**Telco Customer Churn Analysis**

**Overview**

The Telco Customer Churn dataset provides insights into customer retention for a telecommunications company. Understanding customer churn—when customers decide to stop using a company's service—is essential for identifying potential areas for improvement in customer satisfaction and retention strategies. This analysis explores various features of the dataset and their relationship with customer churn, employing different visualization techniques to highlight patterns and insights.

**Methods Used**

1. **Boxplots** - For visualizing the distribution and identifying outliers in continuous variables such as tenure, monthly charges, and total charges.
2. **Histograms** - To assess the frequency distribution of numerical variables.
3. **Bar Charts** - For analyzing categorical variables across different churn statuses.
4. **Statistical Analysis** - Including calculating churn rates and analyzing churn by contract types.

**Key Findings**

**1. Boxplot of Tenure**

* **Description:** Illustrates the distribution of customer tenure in months.
* **Observations:** The central 50% of tenure indicates that many customers stay for around 30 months. There are no significant outliers, suggesting that most customers have tenures between approximately 10 to 50 months. Further analysis by gender could reveal differences in tenure between male and female customers. *Figure-1*

**2. Histogram of Total Charges**

* **Description:** Displays the frequency distribution of total charges among customers.
* **Observations:** A large number of customers show low total charges, consistent with shorter tenures, while higher total charges are less frequent, indicating that high-spending customers are fewer. Analyzing by gender could unveil differences in spending patterns. *Figure-2*

**3. Histogram of Monthly Charges**

* **Description:** Represents the distribution of monthly charges, complemented by a fitted density curve.
* **Observations:** Most monthly charges cluster in the lower range, reflecting a preference for lower-priced plans, with fewer customers opting for premium plans. Exploring these charges by gender may further clarify pricing preferences. *Figure-3*

**4. Churn Distribution**

* **Description:** Shows the distribution of customer churn status (Yes or No).
* **Observations:** A significant majority of customers have not churned (No), revealing strong retention. The lower count of churned customers suggests effective customer satisfaction strategies. Churn rates by gender could help refine retention strategies. *Figure-4*

**5. Boxplot of Monthly Charges**

* **Description:** Displays the distribution of monthly charges.
* **Observations:** The median monthly charge is around $60, with no significant outliers, indicating stable pricing. Further exploration by gender could illuminate differing financial behaviors. *Figure-5*

**6. Histogram of Tenure**

* **Description:** Represents the distribution of customer tenure, similar to previous analyses.
* **Observations:** The frequency of short tenures is high, particularly in the initial months, with a gradual decrease for longer tenures. Gender differences in loyalty dynamics could be an area for further investigation. *Figure-6*

**7. Gender Distribution with Churn**

* **Description:** Bar chart displaying the number of customers by gender and churn status.
* **Observations:** Female customers slightly outnumber male customers, with a higher retention rate noted among women. This highlights potential gender-specific differences in customer loyalty. *Figure-7*

**8. Internet Service Distribution with Churn**

* **Description:** Displays customer distribution by internet service type and churn status.
* **Observations:** Customers using DSL show robust retention, while those on fiber optic experience noticeable churn. This suggests a need for targeted strategies to minimize churn among fiber optic customers. *Figure-8*

**9. Boxplot of Total Charges**

* **Description:** Illustrates the distribution of total charges across customers.
* **Observations:** The middle 50% of total charges falls between $1,000 and $4,000, with some high outliers indicating that a few customers incur significantly higher charges. Understanding these charges could facilitate better customer management. *Figure-9*

**10. Dependents Distribution with Churn**

* **Description:** Shows customer distribution based on dependents and churn status.
* **Observations:** Customers without dependents are more numerous and exhibit a higher churn rate, suggesting demographics might influence retention strategies. *Figure-10*

**11. Contract Distribution with Churn**

* **Description:** Displays customer distribution by contract type categorized by churn status.
* **Observations:** Month-to-month contracts are associated with the highest churn rate. In contrast, one-year and two-year contracts show significantly lower churn rates, indicating better retention for longer commitments. *Figure-11*

