

# Telecome Customer Churn Analysis EDA

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

```
df=pd.read_csv("C://Users//hp//Downloads//Customer Churn.csv")
```

```
df
```

|      | customerID | gender | SeniorCitizen | Partner | Dependents | tenure | \ |
|------|------------|--------|---------------|---------|------------|--------|---|
| 0    | 7590-VHVEG | Female | 0             | Yes     | No         | 1      |   |
| 1    | 5575-GNVDE | Male   | 0             | No      | No         | 34     |   |
| 2    | 3668-QPYBK | Male   | 0             | No      | No         | 2      |   |
| 3    | 7795-CFOCW | Male   | 0             | No      | No         | 45     |   |
| 4    | 9237-HQITU | Female | 0             | No      | No         | 2      |   |
| ...  | ...        | ...    | ...           | ...     | ...        | ...    |   |
| 7038 | 6840-RESVB | Male   | 0             | Yes     | Yes        | 24     |   |
| 7039 | 2234-XADUH | Female | 0             | Yes     | Yes        | 72     |   |
| 7040 | 4801-JZAZL | Female | 0             | Yes     | Yes        | 11     |   |
| 7041 | 8361-LTMKD | Male   | 1             | Yes     | No         | 4      |   |
| 7042 | 3186-AJIEK | Male   | 0             | No      | No         | 66     |   |

|                | PhoneService | MultipleLines    | InternetService |
|----------------|--------------|------------------|-----------------|
| OnlineSecurity | ...          |                  |                 |
| 0              | No           | No phone service | DSL             |
| No             | ...          |                  |                 |
| 1              | Yes          | No               | DSL             |
| Yes            | ...          |                  |                 |
| 2              | Yes          | No               | DSL             |
| Yes            | ...          |                  |                 |
| 3              | No           | No phone service | DSL             |
| Yes            | ...          |                  |                 |
| 4              | Yes          | No               | Fiber optic     |
| No             | ...          |                  |                 |
| ...            | ...          | ...              | ...             |
| ...            | ...          | ...              | ...             |
| 7038           | Yes          | Yes              | DSL             |
| Yes            | ...          |                  |                 |
| 7039           | Yes          | Yes              | Fiber optic     |
| No             | ...          |                  |                 |
| 7040           | No           | No phone service | DSL             |
| Yes            | ...          |                  |                 |
| 7041           | Yes          | Yes              | Fiber optic     |
| No             | ...          |                  |                 |

|                |                  |                           |                  |                 |
|----------------|------------------|---------------------------|------------------|-----------------|
| 7042           | Yes              | No                        | Fiber optic      |                 |
| Yes ...        |                  |                           |                  |                 |
|                | DeviceProtection | TechSupport               | StreamingTV      | StreamingMovies |
| Contract \     |                  |                           |                  |                 |
| 0              | No               | No                        | No               | No Month-       |
| to-month       |                  |                           |                  |                 |
| 1              | Yes              | No                        | No               | No              |
| One year       |                  |                           |                  |                 |
| 2              | No               | No                        | No               | No Month-       |
| to-month       |                  |                           |                  |                 |
| 3              | Yes              | Yes                       | No               | No              |
| One year       |                  |                           |                  |                 |
| 4              | No               | No                        | No               | No Month-       |
| to-month       |                  |                           |                  |                 |
| ...            | ...              | ...                       | ...              | ...             |
| ...            |                  |                           |                  |                 |
| 7038           | Yes              | Yes                       | Yes              | Yes             |
| One year       |                  |                           |                  |                 |
| 7039           | Yes              | No                        | Yes              | Yes             |
| One year       |                  |                           |                  |                 |
| 7040           | No               | No                        | No               | No Month-       |
| to-month       |                  |                           |                  |                 |
| 7041           | No               | No                        | No               | No Month-       |
| to-month       |                  |                           |                  |                 |
| 7042           | Yes              | Yes                       | Yes              | Yes             |
| Two year       |                  |                           |                  |                 |
|                | PaperlessBilling |                           | PaymentMethod    | MonthlyCharges  |
| TotalCharges \ |                  |                           |                  |                 |
| 0              | Yes              |                           | Electronic check | 29.85           |
| 29.85          |                  |                           |                  |                 |
| 1              | No               |                           | Mailed check     | 56.95           |
| 1889.5         |                  |                           |                  |                 |
| 2              | Yes              |                           | Mailed check     | 53.85           |
| 108.15         |                  |                           |                  |                 |
| 3              | No               | Bank transfer (automatic) |                  | 42.30           |
| 1840.75        |                  |                           |                  |                 |
| 4              | Yes              |                           | Electronic check | 70.70           |
| 151.65         |                  |                           |                  |                 |
| ...            | ...              |                           | ...              | ...             |
| ...            |                  |                           |                  |                 |
| 7038           | Yes              |                           | Mailed check     | 84.80           |
| 1990.5         |                  |                           |                  |                 |
| 7039           | Yes              | Credit card (automatic)   |                  | 103.20          |
| 7362.9         |                  |                           |                  |                 |
| 7040           | Yes              |                           | Electronic check | 29.60           |
| 346.45         |                  |                           |                  |                 |
| 7041           | Yes              |                           | Mailed check     | 74.40           |

```

306.6
7042          Yes  Bank transfer (automatic)          105.65
6844.5

