# Report :

## TelCo Customer Churn Prediction Analysis

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# Introduction :

Customer churn is a major challenge for telecom companies, as losing customers directly impacts revenue and increases the cost of acquiring new ones. Understanding why customers leave is essential for implementing effective retention strategies.

The goal of this analysis is to predict whether a customer will churn based on their demographics and service usage. By identifying key factors contributing to churn, the company can take proactive measures to improve customer retention, enhance customer experience, and optimize business strategies.

This report focuses on analyzing churn based on customer tenure (seniority). Specifically, we examine whether newer customers churn more frequently than long-term customers. Using statistical analysis and survival modeling, we aim to provide data-driven insights to help the company reduce churn and maintain customer loyalty.

# Data Overview :

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This analysis is based on a dataset containing **7043 observations** and **21 variables** related to customer demographics, service subscriptions, and billing information. The dataset helps identify key factors contributing to customer churn.

## ➤ Key Variables :

The following variables are particularly relevant to analyzing churn based on tenure:

- **customerID** :
  - Unique identifier for each customer.

- **tenure** :
  - Number of months the customer has been with the company.

- **Churn** :
  - Binary indicator of whether the customer has churned (1 = Yes, 0 = No).

- **Contract** :
  - Type of contract (Month-to-month, One year, Two year).

- **MonthlyCharges**:
  - The amount the customer is charged per month.

- **TotalCharges** :
  - The total amount charged to the customer over their tenure.

- **InternetService** :
  - Type of internet service (DSL, Fiber optic, No).

- **TechSupport :**
  - Whether the customer has tech support (Yes, No).

## ➤ Data Preprocessing :

To ensure data consistency and facilitate analysis, the following preprocessing steps were performed:

- Converted **TotalCharges** to numeric format.

- Converted **Churn** from categorical ("Yes"/"No") to binary (1 = Churned, 0 = Not Churned).

- Standardized missing values by replacing 'No internet service' and 'No phone service' with 'No' for the following variables:

  - **MultipleLines, OnlineSecurity, OnlineBackup, DeviceProtection, TechSupport, StreamingTV, StreamingMovies.**

# Exploratory Data Analysis (EDA) :
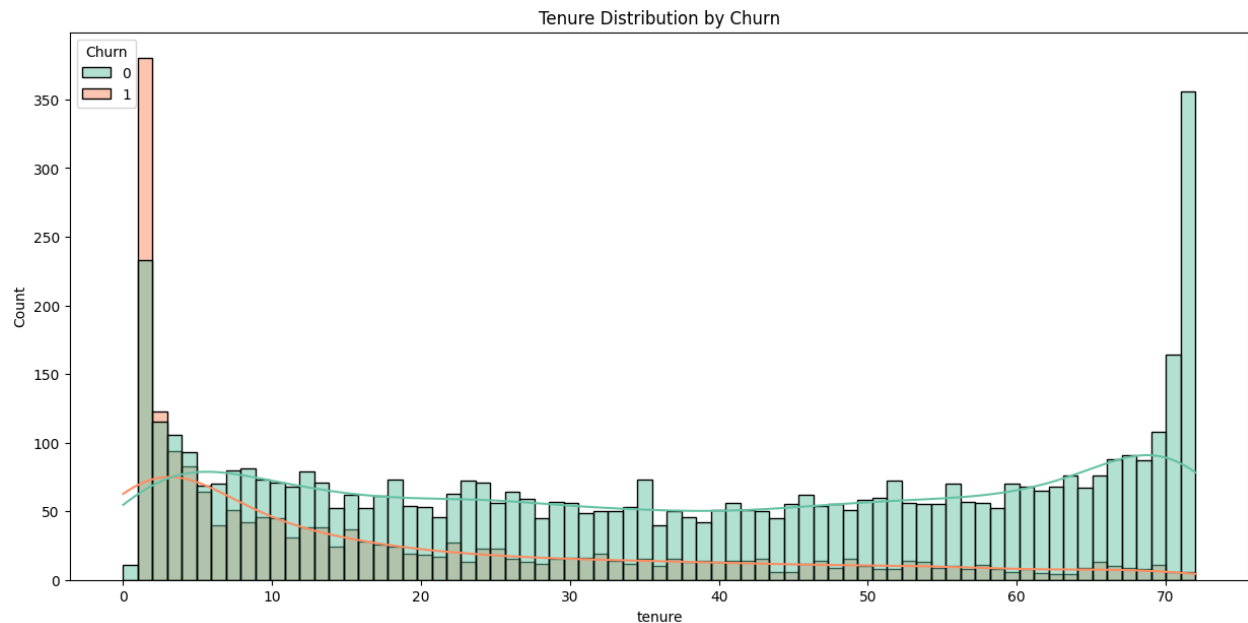
## Churn Distribution :
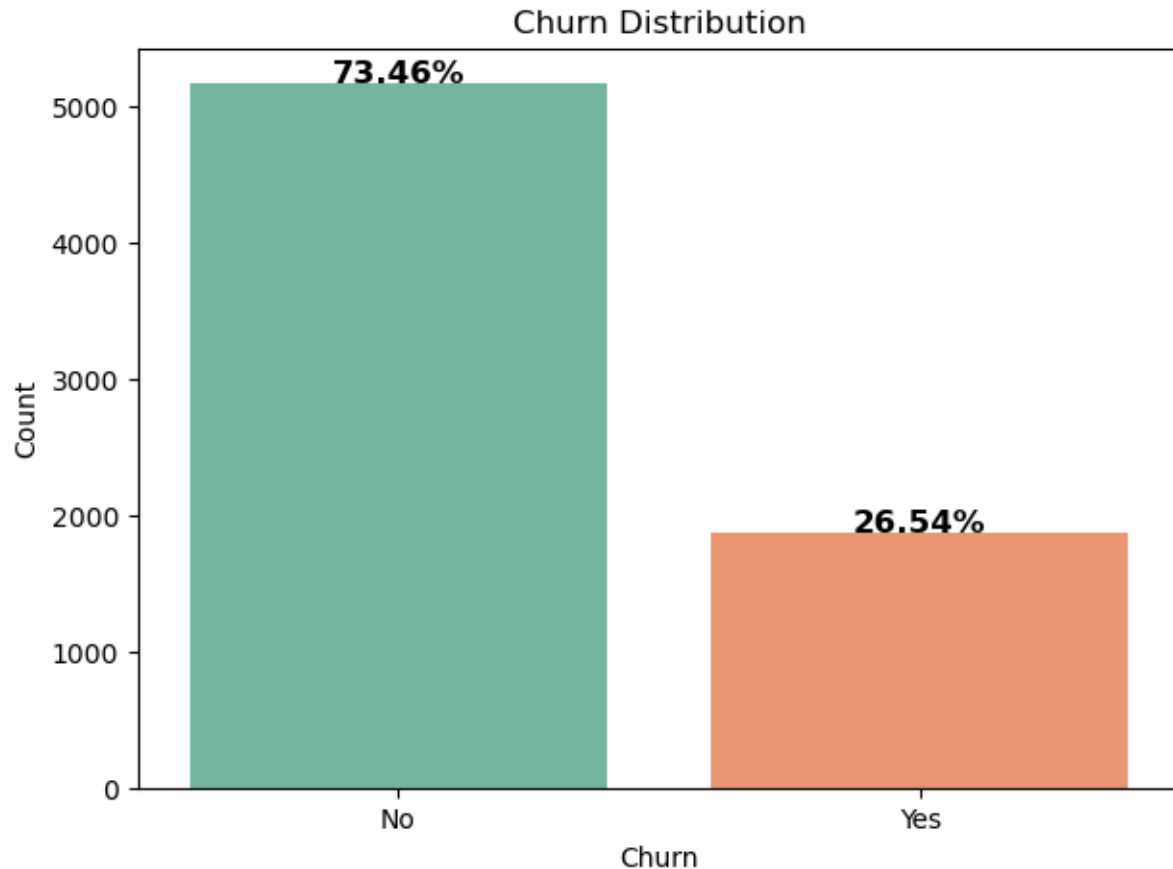


