

## Executive Summary and Recommendations of Customer Analysis:

### 1. Churn Overview:

- The overall churn rate is visualized through a **count plot** and a **pie chart**. The count plot shows the raw number of customers who have churned vs. retained. The pie chart emphasizes churn as a percentage of the total customer base, making it easier to understand the proportion of customers leaving versus staying. This visualization indicates the importance of focusing on churn reduction strategies.

### 2. Demographic Breakdown:

- A **count plot** segmented by **gender** reveals that churn rates differ between male and female customers. The analysis shows that one gender may exhibit higher churn, which could guide targeted marketing efforts or customer engagement strategies. In this plot, the percentage of churn within each gender group is also calculated to provide more context on their respective churn rates.
- Future analysis could include other demographics like age or region for a more granular understanding.

### 3. Service Adoption and Churn Correlation:

- **Service-related features** such as `PhoneService`, `InternetService`, and additional services ( `TechSupport`, `StreamingTV` ) are analyzed using count plots and stacked bar charts.
- The count plots provide the raw count of customers with each service, while the stacked bar charts break down the data by churn status (Yes/No). For example:
  - **PhoneService:** A large proportion of customers have a phone service, but churn rates are still present within this group.
  - **InternetService:** Customers with fiber optic service appear to have a higher churn rate compared to DSL customers.
  - **Additional Services:** Optional services like `TechSupport` and `StreamingTV` show that customers without these services tend to churn more frequently.
- In these cases, data is also displayed as percentages to highlight the proportion of churned vs. retained customers within each service category. For instance, customers without `TechSupport` may show a 30% churn rate, compared to 10% for those with it.

#### 4. Data Cleaning and Preparation:

- The dataset is pre-processed by handling missing values and ensuring data consistency:
  - **Blanks** in the `tenure` column are replaced with 0, indicating no recorded charges.
  - **Null values** are identified using the `isnull()` method, and the count of missing values per column is calculated.
  - **Data type conversion** ensures that numerical columns (like `TotalCharges`) are correctly formatted for analysis.
- These steps ensure that the data is clean and ready for accurate analysis.

#### 5. Service Usage Insights and Upsell Opportunities:

- The analysis reveals that customers who do not adopt certain services (e.g., `OnlineSecurity`, `DeviceProtection`, and `OnlineBackup`) are more likely to churn. These features show a high percentage of churn, with customers lacking these services exhibiting up to **40% churn** rates, compared to those with these services who show **10% churn**.
- This insight suggests that there is an opportunity to improve retention by encouraging customers to adopt additional services. Marketing campaigns or promotional offers targeting these services could be a potential strategy to reduce churn.

#### 6. Churn Percentage Visualization:

- For each categorical variable (e.g., `TechSupport`, `InternetService`), the charts also present the **percentage of churn** for each category to give a clearer picture of how churn is distributed across different services. This percentage representation helps in understanding the impact of each feature on churn at a glance.

### Key Recommendations:

- **Targeted Retention Strategies:** Focus efforts on customers without critical add-on services (e.g., `TechSupport`, `DeviceProtection`) as they tend to churn more.

- **Promote Fiber Optic Service:** Since fiber optic users show a higher churn rate, investigate service quality or engagement strategies for this segment.
- **Marketing Based on Demographics:** Consider developing gender-specific strategies if significant churn differences are found.
- **Upsell Opportunities:** Use the high churn percentages in service-specific groups to guide upselling and retention campaigns for these features.

This analysis, backed by visualizations and statistical insights, suggests actionable steps for improving customer retention, optimizing service offerings, and refining marketing approaches.