Exploratory Data Analysis of Telco Customer Churn Dataset

Abstract

This report presents an exploratory data analysis (EDA) of the Telco Customer Churn dataset, aiming to identify patterns and insights regarding customer churn in a telecom company. Key factors such as contract type, service features, and customer demographics are analyzed to understand their impact on churn rates, providing actionable insights for improving customer retention.

1 Introduction

Customer churn represents a critical issue for telecom companies, as retaining customers is often more cost-effective than acquiring new ones. By identifying patterns in churned customers, companies can develop strategies to improve customer satisfaction and reduce churn rates. This project leverages statistical and visual analyses to explore drivers of churn, including contract type, service features, and customer demographics.

2 Data Description

The Telco Customer Churn dataset contains 7,043 records with the following columns:

- **Demographics**: gender, SeniorCitizen, Partner, Dependents
- **Service Features**: PhoneService, MultipleLines, InternetService, OnlineSecurity, OnlineBackup, TechSupport, StreamingTV, StreamingMovies
- **Account Information**: Contract, PaperlessBilling, PaymentMethod, MonthlyCharges, TotalCharges, tenure
- **Target**: Churn (whether the customer left within the last month)

3 Methodology

The analysis is conducted in the following steps:

1. Data loading and cleaning: Convert `TotalCharges` to numeric, handle missing values by replacing them with `0` where tenure was also `0`.
2. Exploratory Data Analysis (EDA): Explore categorical and numerical variables, visualize distributions, and analyze churn patterns.
3. Insights and recommendations: Based on the findings, provide actionable insights to reduce churn.

4 Exploratory Data Analysis (EDA)

4.1 Churn Distribution

The first step is to examine the churn distribution to understand the proportion of customers who churned. The bar plot in Figure 1 shows that about 26.5% of the customers in the dataset have churned.

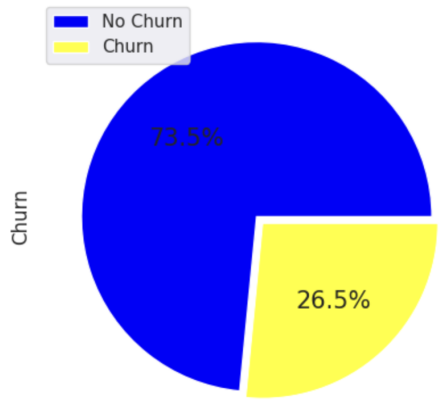

Figure 1: Churn Distribution in the Dataset

4.2 Numerical Features

We analyze the distribution of numerical features such as `tenure`, `MonthlyCharges`, and `TotalCharges`. Figure 2 shows that these distributions are right-skewed, with many customers having lower tenure, monthly charges, and total charges.