The churn rate in the dataset indicates that 26.54% of customers have churned, while 73.46% have remained with the company.

Key Observations:

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- The majority of customers stay with the company, but over a quarter still leave, highlighting a significant retention challenge.
- Further analysis is needed to identify which factors contribute most to churn (e.g., contract type, billing method, or customer tenure).
- Since churn is not balanced (more customers stay than leave), predictive models may require techniques to handle class imbalance.

# Churn Distribution by Tenure :



We analyzed the distribution of churned and retained customers based on their tenure. The histogram below illustrates the relationship between tenure (in months) and churn status:

## ➤ Key Observations:

A high churn rate is observed among customers with very short tenure (0-5 months). The churn rate gradually declines as tenure increases.

Customers with longer tenure (above 60 months) have significantly lower churn rates, indicating stronger customer retention.

A noticeable spike in tenure at 72 months suggests a contractual or behavioral pattern in customer retention.

## ➤ Statistical Test:

A T-test was performed to compare tenure between churned and non-churned customers.

The resulting p-value ≈ 0 confirms a statistically significant difference between the tenure of churned and retained customers ($p < 0.05$), meaning that tenure strongly influences churn behavior.

# Churn Distribution by Contract Type :
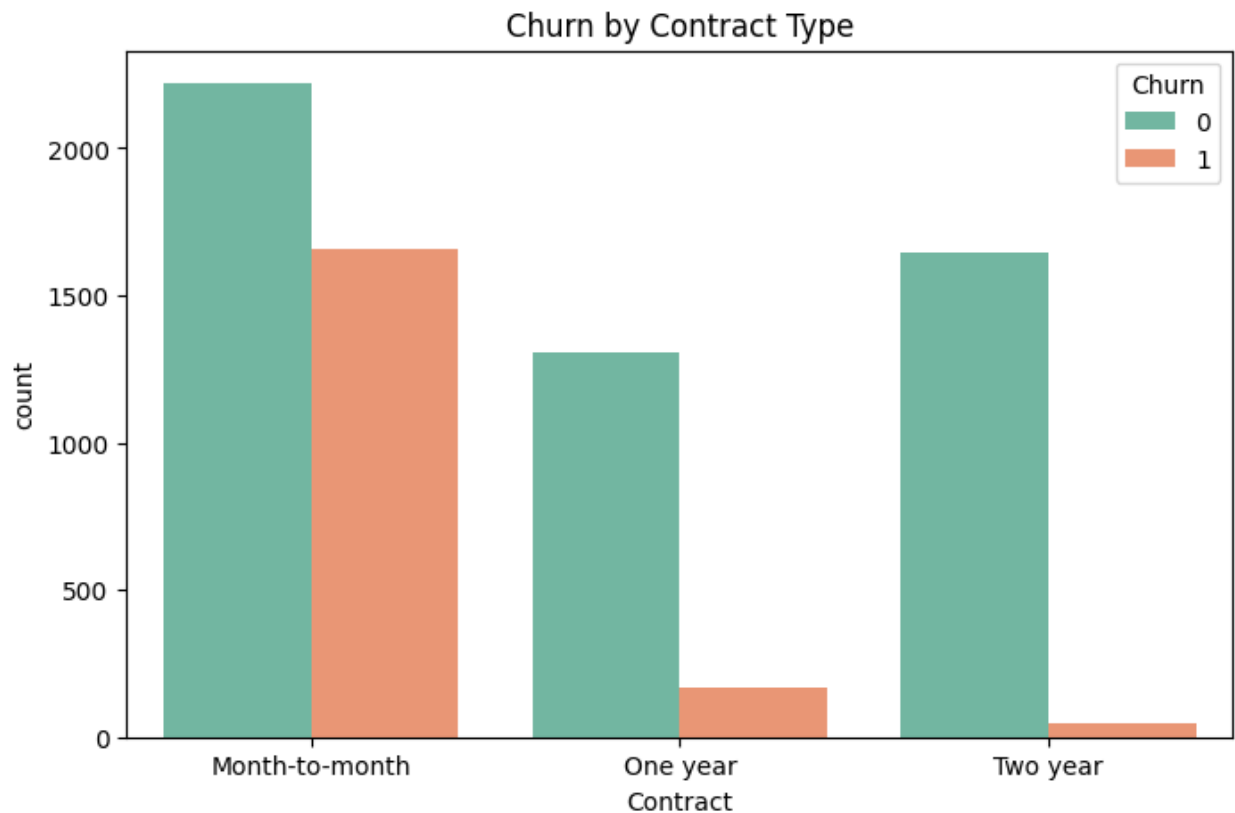


The contract type significantly influences customer churn, as shown in the analysis:

## ➤ Key Observations:

- Customers on **month-to-month contracts** have the highest churn rate (**42.71%**), indicating that short-term contracts provide more flexibility to leave.
- Customers with **longer-term contracts** (one-year and two-year) are far less likely to churn, likely due to commitment and potential discounts.
- A **Chi-Square test confirms a significant relationship** between contract type and churn (**$p < 0.05$**).