```

```

      Churn
0      No
1      No
2      Yes
3      No
4      Yes
...     ...
7038    No
7039    No
7040    No
7041    Yes
7042    No

```

```
[7043 rows x 21 columns]
```

```
df.head()
```

```

   customerID  gender  SeniorCitizen  Partner  Dependents  tenure
PhoneService \
0  7590-VHVEG  Female                0      Yes         No        1
No
1  5575-GNVDE   Male                0      No         No       34
Yes
2  3668-QPYBK   Male                0      No         No        2
Yes
3  7795-CF0CW   Male                0      No         No       45
No
4  9237-HQITU   Female              0      No         No        2
Yes

```

```

   MultipleLines  InternetService  OnlineSecurity  ...
DeviceProtection \
0  No phone service              DSL              No  ...
No
1                      No              DSL              Yes  ...
Yes
2                      No              DSL              Yes  ...
No
3  No phone service              DSL              Yes  ...
Yes
4                      No      Fiber optic              No  ...
No

```

```

   TechSupport  StreamingTV  StreamingMovies      Contract
PaperlessBilling \
0              No          No          No  Month-to-month

```

|     |     |    |    |                |
|-----|-----|----|----|----------------|
| Yes |     |    |    |                |
| 1   | No  | No | No | One year       |
| No  |     |    |    |                |
| 2   | No  | No | No | Month-to-month |
| Yes |     |    |    |                |
| 3   | Yes | No | No | One year       |
| No  |     |    |    |                |
| 4   | No  | No | No | Month-to-month |
| Yes |     |    |    |                |

|   | PaymentMethod             | MonthlyCharges | TotalCharges | Churn |
|---|---------------------------|----------------|--------------|-------|
| 0 | Electronic check          | 29.85          | 29.85        | No    |
| 1 | Mailed check              | 56.95          | 1889.5       | No    |
| 2 | Mailed check              | 53.85          | 108.15       | Yes   |
| 3 | Bank transfer (automatic) | 42.30          | 1840.75      | No    |
| 4 | Electronic check          | 70.70          | 151.65       | Yes   |

[5 rows x 21 columns]

df.info()

<class 'pandas.core.frame.DataFrame'>

RangeIndex: 7043 entries, 0 to 7042

Data columns (total 21 columns):

