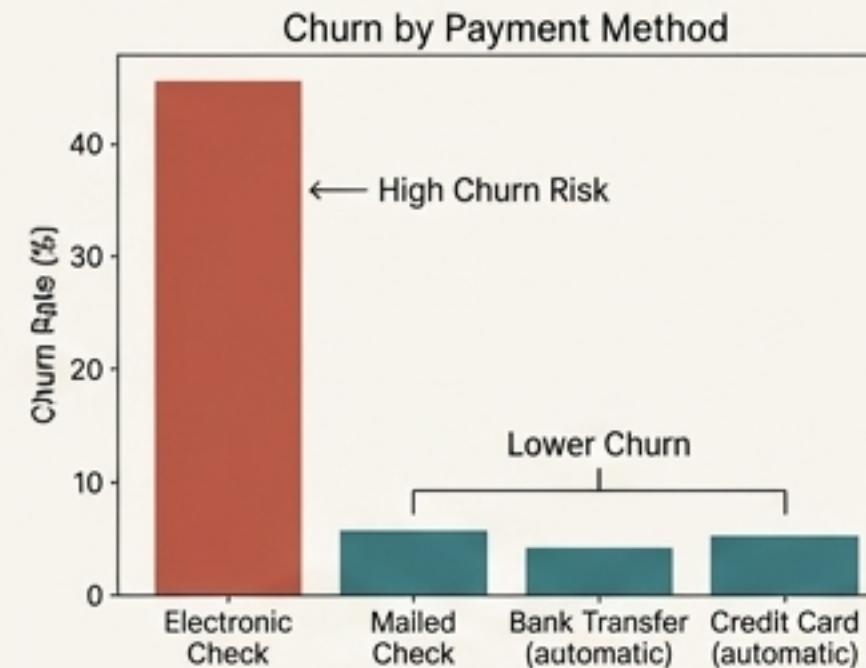
Insight 2: Customer Tenure



Implication: This signals a critical failure in the customer onboarding journey or early-stage dissatisfaction.

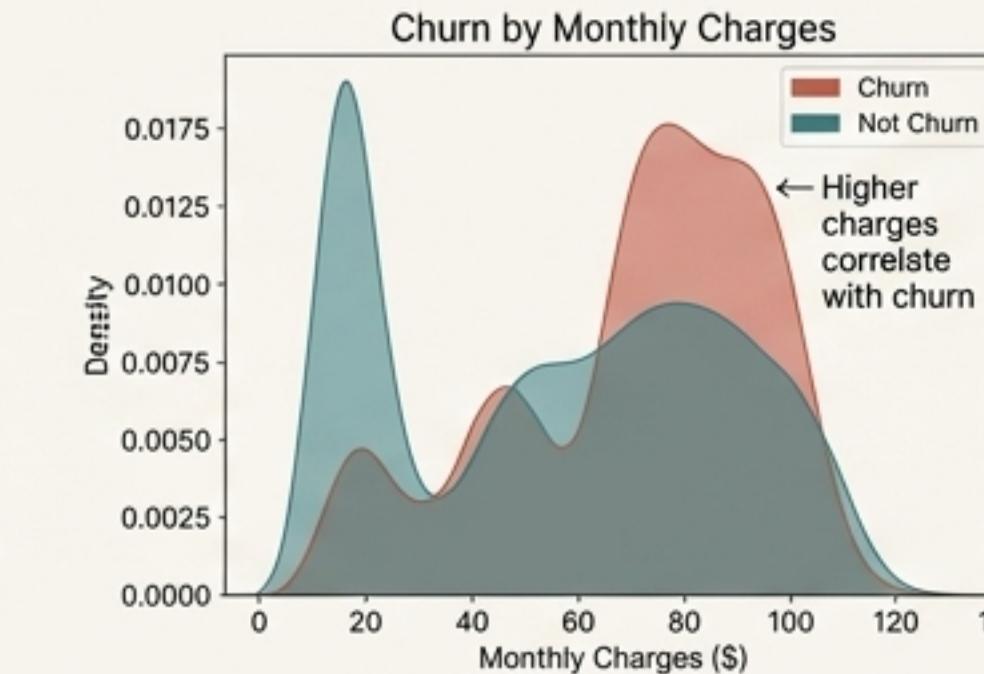
Financial friction and a lack of perceived value are pushing customers away.