# Churn Rate by Internet Service Type:
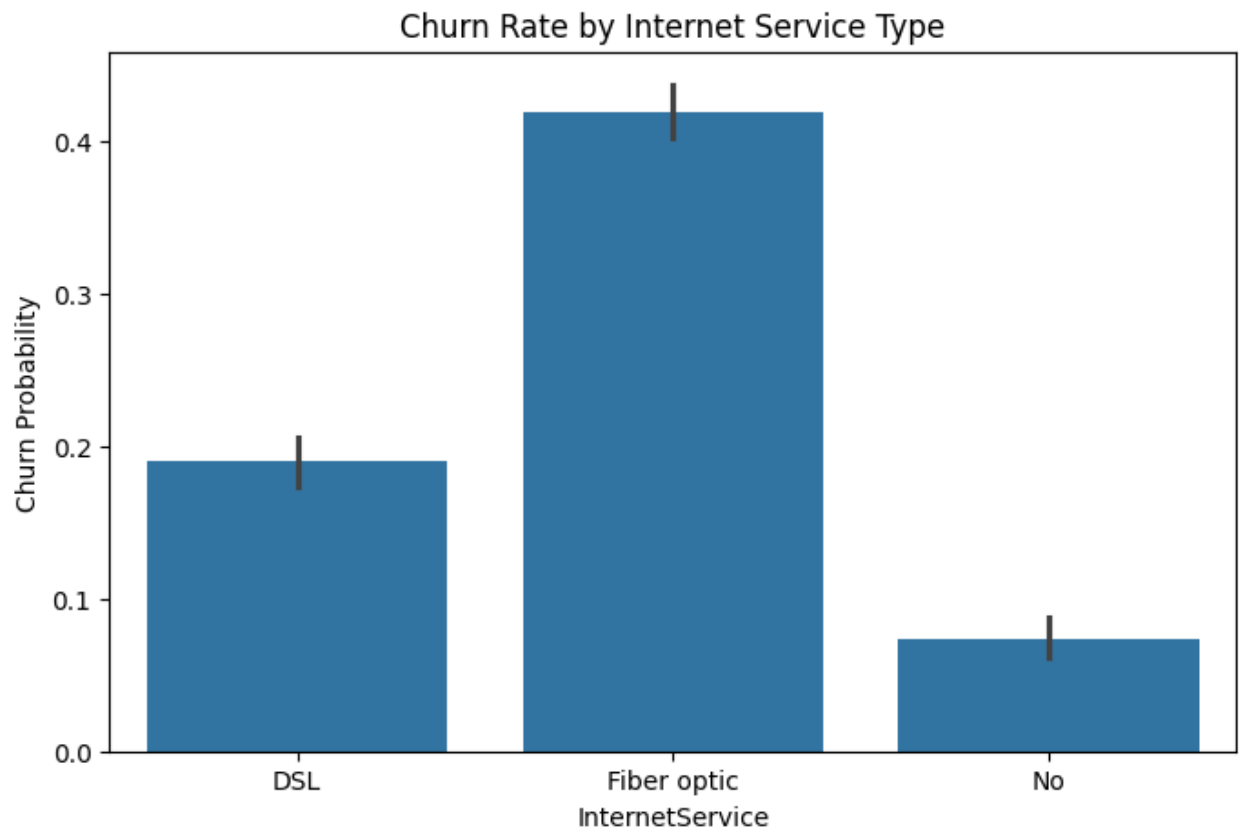


The bar chart illustrates the relationship between internet service type and customer churn probability.
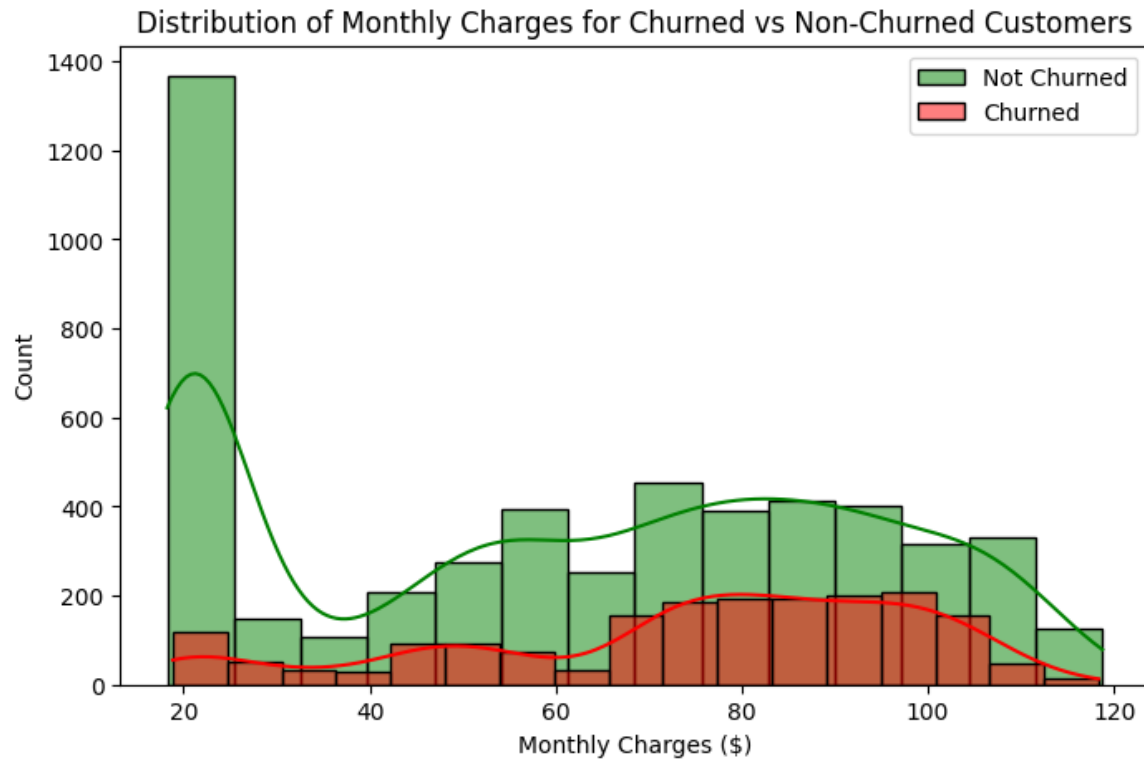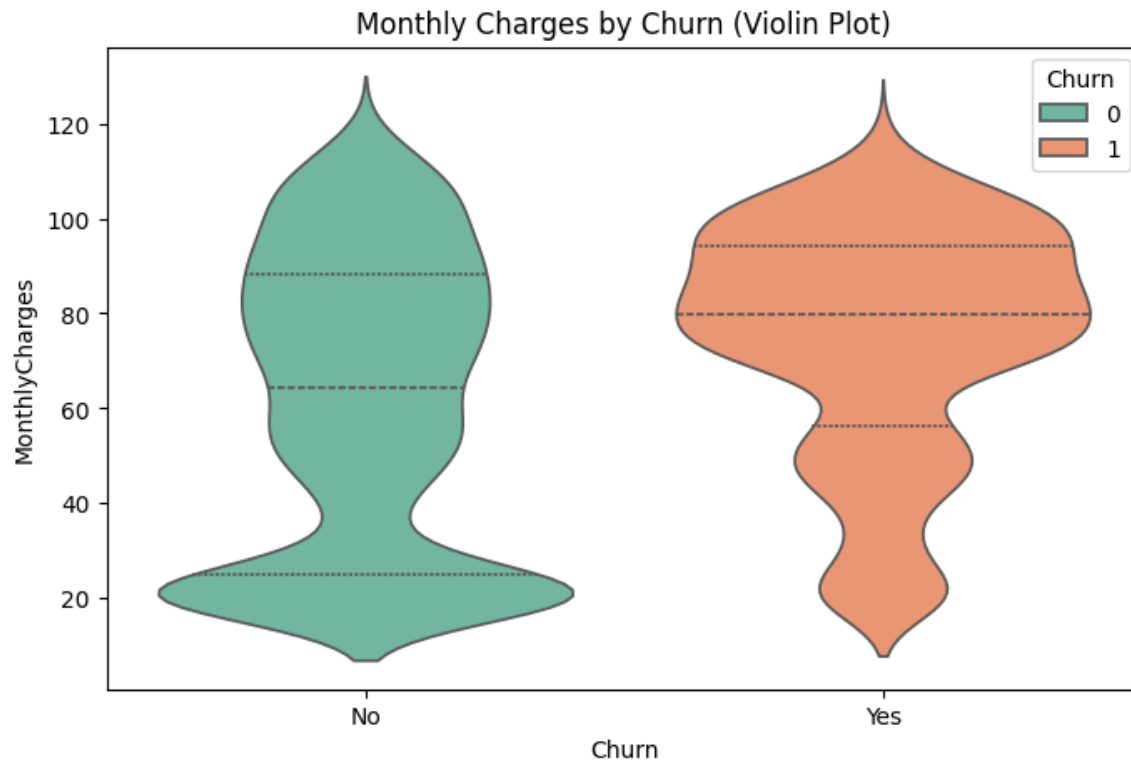
## ➤ Key Observations:

- Customers using **Fiber optic** have the highest churn rate, exceeding **40%**, indicating potential dissatisfaction or competitive alternatives.
- Customers with **DSL** service have a lower churn probability (**~18%**).
- Customers who do **not use internet service** have the lowest churn rate (**<10%**), possibly due to fewer service interactions or different contract terms.

## ➤ Statistical Test:

- The **Chi-Square test** results indicate a **significant relationship** between **Internet Service Type and Churn (p < 0.05)**, confirming that the type of internet service influences churn behavior.

# Distribution of Monthly Charges for Churned vs. Non-Churned Customers:

Distribution of Monthly Charges for Churned vs Non-Churned Customers

Monthly Charges by Churn (Violin Plot)

The plot shows the distribution of **MonthlyCharges** for both churned and non-churned customers.

➢ **Key Observations:**

• Churned customers tend to have higher monthly charges, while most non-churned customers are in the lower charge range.
• A peak around $20 is visible among retained customers, suggesting that lower charges might be associated with higher retention.
• Customers who do not use internet service have the lowest churn rate (<10%), possibly due to fewer service interactions or different contract terms.

➢ **Statistical Test:**

• A T-test comparing the MonthlyCharges between churned and non-churned customers gives a highly significant p-value ($p < 0.05$).

• This confirms that **MonthlyCharges strongly impact churn**, suggesting that pricing strategies may influence customer retention.