**12. Partner Distribution with Churn**

* **Description:** Reflects customer distribution by partner status and churn.
* **Observations:** Customers with partners show low churn rates, while single customers exhibit higher churn rates, suggesting that partnership status correlates with customer loyalty. Understanding these dynamics is crucial for developing targeted retention strategies. *Figure-12*

**13. Payment Methods Distribution with Churn**

* **Description:** Analyzes the relationship between payment methods and churn rates.
* **Electronic Check:** This method has the highest number of customers and a significant portion experiences churn, indicating that customers using electronic checks may require additional retention efforts.
* **Mailed Check:** Fewer customers opt for this method, but those who do show a high churn rate.
* **Credit Card:** Customers using credit cards demonstrate strong retention, suggesting that this payment method might contribute positively to customer loyalty.
* **Bank Transfer (Automatic):** Similar to credit cards, this method correlates with lower churn rates, indicating preferences that favor automatic payments among retained customers. *Figure-13*

**14.**

* **Customer Segmentation Strategies:**The low correlation between SeniorCitizen and other features suggests that being a senior citizen does not significantly impact retention. Thus, retention strategies may need to focus on other demographic features.
* **Retention Focus on Tenure:**The strong correlation between TotalCharges and Tenure highlights the importance of customer retention strategies, especially aimed at maintaining longer-tenured customers who contribute more to total revenue.
* **Targeting High-Value Customers:**Given the positive correlation between MonthlyCharges and TotalCharges, strategies targeting customers with higher monthly charges may yield significant returns, as these customers exhibit engagement over time. *Figure-14*

**15. Descriptive Statistics Table:**

Approximately 16.2% of the customers are seniors. The average duration customers have been with the service is roughly 2.7 years, suggesting a relatively stable customer base. A quarter of customers have been with the service for less than 9 months, indicating a significant number of newer customers. The average monthly charge suggests a mid-range pricing strategy. Customers, on average, have contributed a substantial amount over their lifetimes. Some long-term customers have significantly higher accumulative charges, which could be analyzed further for high-value customer retention strategies. *Table-1*

**16. Churn Rate:**

A significant majority (73.46%) of customers did not churn, demonstrating effective retention strategies. However, the 26.54% churn rate indicates room for improvement, particularly in targeting retention strategies at the churned customers. *Table-2*

**17. Churn by Contract Type:**

* Month-to-Month: High churn rate of 42.71%, indicating flexibility may facilitate higher churn. This segment requires targeted retention efforts.
* One Year and Two Year Contracts: Much lower churn rates (11.27% and 2.83% respectively) suggest customers are more committed when they choose longer contracts. *Table-2*

18. **Classification Metrics:**

* Precision (0.83 for No, 0.66 for Yes): High precision for "No churn" indicates that the model is effective but shows room for improvement in predicting actual churn.
* Recall (0.91 for No, 0.47 for Yes): High recall for non-churning customers means the model captures most of them but does a poor job for churned customers.
* F1-Score (0.87 for No, 0.55 for Yes): The F1-score is useful for balancing precision and recall; therefore, improving churn predictions should focus on increasing recall for the "Yes" class (churn). *Table-3*

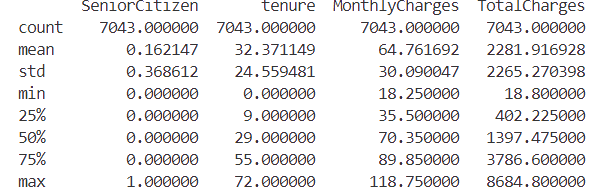
**Overall Insights:**

* **Churn Rate:** The overall churn rate stands at approximately 26.5%, suggesting room for improvement in customer retention strategies.
* **Churn by Contract Type:**
* **Month-to-Month:** This group shows a notable churn rate of around 42.7%, indicating that flexible contracts might not incentivize customers to stay.
* **One-Year and Two-Year Contracts:** These contracts have significantly lower churn rates (approximately 11.3% and 2.8% respectively), suggesting that customers prefer longer commitments for better service stability.