Payment Method & Pricing



Insight 1: Payment Method Friction

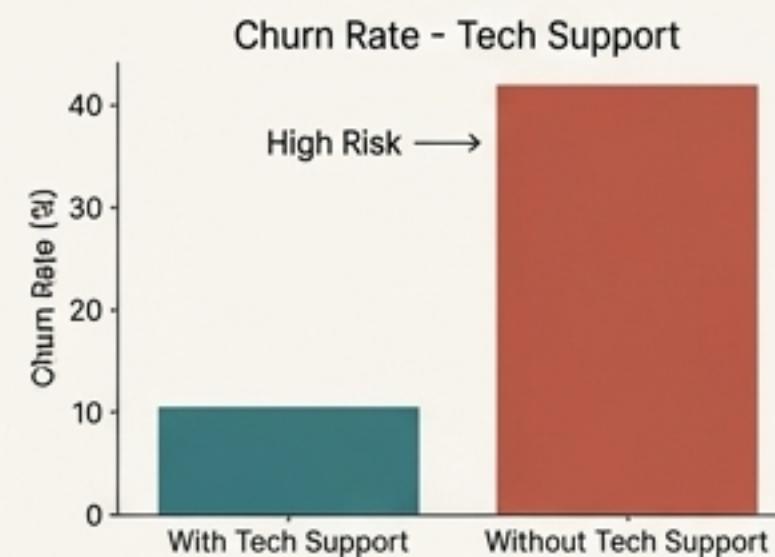
- ✓ **Finding:** Customers who pay via **Electronic Check** churn at a significantly higher rate than those using automatic bank transfers or credit cards.
- ⚙️ **Implication:** This points to a potential usability or trust issue in the electronic check payment process.



Insight 3: Pricing Sensitivity

- ✓ **Finding:** Higher monthly charges directly correlate with increased churn.
- ⚙️ **Implication:** Customers are price-sensitive, especially if they don't perceive sufficient value from their subscriptions.

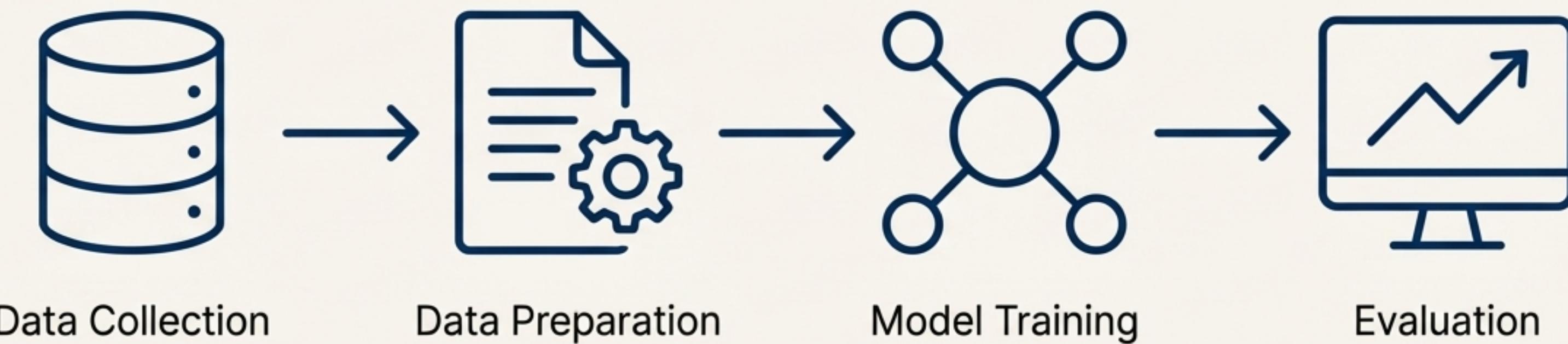
Service Value



Insight 2: Service Value

- ✓ **Finding:** Customers without value-added services like **Tech Support** or **Online Security** are far more likely to churn.
- ⚙️ **Implication:** These services are not just add-ons; they are high-value, retention-driving components of our offering that create 'stickiness'.

We engineered a foresight engine using a rigorous data science lifecycle.