# Churn Distribution by Total Charges:



Distribution of Total Charges for Churned vs Non-Churned Customers
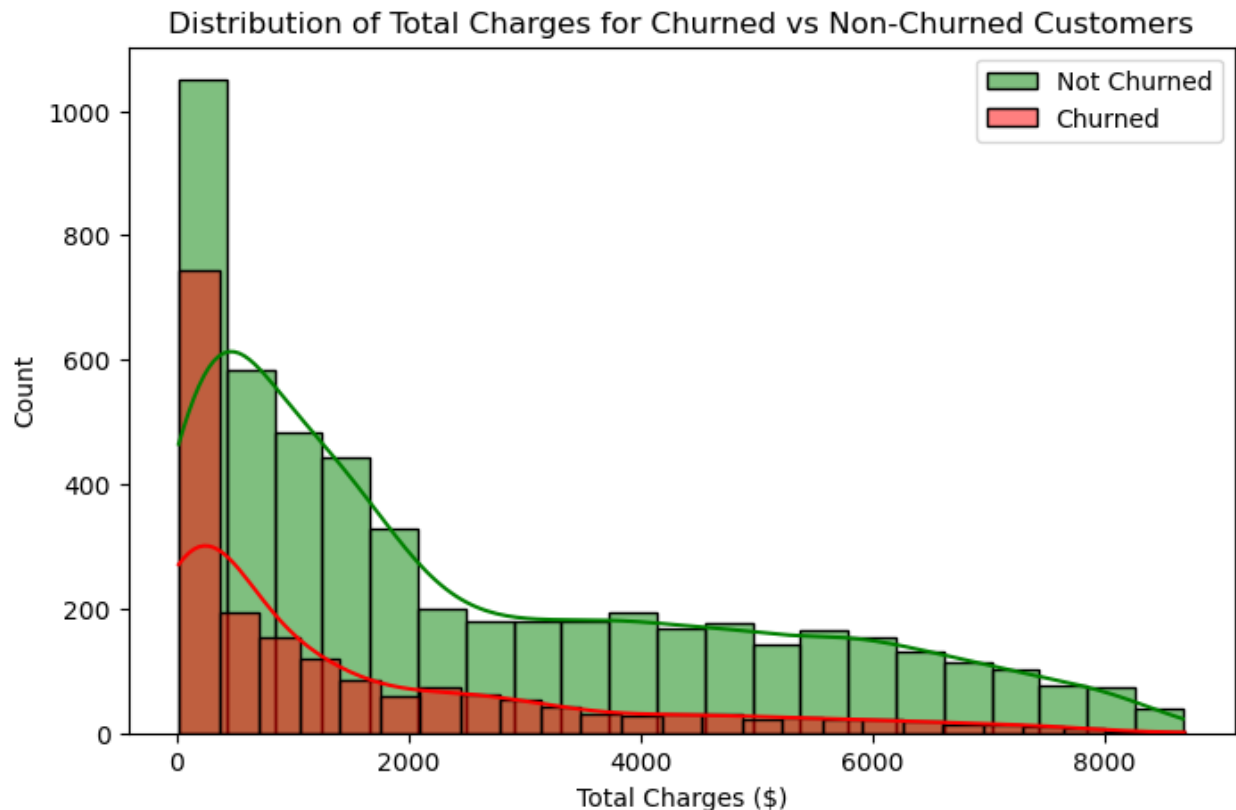
This analysis examines whether total charges (the cumulative amount a customer has paid) influence churn behavior.
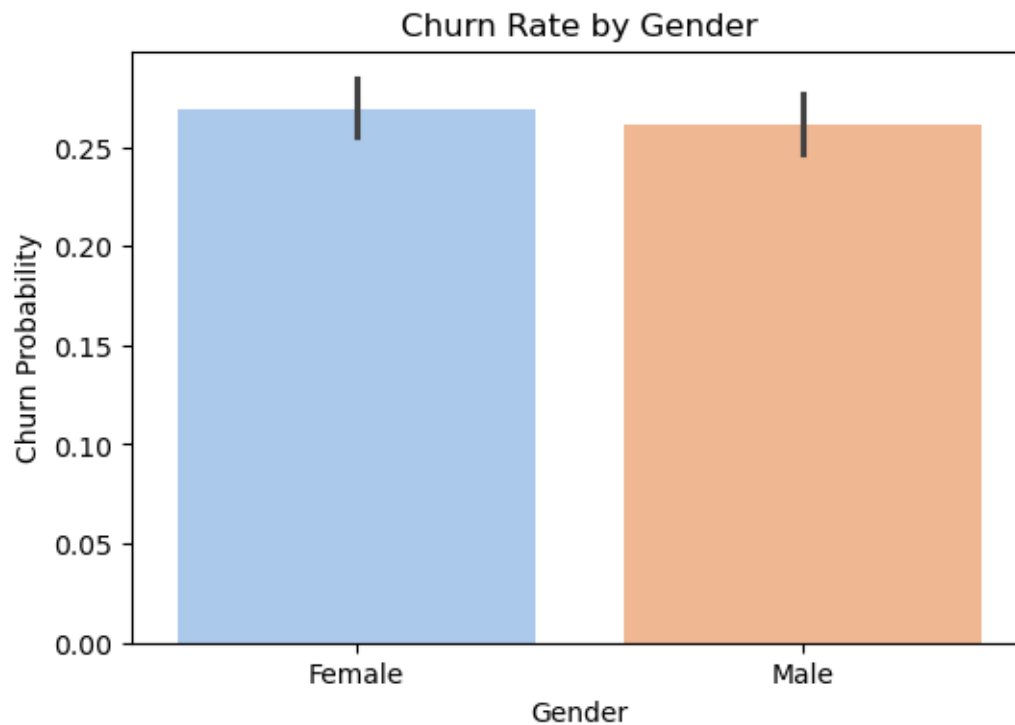
➤ **Key Observations:**

- The distribution of total charges for churned and non-churned customers is right-skewed, meaning most customers have lower total charges.
- Churned customers appear to have lower total charges on average, which might indicate that newer customers (who have paid less over time) tend to churn more frequently.

➤ **Statistical Test:**

- A **T-test** was conducted to assess whether there is a significant difference in total charges between churned and non-churned customers.
- There is **no statistically significant relationship** between **TotalCharges and churn**.

# Churn Distribution by Gender:



Churn Rate by Gender

This analysis investigates whether churn behavior varies based on gender.

## ➤ Key Observations:

- The churn rates for male and female customers are nearly identical.
- No strong gender-based pattern in customer retention is observed.
- This suggests that other factors, such as contract type or service quality, may have a greater impact on churn than gender.

## ➤ Statistical Test:

- **A Chi-Square test was performed to examine the relationship between gender and churn.**
- The **p-value is ≥ 0.05**, meaning gender does not significantly influence churn.