| #  | Column           | Non-Null | Count    | Dtype   |
|----|------------------|----------|----------|---------|
| 0  | customerID       | 7043     | non-null | object  |
| 1  | gender           | 7043     | non-null | object  |
| 2  | SeniorCitizen    | 7043     | non-null | int64   |
| 3  | Partner          | 7043     | non-null | object  |
| 4  | Dependents       | 7043     | non-null | object  |
| 5  | tenure           | 7043     | non-null | int64   |
| 6  | PhoneService     | 7043     | non-null | object  |
| 7  | MultipleLines    | 7043     | non-null | object  |
| 8  | InternetService  | 7043     | non-null | object  |
| 9  | OnlineSecurity   | 7043     | non-null | object  |
| 10 | OnlineBackup     | 7043     | non-null | object  |
| 11 | DeviceProtection | 7043     | non-null | object  |
| 12 | TechSupport      | 7043     | non-null | object  |
| 13 | StreamingTV      | 7043     | non-null | object  |
| 14 | StreamingMovies  | 7043     | non-null | object  |
| 15 | Contract         | 7043     | non-null | object  |
| 16 | PaperlessBilling | 7043     | non-null | object  |
| 17 | PaymentMethod    | 7043     | non-null | object  |
| 18 | MonthlyCharges   | 7043     | non-null | float64 |
| 19 | TotalCharges     | 7043     | non-null | object  |
| 20 | Churn            | 7043     | non-null | object  |

dtypes: float64(1), int64(2), object(18)

memory usage: 1.1+ MB

```
df['MonthlyCharges']= df['MonthlyCharges'].replace(' ','0')
df['MonthlyCharges']=df['MonthlyCharges'].astype('float')
```

```
df.isnull().sum().sum()
```

```
0
```

```
df.describe()
```

|       | SeniorCitizen | tenure      | MonthlyCharges |
|-------|---------------|-------------|----------------|
| count | 7043.000000   | 7043.000000 | 7043.000000    |
| mean  | 0.162147      | 32.371149   | 64.761692      |
| std   | 0.368612      | 24.559481   | 30.090047      |
| min   | 0.000000      | 0.000000    | 18.250000      |
| 25%   | 0.000000      | 9.000000    | 35.500000      |
| 50%   | 0.000000      | 29.000000   | 70.350000      |
| 75%   | 0.000000      | 55.000000   | 89.850000      |
| max   | 1.000000      | 72.000000   | 118.750000     |

```
df.duplicated().sum()
```

```
0
```

```
def conv(value):
    if value == 1:
        return "yes"
    else:
        return "no"
```

```
df["SeniorCitizen"] = df["SeniorCitizen"].apply(conv)
```

```
df
```

|      | customerID | gender | SeniorCitizen | Partner | Dependents | tenure | \ |
|------|------------|--------|---------------|---------|------------|--------|---|
| 0    | 7590-VHVEG | Female | no            | Yes     | No         | 1      |   |
| 1    | 5575-GNVDE | Male   | no            | No      | No         | 34     |   |
| 2    | 3668-QPYBK | Male   | no            | No      | No         | 2      |   |
| 3    | 7795-CF0CW | Male   | no            | No      | No         | 45     |   |
| 4    | 9237-HQITU | Female | no            | No      | No         | 2      |   |
| ...  | ...        | ...    | ...           | ...     | ...        | ...    |   |
| 7038 | 6840-RESVB | Male   | no            | Yes     | Yes        | 24     |   |
| 7039 | 2234-XADUH | Female | no            | Yes     | Yes        | 72     |   |
| 7040 | 4801-JZAZL | Female | no            | Yes     | Yes        | 11     |   |
| 7041 | 8361-LTMKD | Male   | yes           | Yes     | No         | 4      |   |
| 7042 | 3186-AJIEK | Male   | no            | No      | No         | 66     |   |

|                | PhoneService | MultipleLines    | InternetService |
|----------------|--------------|------------------|-----------------|
| OnlineSecurity | ...          | \                |                 |
| 0              | No           | No phone service | DSL             |
| No             | ...          |                  |                 |

