

## Executive Summary: Customer Churn Analysis

The objective of this analysis was to understand the factors driving customer churn and to develop predictive models to help reduce churn rates. By analyzing historical data, key insights were extracted, and a machine learning pipeline was implemented to identify high-risk customers effectively.

### Key Insights from Exploratory Analysis:

1. **Customer Tenure:** Customers with shorter tenure are more likely to churn, highlighting the importance of early-stage engagement strategies.
2. **Monthly Charges:** Higher monthly charges correlate with increased churn, suggesting the need to evaluate pricing strategies or added value for high-paying customers.
3. **Contract Type:** Month-to-month contracts show significantly higher churn rates compared to long-term agreements, emphasizing the stability brought by long-term commitments.

### Data Preparation:

- The dataset was cleaned, with missing values addressed and outliers managed.
- Categorical variables were encoded, and numerical features were scaled for consistency and better model performance.

### Machine Learning Implementation:

- Various models, including Logistic Regression, Decision Trees, Random Forest, and Support Vector Machines, were trained to predict customer churn.
- The **Random Forest model** outperformed others, achieving the highest accuracy and providing a robust predictive framework.

### Feature Importance:

Key factors influencing churn include:

- **Tenure:** Indicates customer loyalty over time.
- **Monthly Charges:** Drives decision-making for cost-sensitive customers.
- **Contract Type:** Highlights the impact of commitment levels on customer retention.

### Recommendations:

1. **Engage Early:** Develop targeted engagement strategies for new customers to minimize churn in the early stages of their tenure.
2. **Review Pricing Models:** Offer customized plans or loyalty incentives for high-paying customers.

3. **Promote Long-Term Contracts:** Introduce benefits like discounts or premium services to incentivize long-term commitments.

**Business Value:**

This analysis provides actionable insights to guide retention strategies and improve customer lifetime value. The predictive models offer a reliable framework to identify at-risk customers, enabling proactive intervention and improved business outcomes.