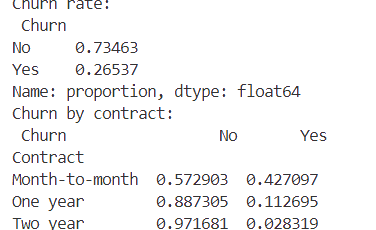
**Recommendations:**

* **Targeted Retention Programs:** Given the higher churn rates among month-to-month customers, implementing targeted retention strategies such as loyalty discounts or incentives for longer commitments could help reduce churn in this segment.
* **Understand Spending Patterns:** Further investigation into the spending patterns of male vs. female customers and across different payment methods could uncover actionable insights for personalized marketing and pricing strategies.
* **Enhance Fiber Optic Service:** Given the higher churn among fiber optic customers, it would be beneficial to investigate the reasons for dissatisfaction and enhance service offerings in this area.
* **Leverage Partner Status:** As partner status seems to correlate with lower churn, retention strategies could be tailored to appeal to single customers, possibly by highlighting community aspects or family plans.
* **Focus on Long-Term Contracts:** Given the strong negative correlation between churn and longer contract types (one-year and two-year contracts), the company should promote these contracts more aggressively. Offering additional benefits or promotional pricing for customers willing to commit to longer terms can enhance retention rates.
* **Segment Based on Monthly Charges:** Analyze customer segments based on their monthly charges to identify high-value customers. Tailored marketing strategies could be developed to retain these customers, such as premium support services, exclusive offers, or loyalty rewards that resonate with their service usage and spending patterns.
* **Customer Education and Engagement Programs:** Implement educational programs focused on the value and benefits of various service tiers and contracts. By increasing awareness of service offerings and helping customers make informed choices, the company can foster greater loyalty and potentially reduce churn among customers unaware of their options.
* **Increase Customer Support for Seniors:** While the correlation between SeniorCitizen status and other variables is low, it may still be beneficial to enhance support services tailored to senior customers. Specialized support or assistance can build loyalty and reduce any potential dissatisfaction among this demographic.
* **Enhance Customer Experience with Automated Follow-Ups:** Utilize analytics driven from customer tenure and engagement patterns to implement automated follow-up communications to customers, particularly those nearing the end of their contract terms. This can serve as an opportunity to discuss renewal options or address any service issues they may be experiencing.
* **Analyze Changes in Charges Over Time:** Regularly evaluate how monthly and total charges change for customers over time, especially for those with high churn rates. Understanding these dynamics can inform proactive engagement strategies and enhance overall customer satisfaction.
* **Feedback Loop for Service Improvement:** Establish a systematic feedback mechanism to gather insights from customers about their experiences, particularly from those using fiber optic services. Understanding their pain points will be crucial for targeted service enhancements that address dissatisfaction.