|  |     |                  |             |     |        |
|--|-----|------------------|-------------|-----|--------|
| 1  | Yes | No               | DSL         |     |        |
| Yes ...  |     |                  |             |     |        |
| 2  | Yes | No               | DSL         |     |        |
| Yes ...  |     |                  |             |     |        |
| 3  | No  | No phone service | DSL         |     |        |
| Yes ...  |     |                  |             |     |        |
| 4  | Yes | No               | Fiber optic |     |        |
| No ...   |     |                  |             |     |        |
| ...  | ... | ...              | ...         | ... | ...    |
| .  |     |                  |             |     |        |
| 7038   | Yes | Yes              | DSL         |     |        |
| Yes ...  |     |                  |             |     |        |
| 7039   | Yes | Yes              | Fiber optic |     |        |
| No ...   |     |                  |             |     |        |
| 7040   | No  | No phone service | DSL         |     |        |
| Yes ...  |     |                  |             |     |        |
| 7041   | Yes | Yes              | Fiber optic |     |        |
| No ...   |     |                  |             |     |        |
| 7042   | Yes | No               | Fiber optic |     |        |
| Yes ...  |     |                  |             |     |        |
| DeviceProtection TechSupport StreamingTV StreamingMovies |     |                  |             |     |        |
| Contract \   |     |                  |             |     |        |
| 0  | No  | No               | No          | No  | Month- |
| to-month   |     |                  |             |     |        |
| 1  | Yes | No               | No          | No  |        |
| One year   |     |                  |             |     |        |
| 2  | No  | No               | No          | No  | Month- |
| to-month   |     |                  |             |     |        |
| 3  | Yes | Yes              | No          | No  |        |
| One year   |     |                  |             |     |        |
| 4  | No  | No               | No          | No  | Month- |
| to-month   |     |                  |             |     |        |
| ...  | ... | ...              | ...         | ... |        |
| ...  |     |                  |             |     |        |
| 7038   | Yes | Yes              | Yes         | Yes |        |
| One year   |     |                  |             |     |        |
| 7039   | Yes | No               | Yes         | Yes |        |
| One year   |     |                  |             |     |        |
| 7040   | No  | No               | No          | No  | Month- |
| to-month   |     |                  |             |     |        |
| 7041   | No  | No               | No          | No  | Month- |
| to-month   |     |                  |             |     |        |
| 7042   | Yes | Yes              | Yes         | Yes |        |
| Two year   |     |                  |             |     |        |
| PaperlessBilling PaymentMethod MonthlyCharges            |     |                  |             |     |        |
| TotalCharges \   |     |                  |             |     |        |
| 0  | Yes | Electronic check | 29.85       |     |        |

|         |     |                           |        |
|---------|-----|---------------------------|--------|
| 29.85   |     |                           |        |
| 1       | No  | Mailed check              | 56.95  |
| 1889.5  |     |                           |        |
| 2       | Yes | Mailed check              | 53.85  |
| 108.15  |     |                           |        |
| 3       | No  | Bank transfer (automatic) | 42.30  |
| 1840.75 |     |                           |        |
| 4       | Yes | Electronic check          | 70.70  |
| 151.65  |     |                           |        |
| ...     | ... | ...                       | ...    |
| ...     |     |                           |        |
| 7038    | Yes | Mailed check              | 84.80  |
| 1990.5  |     |                           |        |
| 7039    | Yes | Credit card (automatic)   | 103.20 |
| 7362.9  |     |                           |        |
| 7040    | Yes | Electronic check          | 29.60  |
| 346.45  |     |                           |        |
| 7041    | Yes | Mailed check              | 74.40  |
| 306.6   |     |                           |        |
| 7042    | Yes | Bank transfer (automatic) | 105.65 |
| 6844.5  |     |                           |        |