# Churn Distribution by Seniority (Senior Citizen Status):

Churn Rate by Seniority (No = Not Senior, Yes = Senior)
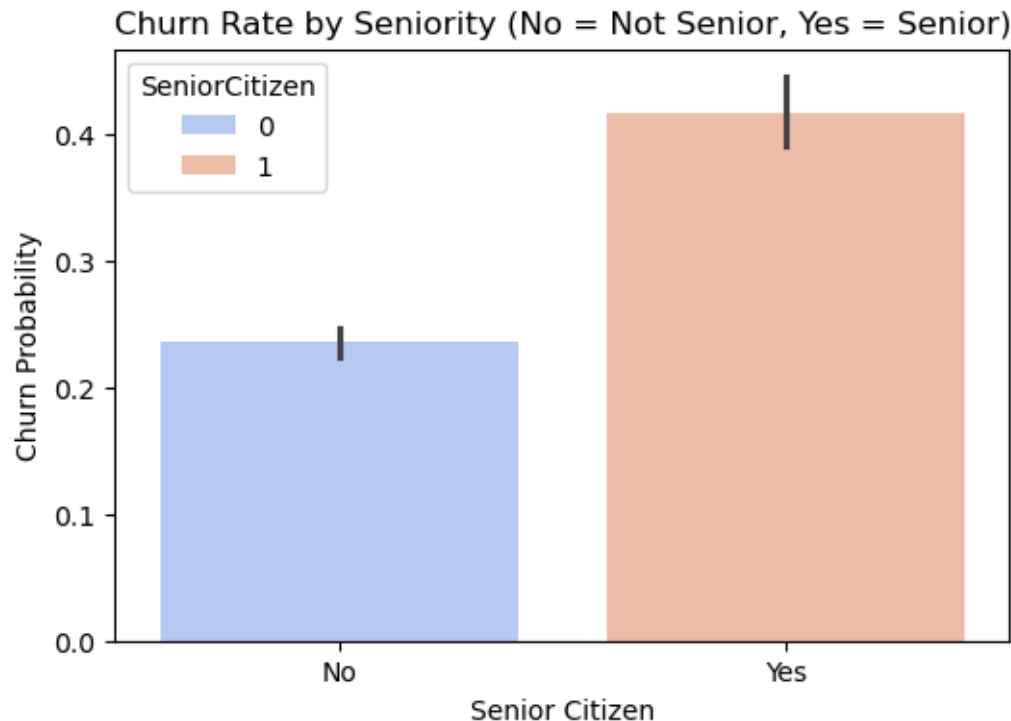


This analysis examines whether seniority (being a senior citizen) impacts the likelihood of churn.

➢ **Key Observations:**

- Senior citizens have a significantly higher churn rate (~40%) compared to non-senior customers (~25%).
- This suggests that older customers may face challenges (e.g., pricing concerns, technology adoption) that contribute to a higher likelihood of leaving the service.

- Companies may need to tailor strategies (such as better customer support or senior-friendly packages) to reduce churn in this segment.

➢ **Statistical Test:**
- **A Chi-Square test was conducted to evaluate the relationship between senior citizen status and churn.**
- **The p-value = 0.00000000000000000000000000000000015101, which is highly significant (p < 0.05).**
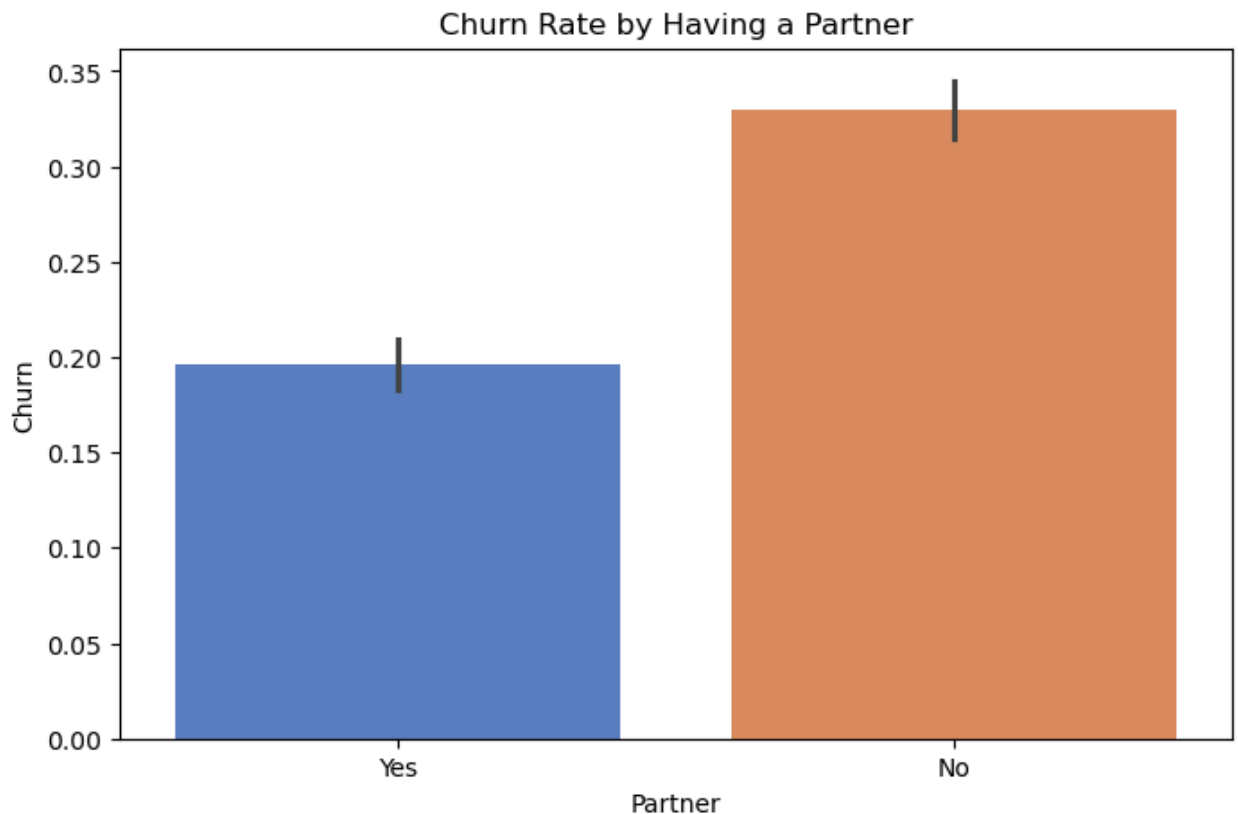- **There is a statistically significant relationship between seniority and churn.**

# Demographic Factors Analysis :

### Partner and Dependents Impact :

Analysis of demographic factors reveals significant patterns in churn behavior:

## ➢ Partner Status:



- Customers without partners show a notably higher churn rate (33%) compared to those with partners (20%)
- Statistical analysis confirms a highly significant relationship ($p < 0.05$)
- This suggests that customers with partners tend to be more stable and less likely to switch providers

## ➤ Dependents:



Churn Rate by Having Dependents
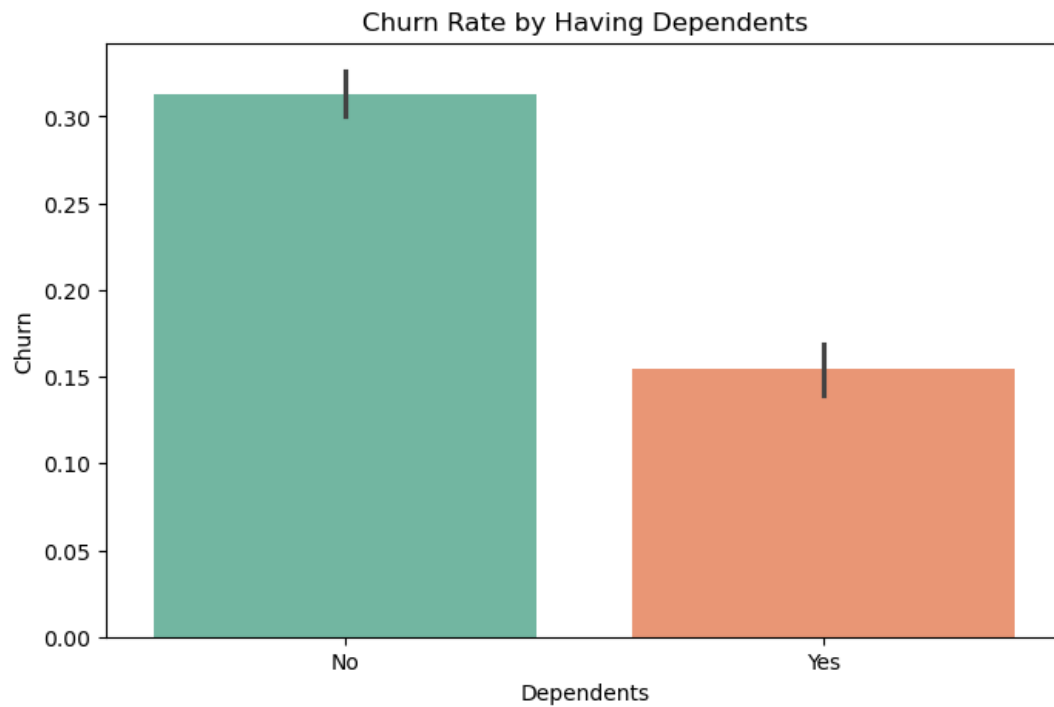
- Customers without dependents exhibit a higher churn rate (31%) compared to those with dependents (15%)
- The relationship is statistically significant ($p < 0.05$)
- This indicates that family commitments may lead to more stable service relationships

# Churn Distribution by Service subscriptions :



Churn Percentage by Service Subscription
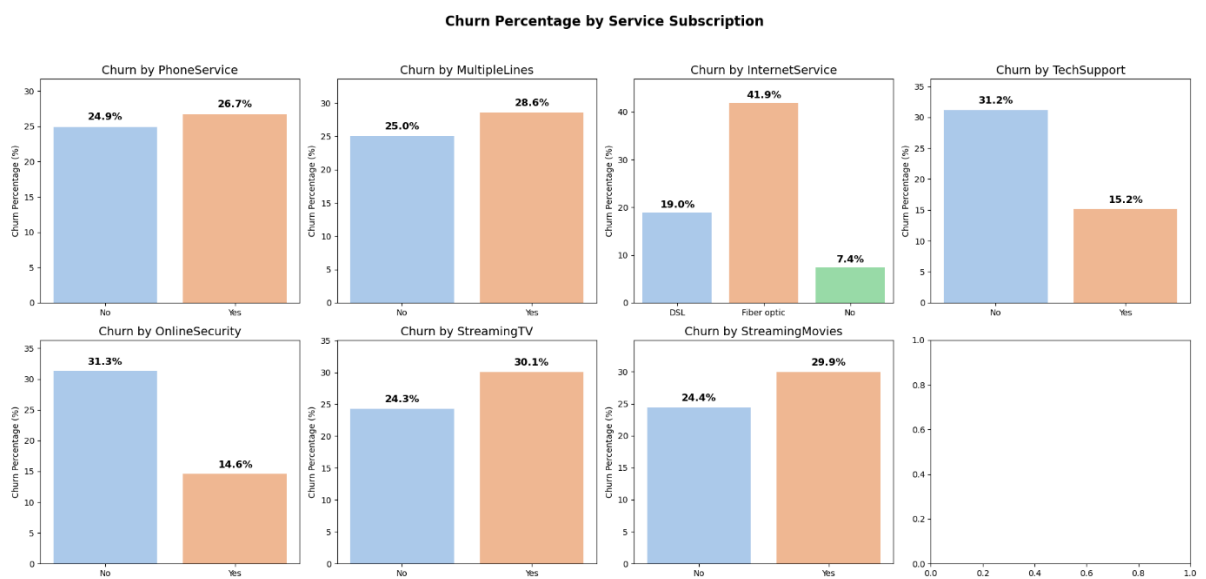
## ➢ Basic Services Impact:

- Phone service has minimal impact on churn (not statistically significant)
- Multiple lines users have slightly higher churn (28.6% vs 25%)

## ➢ Internet Service - Most Critical Factor:

- Fiber optic shows concerning high churn (41.9%)
- DSL has moderate churn (19%)
- No internet shows lowest churn (7.4%)