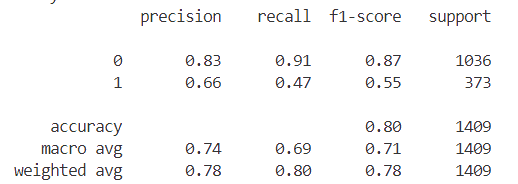
**Tables:**



*Table-1*

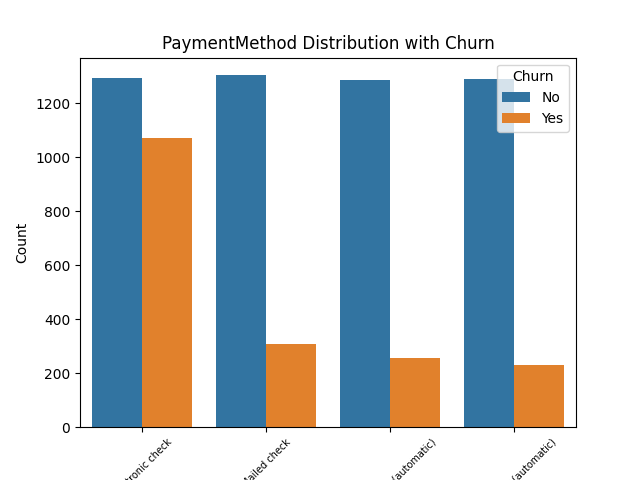
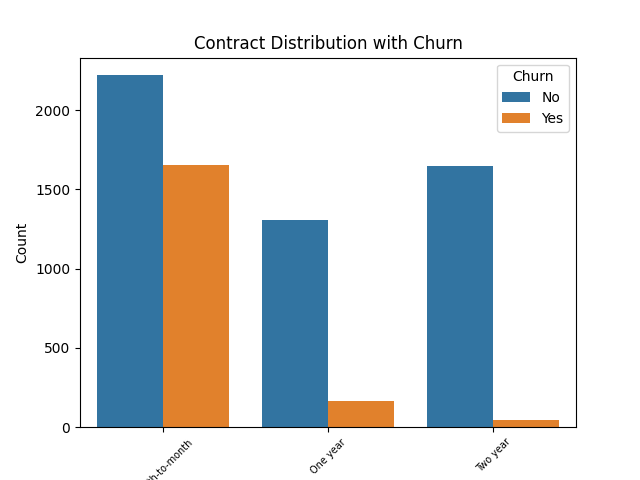
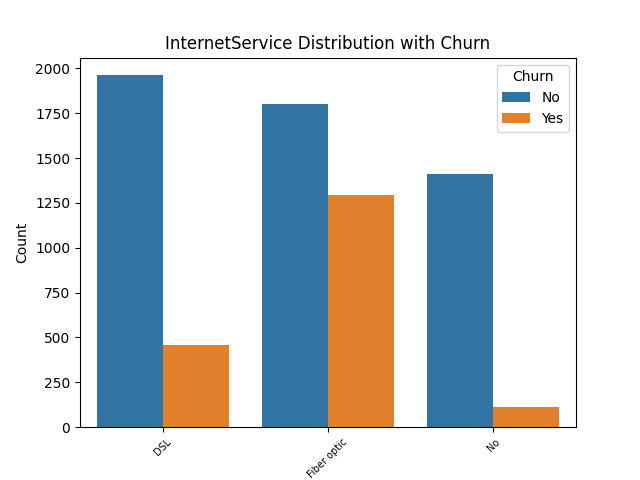