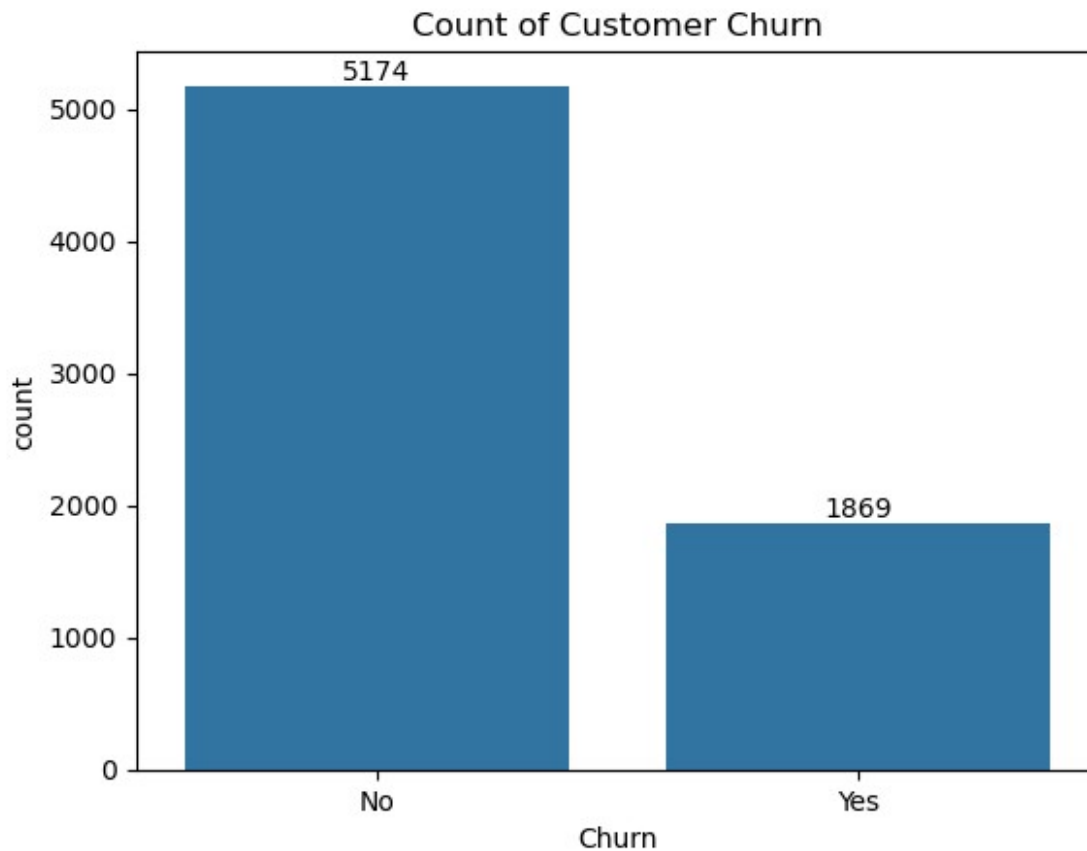
|      | Churn |
|------|-------|
| 0    | No    |
| 1    | No    |
| 2    | Yes   |
| 3    | No    |
| 4    | Yes   |
| ...  | ...   |
| 7038 | No    |
| 7039 | No    |
| 7040 | No    |
| 7041 | Yes   |
| 7042 | No    |

[7043 rows x 21 columns]

```
df['TotalCharges']=df['TotalCharges'].replace(' ', '0')
df['TotalCharges']=df['TotalCharges'].astype('float')
```

```
ax= sns.countplot(x='Churn',data=df)
```

```
ax.bar_label(ax.containers[0])
plt.title('Count of Customer Churn')
plt.figure(figsize=(3,3))
plt.show()
```



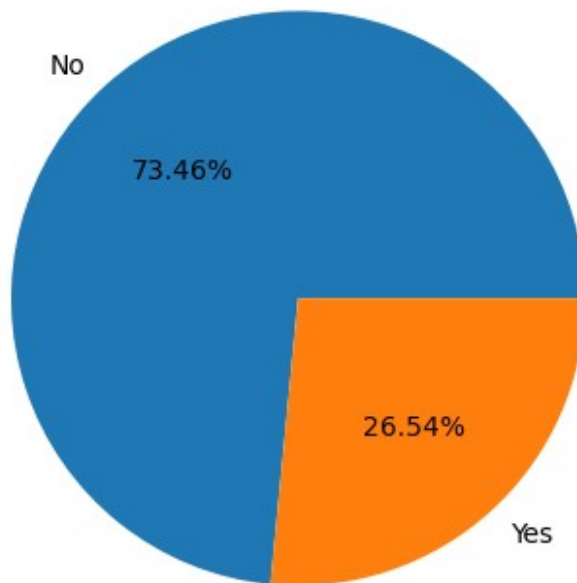
<Figure size 300x300 with 0 Axes>

Our count of Churn is less as compared to Customer who still use our Services

```
gb= df.groupby('Churn').agg({'Churn': 'count'})  
plt.pie(gb['Churn'], labels=gb.index, autopct="%1.2f%%")  
plt.title("Percentage of Churn Customer")  
plt.figure(figsize=(3,4))  
plt.show()
```



