

EXPLORATORY DATA ANALYSIS

Customer Churn Analysis - Telecom Sector

1. Business Context

Customer churn directly affects profitability in the telecom sector. Retaining customers is significantly more cost-efficient than acquiring new ones. This project analyzes churn data to discover key drivers of attrition and offer actionable recommendations.

The dataset includes customer demographics, service usage, contract details, billing behavior, and tenure. An in-depth exploration reveals who is leaving and why.

2. Project Goals

- Analyze customer behavior and churn patterns using EDA.
- Identify churn drivers: demographics, services, account features.
- Visualize key patterns with interpretable charts.
- Recommend data-driven actions for reducing churn.

3. Dataset Overview

- **Rows:** 7,043 customer records

- **Columns:** 21 features including:
 - **Demographics:** Gender, SeniorCitizen, Partner, Dependents
 - **Services:** InternetService, OnlineSecurity, TechSupport, StreamingTV, etc.
 - **Account Info:** Contract type, MonthlyCharges, TotalCharges, Tenure
 - **Target Variable:** Churn (Yes/No)

4. Data Cleaning & Preprocessing

- Converted SeniorCitizen binary values into "Yes"/"No" for readability.
- Standardized values in columns like TotalCharges, handling blanks and non-numeric entries.
- Removed whitespace errors in string values.
- Converted categorical features to appropriate data types for analysis and visualization.

5. Exploratory Data Analysis (EDA)

A. Overall Churn Rate

Pie Chart: Churn Proportion

This pie chart shows that **26.54%** of customers have churned. This gives us an initial benchmark of churn severity.

Insight:

- There is significant churn, but not a majority — ideal for retention intervention.
- Indicates potential imbalance in the target variable (important for future ML modeling).

B. Churn by Senior Citizen Status

Stacked Bar Chart: Senior Citizen vs Churn

- Plots normalized percentage of churn among senior and non-senior citizens.
- **Seniors have a higher churn rate** than non-seniors.
- Clear contrast in behavior based on age group.

Insight:

- Senior citizens may face usability or pricing issues.
- Special support or senior-focused packages could improve retention.

C. Churn by Contract Type

Bar Chart: Contract vs Churn Percentage

- Customers with **Month-to-Month** contracts exhibit the highest churn (~45%).
- **Two-year contracts** show strong retention.

Insight:

- Long-term contracts build loyalty — possibly via pricing or commitment.
- Encourage customers to shift to longer plans with incentives.

D. Tenure Distribution

Histogram: Tenure of Churned vs Non-Churned

- Churners tend to have **short tenure (<12 months)**.
- Non-churners have a spread across the tenure spectrum.

Insight:

- Early churn is common.
- Indicates a poor onboarding or satisfaction in early months.
- Target customers in their first 6 months with support/check-ins.

E. Monthly Charges and Churn

Boxplot: MonthlyCharges by Churn

- Churned customers tend to pay **higher monthly charges**.
- Price sensitivity could be a driver.

Insight:

- Consider offering tiered plans or discounts for high-paying customers at risk of leaving.

F. Tech Support Usage

Stacked Bar Chart: TechSupport vs Churn

- Customers **not using Tech Support** have significantly higher churn.
- Those who use Tech Support are more likely to stay.

Insight:

- Tech support access improves customer satisfaction.
- Proactively offer free or discounted support to high-risk segments.

G. Service Combinations and Churn

Multiple Bar Charts: Internet, Backup, Streaming

- Absence of Online Backup or Online Security correlates with churn.
- Some services like StreamingTV are less correlated, showing mixed effects.

Insight:

- Bundle essential services to reduce churn.
- Streaming alone isn't a strong retention factor; security and support are.

H. Correlation Heatmap

Heatmap of Numerical Features

- Tenure and MonthlyCharges are inversely related to churn.
- TotalCharges has moderate correlation with tenure.

Insight:

- Long-tenure and high total revenue customers are less likely to churn.

6. Advanced Insights

- **Contract Type:** Month-to-month contracts have a **>40% churn rate**, while 2-year plans have less than **10%**.
- **Tenure:** Long-tenure customers are significantly less likely to churn — loyalty is a major retention signal.
- **Streaming Services:** Mixed impact — some churned customers use streaming, but many have no such services at all.
- **Payment Methods:** Electronic checks are highly associated with churn, compared to automatic bank/credit withdrawals.

7. Strategic Recommendations

- **Customer Lifecycle Strategy:** Focus retention efforts in the **first 6-12 months**.
- **Contract Optimization:** Provide **discounted annual plans** to month-to-month users.

- **Service Bundling:** Bundle **OnlineSecurity + TechSupport** to increase satisfaction.
- **Customer Segmentation:** Segment by tenure, seniority, and service usage for targeted campaigns.
- **Proactive Engagement:** Use churn signals to trigger **personalized retention offers**.

8. Tech Stack

- **Python:** Pandas, NumPy for analysis
- **Matplotlib & Seaborn:** For visual storytelling
- **Jupyter Notebook:** Project structure and documentation

9. Conclusion

This telecom churn project demonstrates real-world data wrangling, pattern recognition, and decision-making strategies. It offers a clear pathway for implementing data-driven churn reduction methods in a telecom environment.