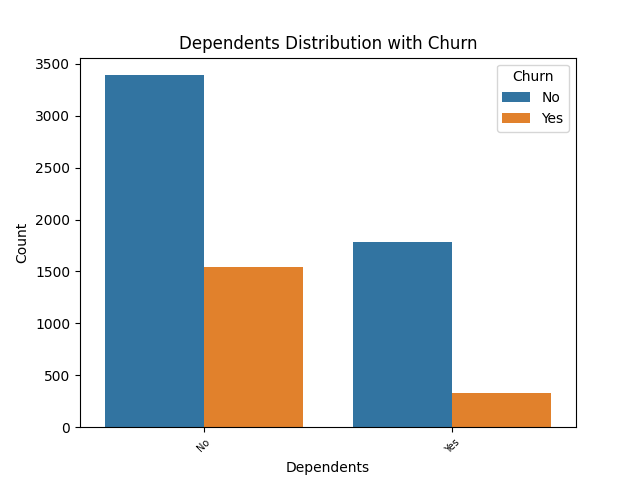
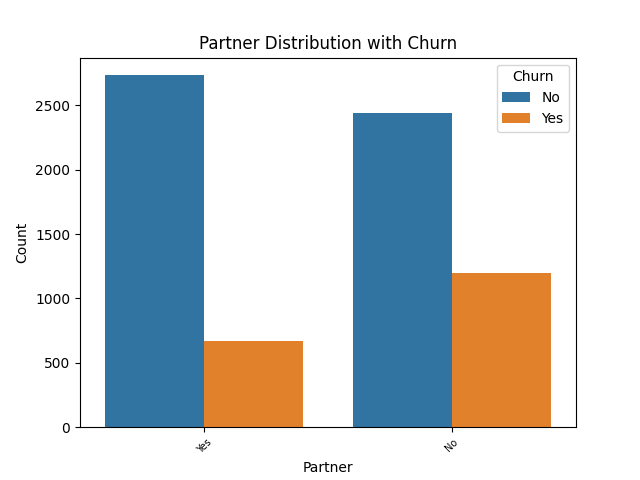
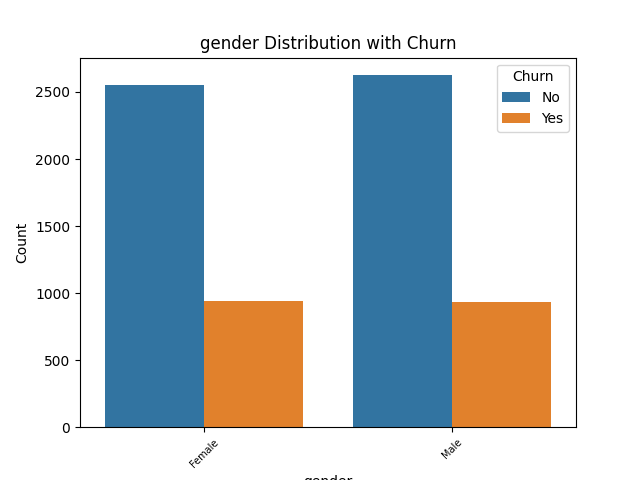
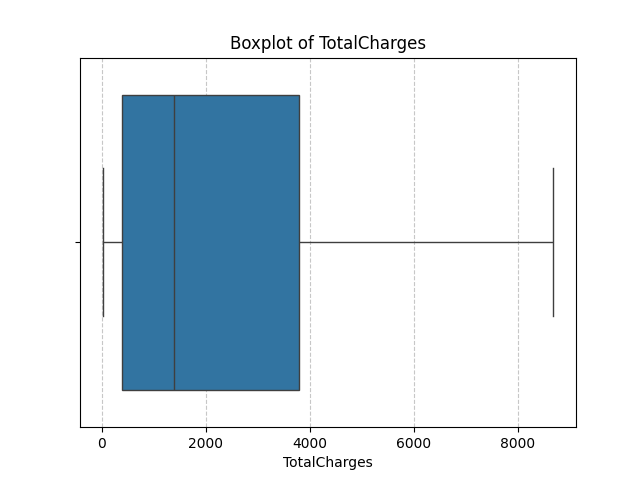