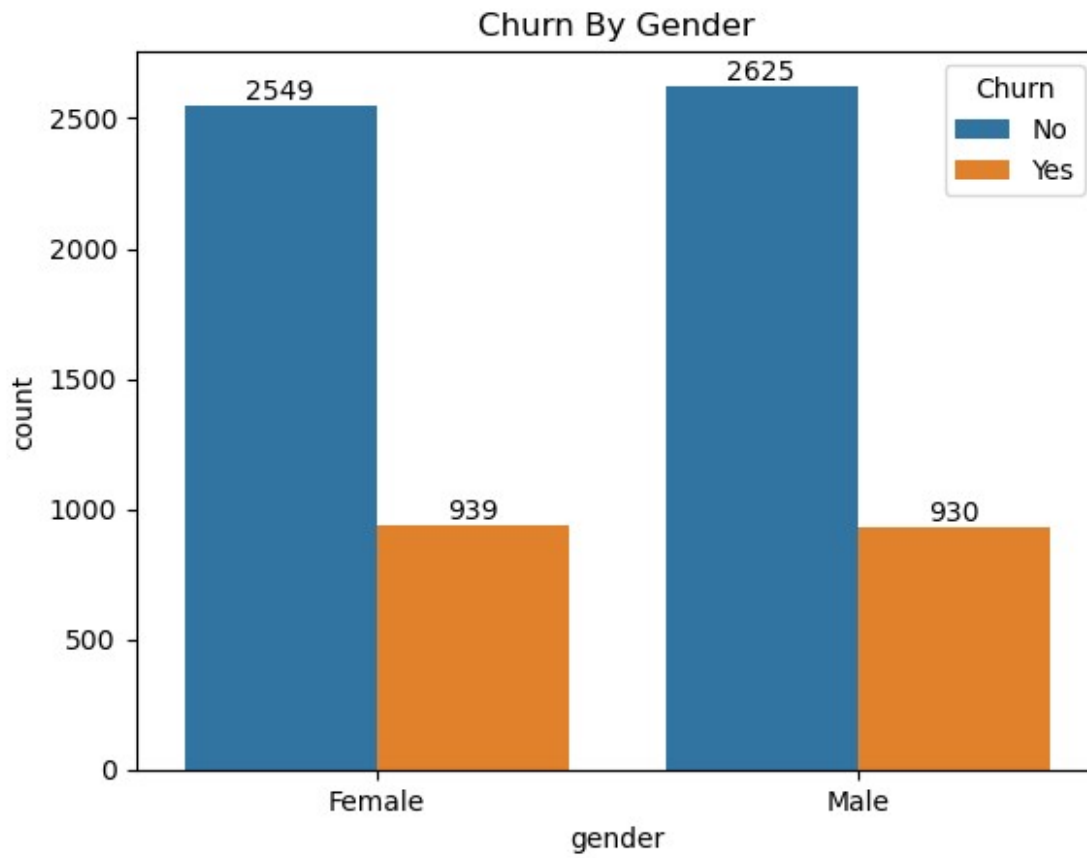
Percentage of Churn Customer



<Figure size 300x400 with 0 Axes>

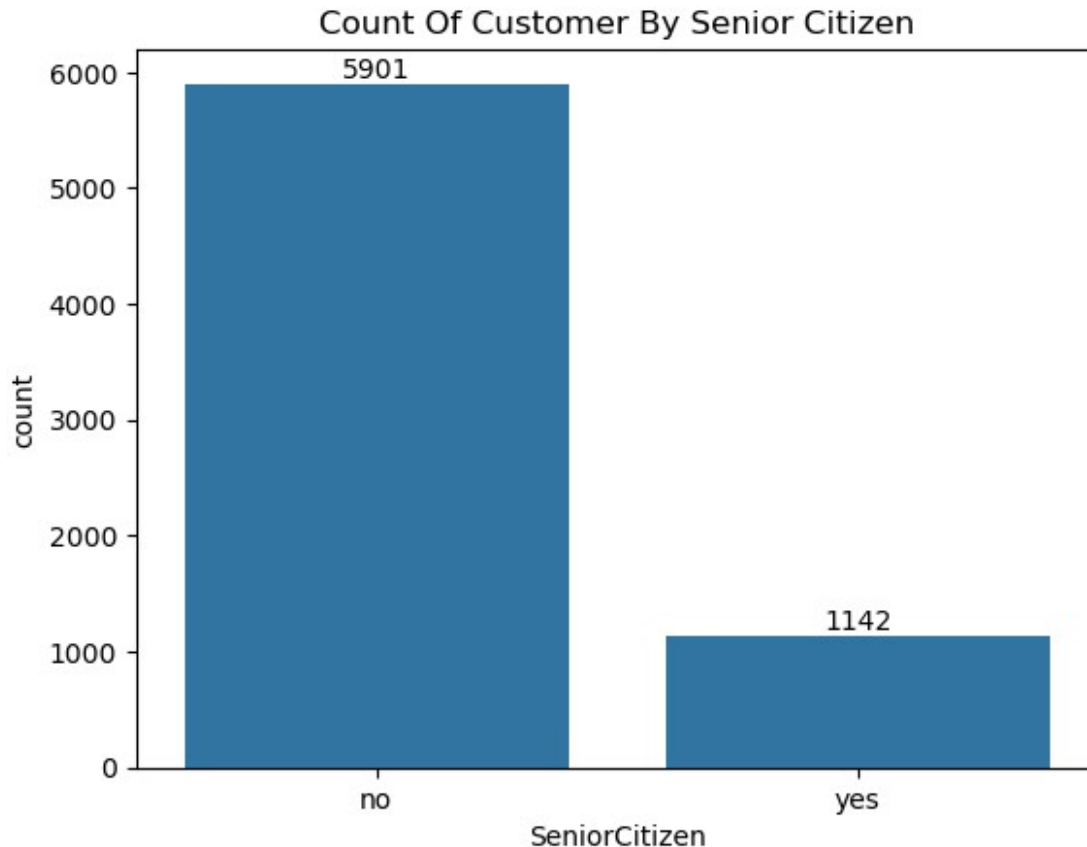
In current Situation we see our Customers Churn Rate 26.54% and 73.46% Customer who stay with us

```
plt.title("Churn By Gender")
ax=sns.countplot(x='gender',data=df,hue='Churn')
plt.bar_label(ax.containers[0])
plt.bar_label(ax.containers[1])
plt.show()
```



From above Chart it is Clear that there is not any Significant Difference between Genders both male and female have almost same Number of Churn

```
plt.title('Count Of Customer By Senior Citizen')
ax=sns.countplot(x='SeniorCitizen',data=df)
ax.bar_label(ax.containers[0])
plt.figure(figsize=(3,3))
plt.show()
```