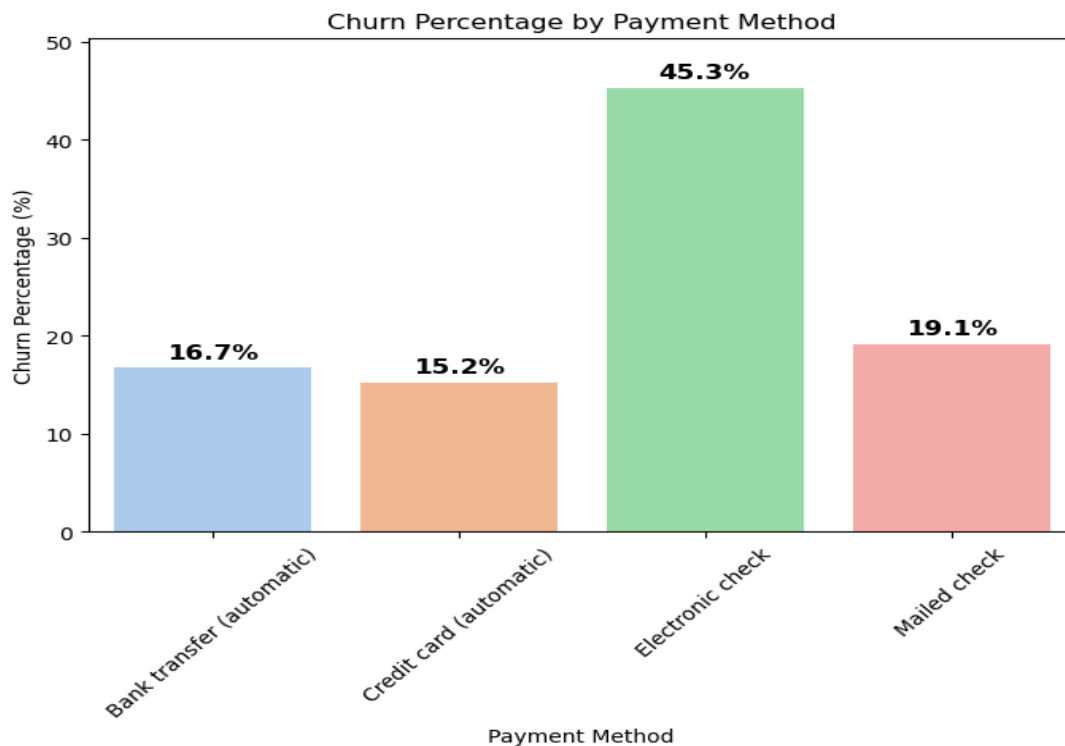## ➢ Support Services - Positive Impact:

- Technical support significantly reduces churn (31.2% → 15.2%)
- Online security shows similar positive effect (31.3% → 14.6%)

## ➢ Entertainment Services - Negative Trend:

- Both streaming TV and movies show higher churn (~30%)
- Non-streaming customers have lower churn (~24%)

# Churn Distribution by Payment Method:



Churn Percentage by Payment Method

This analysis examines how different payment methods impact customer churn rates.

  ➤ **Key Observations:**

- Electronic check users show an alarmingly high churn rate (45.3%) compared to other payment methods
- Automatic payment methods show the lowest churn rates:
  - Credit card: 15.2%
  - Bank transfer: 16.7%

- Traditional mailed checks have a moderate churn rate (19.1%)
- The substantial difference in churn rates (30 percentage points between highest and lowest) indicates payment method is a crucial factor in customer retention

  ➤ **Statistical Test:**

- A Chi-Square test was conducted to evaluate the relationship between payment method and churn
- The p-value = 0.00000 is highly significant ($p < 0.05$)There is a statistically significant relationship between seniority and churn.
- There is a strong statistical evidence that payment method significantly influences customer churn decisions

# Summary of Findings :

The analysis of customer churn in the telecom dataset revealed several key insights into why customers leave the service. The dataset, consisting of 7,043 observations and 21 variables, was thoroughly explored to identify patterns and factors influencing churn. Key findings include:

- **Churn Rate:**
  - 26.54% of customers churned, while 73.46% remained, indicating a significant retention challenge.
- **Tenure**:
  - Customers with short tenure (0-5 months) are more likely to churn, while those with longer tenure (60+ months) show stronger loyalty.
- **Contract Type:**
  - Month-to-month contracts have the highest churn rate (42.71%), while long-term contracts (one-year and two-year) have significantly lower churn rates.

- **Internet Service:**
  - Fiber optic users have the highest churn rate (>40%), while DSL and no internet service users have lower churn rates.
- **Monthly Charges:**
  - Churned customers tend to have higher monthly charges, suggesting that pricing plays a role in customer retention.
- **Demographics:**
  - Senior citizens have a higher churn rate (~40%) compared to non-seniors (~25%).
  - Customers without partners or dependents are more likely to churn.
- **Payment Method:**
  - Customers using electronic checks have the highest churn rate (45.3%), while those using automatic payment methods (credit card, bank transfer) have the lowest.
- **Service Subscriptions:**
  - Technical support and online security reduce churn, while streaming TV and movies are associated with higher churn.

# Key Recommendations :

Based on the analysis, the following strategies are recommended to reduce customer churn and improve retention:

1. **Target Short-Tenure Customers:**

   - Implement early engagement programs for new customers (e.g., welcome offers, onboarding support) to reduce churn in the first few months.

2. **Encourage Long-Term Contracts:**

   - Offer incentives (e.g., discounts, free months) for customers to switch from month-to-month to one-year or two-year contracts.

3. **Improve Fiber Optic Service:**

   - Investigate and address potential issues with fiber optic service (e.g., reliability, speed, pricing) to reduce churn among these users.

4. **Review Pricing Strategies:**

   - Analyze and adjust **monthly charges** to ensure they are competitive and fair, especially for customers at risk of churning.

5.  **Support for Senior Citizens:**

    o   Develop **senior-friendly packages** (e.g., discounted rates, dedicated support) to address the higher churn rate among older customers.

6.  **Promote Automatic Payments:**

    o   Encourage customers to switch to **automatic payment methods** (credit card, bank transfer) by offering small incentives or discounts.

7.  **Enhance Support Services**:

    o   Promote **technical support** and **online security** services, as they significantly reduce churn. Consider offering these services at a discounted rate or as part of bundled packages.

8.  **Personalized Retention Offers**:

    o   Use customer data to create **personalized offers** for at-risk customers (e.g., discounts, free upgrades) based on their usage patterns and demographics.

9.  **Reduce Churn in Streaming Services**:

    o   Investigate why customers with **streaming TV and movies** are more likely to churn. Consider improving content offerings or reducing costs for these services.

10. **Monitor and Address Payment Issues**:

    o   For customers using **electronic checks**, provide support to transition to automatic payments and address any issues causing dissatisfaction.