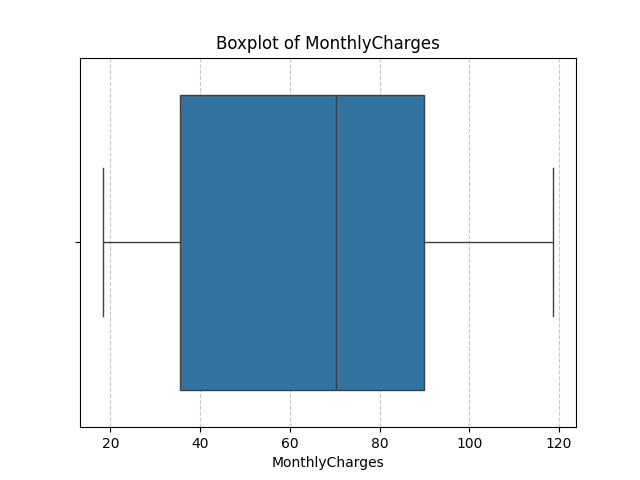
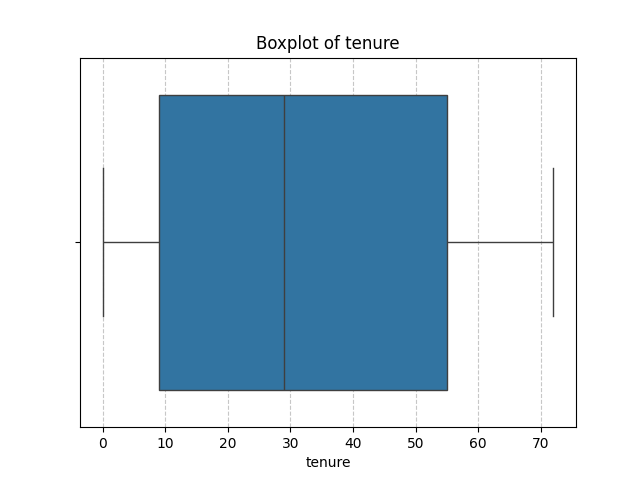
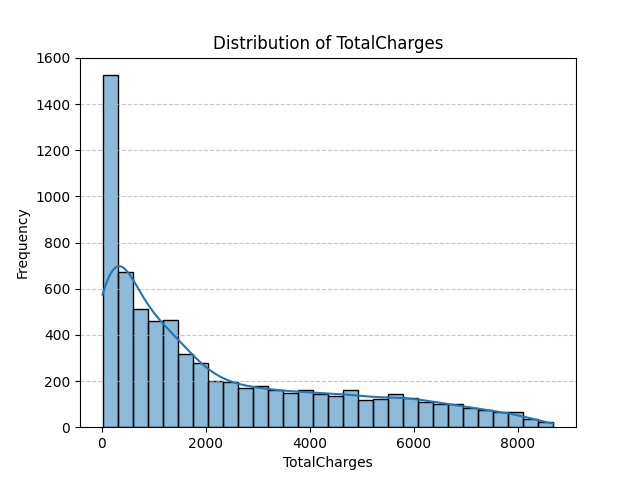
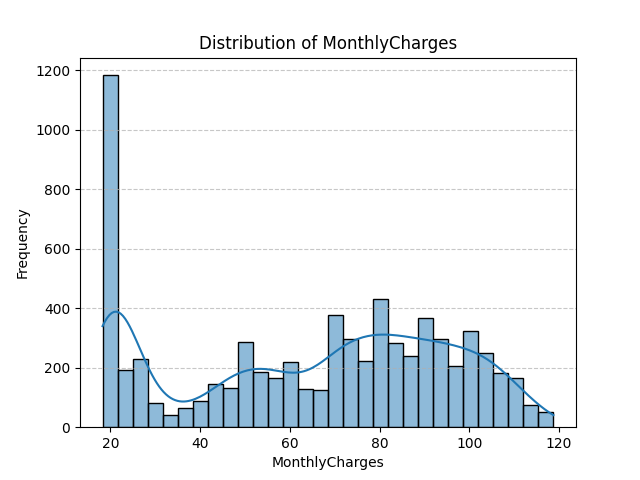
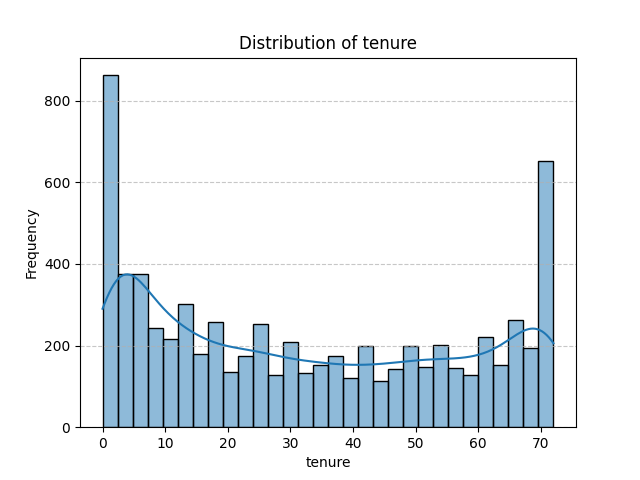