1. Data Collection & Preparation

Sourced and cleaned a dataset of 7,043 customers with 21 features, handling inconsistencies in `TotalCharges` and encoding categorical variables.

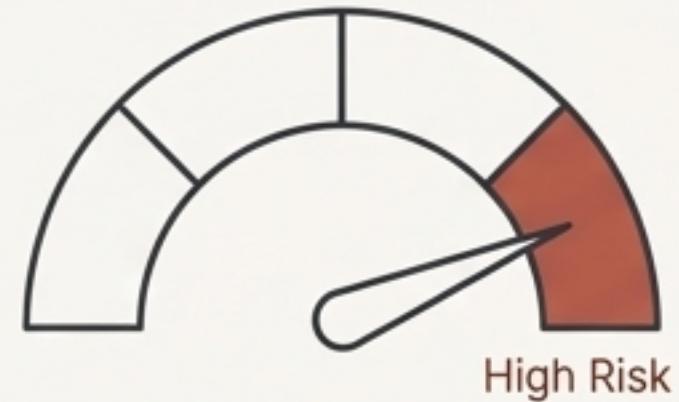
2. Model Training

Tested and trained multiple supervised machine learning algorithms, including Logistic Regression, Random Forest, and Gradient Boosting, on an 80:20 train-test split.

3. Model Evaluation

Assessed models using a confusion matrix, ROC-AUC score, and F1-score, with a strategic emphasis on **Recall** to minimize the business cost of missing a true churner.

AI transforms churn management from a historical report into a future-focused, predictive capability.



Probability Scoring

Algorithms generate a precise churn risk score for every customer, enabling segmentation into Low, Medium, and High-risk tiers.



Scalability

The model allows for automated scoring of thousands of customers in real-time, with the capability to integrate predictions directly into CRM systems for front-line use.



Feature Extraction

The model moves beyond correlation to identify the most actionable drivers of churn (e.g., pricing, service gaps), providing clear targets for intervention.

The model's insights provide a clear, data-driven playbook to reduce churn.



1. Proactive Retention

Target customers flagged as "High-Risk" by the model with customized offers, loyalty programs, or proactive support calls *before* they decide to leave.



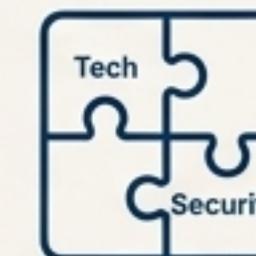
2. Smarter Marketing Spend

Cease generic, broad-based discount campaigns. Focus retention budgets exclusively on at-risk segments to maximize ROI and protect margins.



3. Targeted Operational Fixes

- Payments:** Overhaul the "Electronic Check" user interface to reduce friction.
- Onboarding:** Redesign the customer journey for the first 6 months to address the high churn rate among new customers.



4. High-Value Product Bundling

Aggressively market "Tech Support" and "Online Security" to at-risk customer segments, highlighting their value as core retention-driving services.

This predictive capability drives long-term value and creates a durable competitive advantage.



Increased Customer Lifetime Value (CLV)

By proactively reducing a 26.54% churn rate, we extend the average duration of customer relationships, locking in future revenue and increasing overall lifetime value.



Improved Margin Stability

Smarter, targeted marketing and retention efforts mean less wasted spend on customers who were never going to leave, leading to higher profitability.



Strengthened Competitive Edge

A data-driven retention strategy allows us to respond faster and more effectively to market pressures and competitor actions, strengthening long-term customer relationships.

We have successfully moved from analyzing churn to predicting it, creating a powerful tool for sustainable growth.



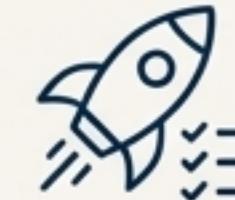
Summary of Findings

The analysis of 7,043 customer records revealed a 26.54% churn rate, driven principally by contract type, customer tenure, and specific payment methods.



Impact Statement

The developed machine learning model equips the business with a precise instrument to accurately identify at-risk customers and intervene effectively.



Next Steps & Resources

- The immediate next step is to integrate this model into our CRM and begin piloting targeted retention campaigns based on the strategic playbook.
- All project files, including the code, trained models, and dataset, are available in the project repository.