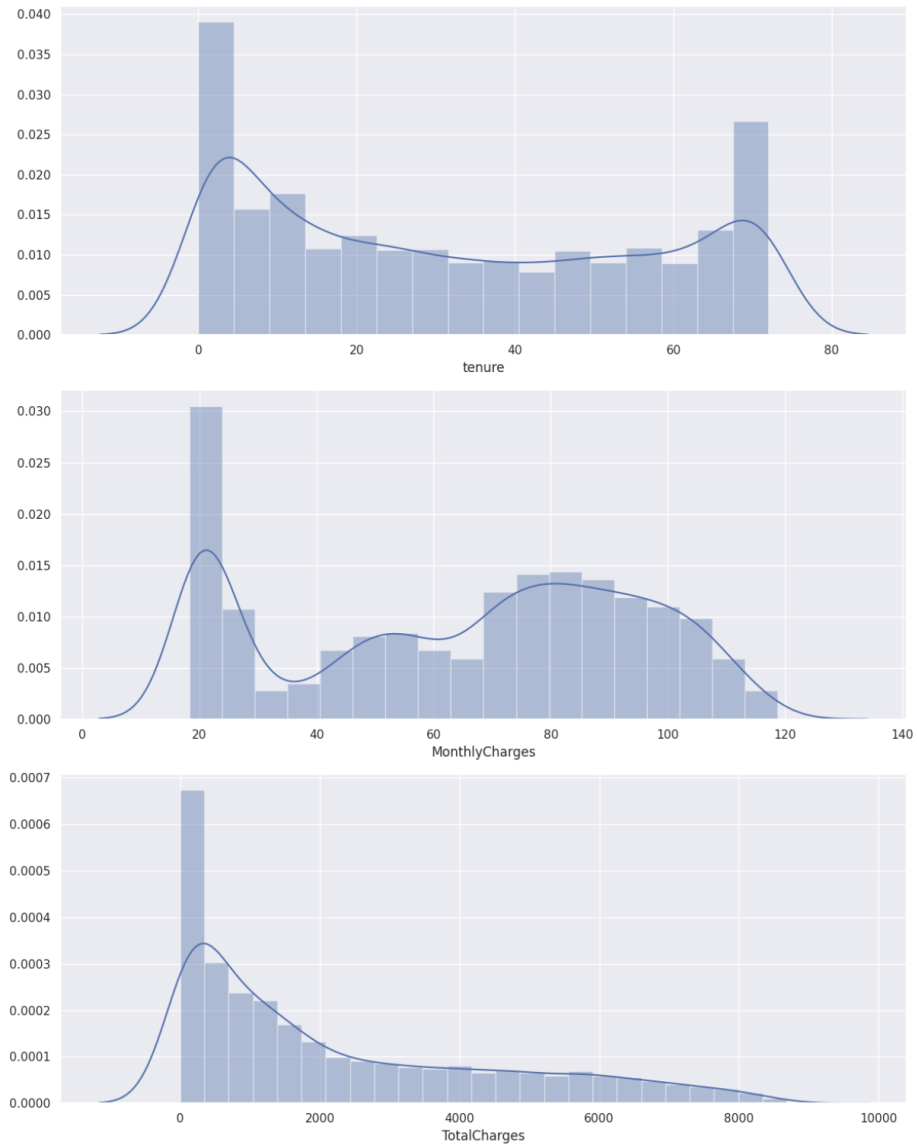

Figure 2: Distribution of Numerical Features (tenure, MonthlyCharges, TotalCharges)

4.3 Churn by Contract Type and Payment Method

Figure 3a illustrates churn rates by contract type, showing that customers with month-to-month contracts have a significantly higher churn rate compared to those with longer-term contracts. Figure 3b shows that customers using electronic checks also exhibit higher churn rates.

churn_by_contract.png

(a) Churn by Contract Type

churn_by_payment.png

(b) Churn by Payment Method

Figure 3: Churn Analysis by Contract Type and Payment Method

4.4 Impact of Service Features on Churn

Service features such as `OnlineSecurity`, `TechSupport`, and `InternetService` have significant impacts on churn rates. Figure 4 shows that customers who do not subscribe to OnlineSecurity and TechSupport services are more likely to churn.

service_features_churn.png

Figure 4: Churn Analysis by Service Features

4.5 Tenure and Churn Analysis

To understand the effect of tenure on churn, we divide tenure into groups. Figure 5 shows that churn is highest among customers with a tenure of 12 months or less, indicating possible issues with customer onboarding and initial service experience.

tenure_churn.png

Figure 5: Churn by Tenure Group

5 Conclusion

The analysis reveals that:

- Customers with month-to-month contracts and electronic check payments have higher churn rates.
- Service features such as `OnlineSecurity` and `TechSupport` play a key role in customer retention.
- Churn rate is particularly high in the first 12 months, suggesting that the onboarding process may require improvement.

6 Recommendations

Based on the insights, we recommend the following strategies to reduce churn:

- Incentivize customers with month-to-month contracts to switch to longer-term contracts.
- Consider offering OnlineSecurity and TechSupport as part of a basic package or providing promotional trials.
- Enhance onboarding and engagement efforts in the first 12 months to improve customer satisfaction and retention.