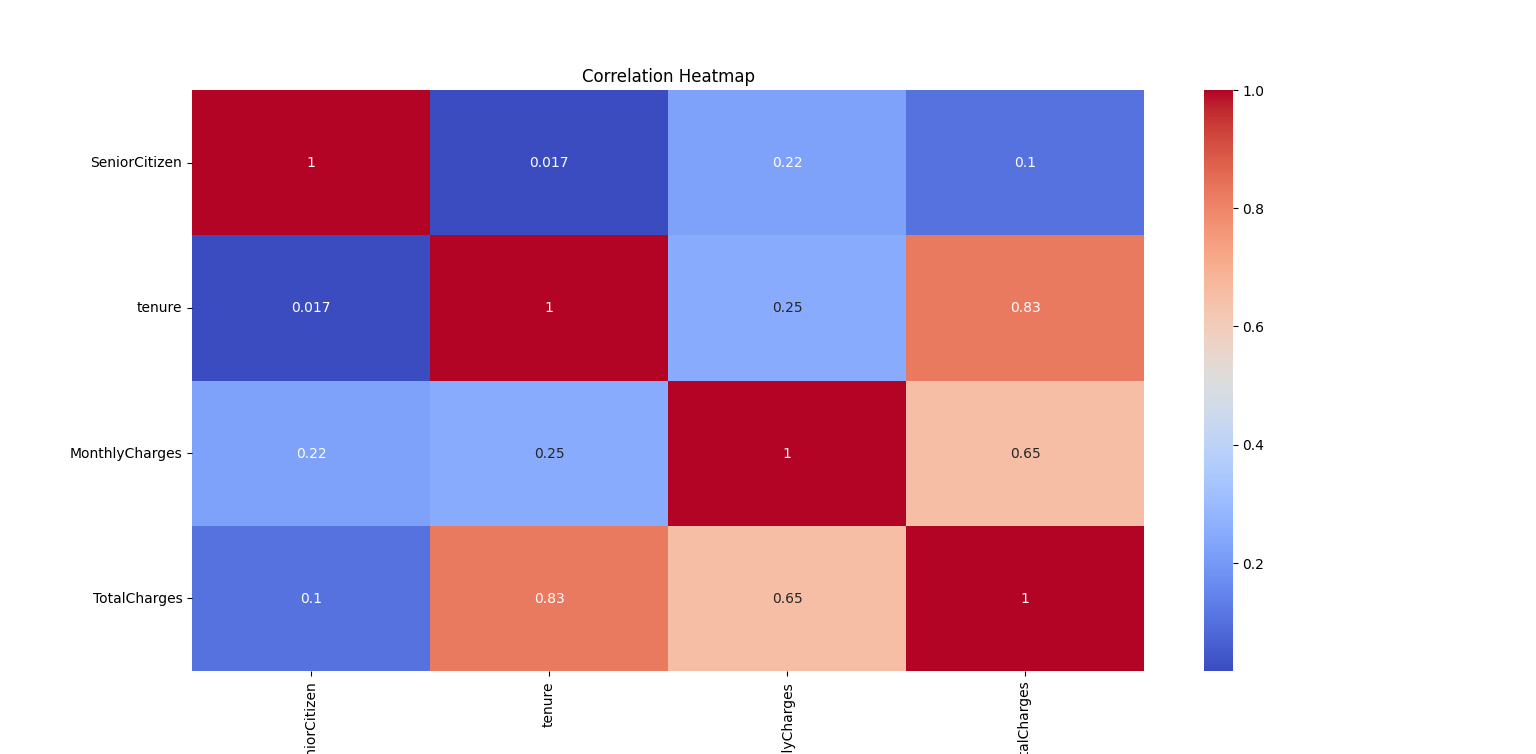
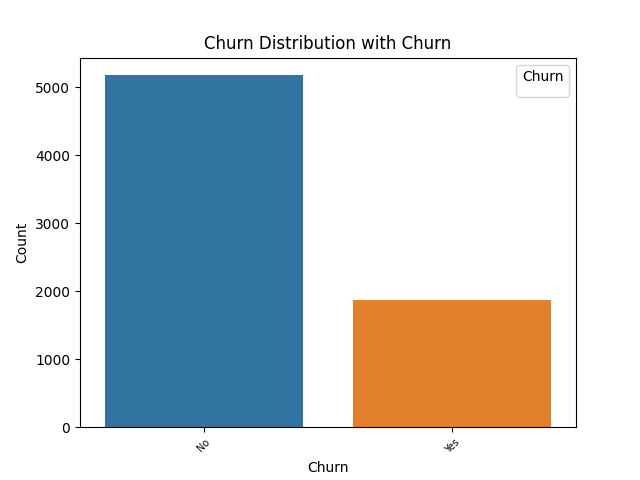


*Table-2*



*Table-3*

**Figures:**

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