<Figure size 300x300 with 0 Axes>

```
total_counts = df.groupby('SeniorCitizen')
['Churn'].value_counts(normalize=True).unstack() * 100

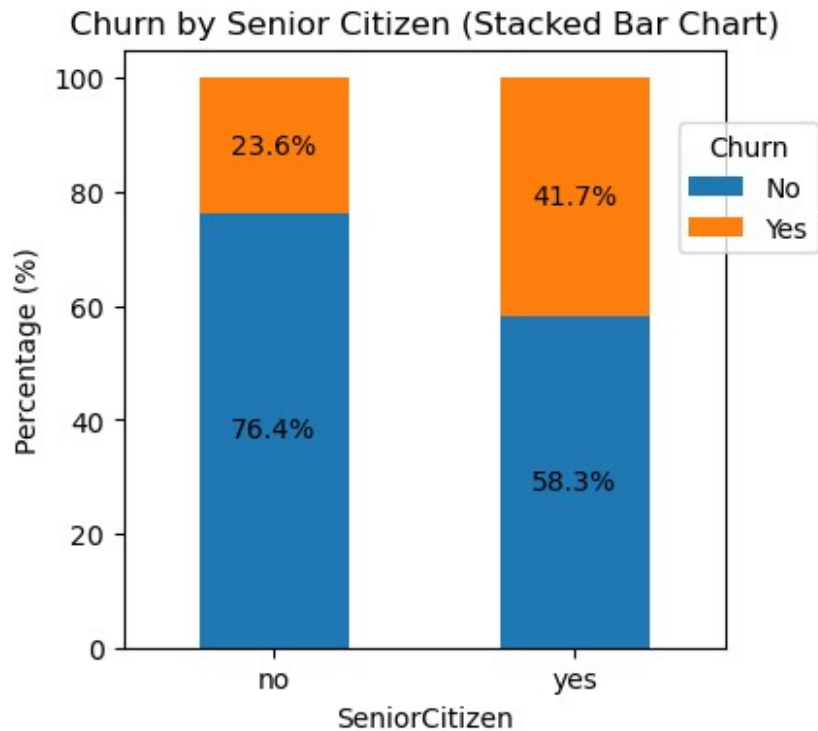
# Plot
fig, ax = plt.subplots(figsize=(4, 4)) # Adjust figsize for better
visualization

# Plot the bars
total_counts.plot(kind='bar', stacked=True, ax=ax, color=['#1f77b4',
'#ff7f0e']) # Customize colors if desired

# Add percentage labels on the bars
for p in ax.patches:
    width, height = p.get_width(), p.get_height()
    x, y = p.get_xy()
    ax.text(x + width / 2, y + height / 2, f'{height:.1f}%',
ha='center', va='center')

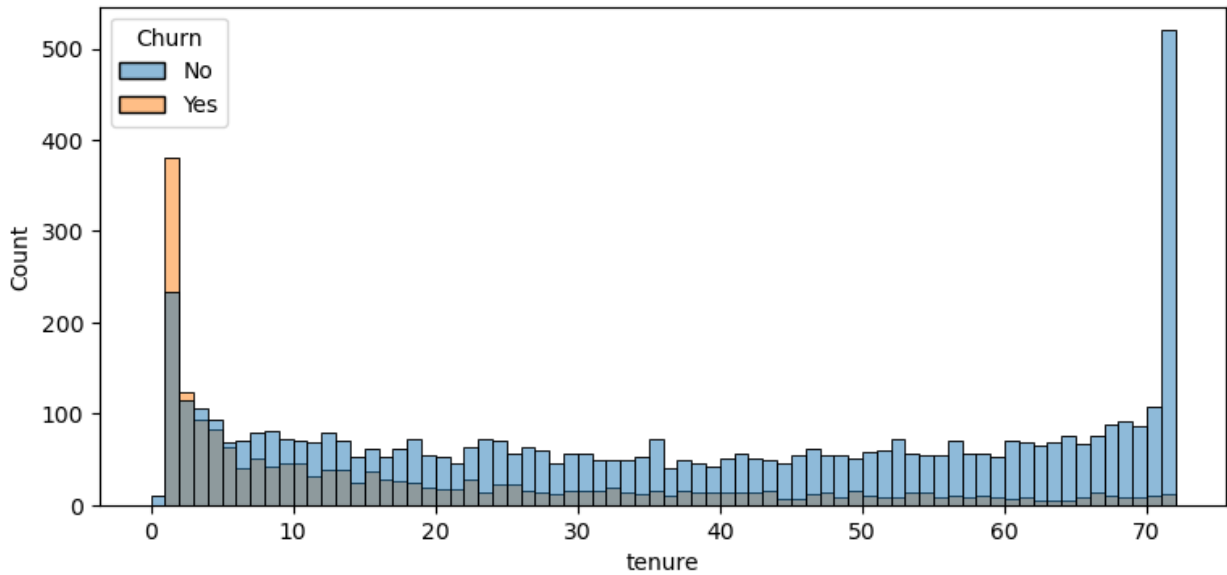
plt.title('Churn by Senior Citizen (Stacked Bar Chart)')
plt.xlabel('SeniorCitizen')
plt.ylabel('Percentage (%)')
```

```
plt.xticks(rotation=0)
plt.legend(title='Churn', bbox_to_anchor = (0.9,0.9)) # Customize
legend location
plt.show()
```



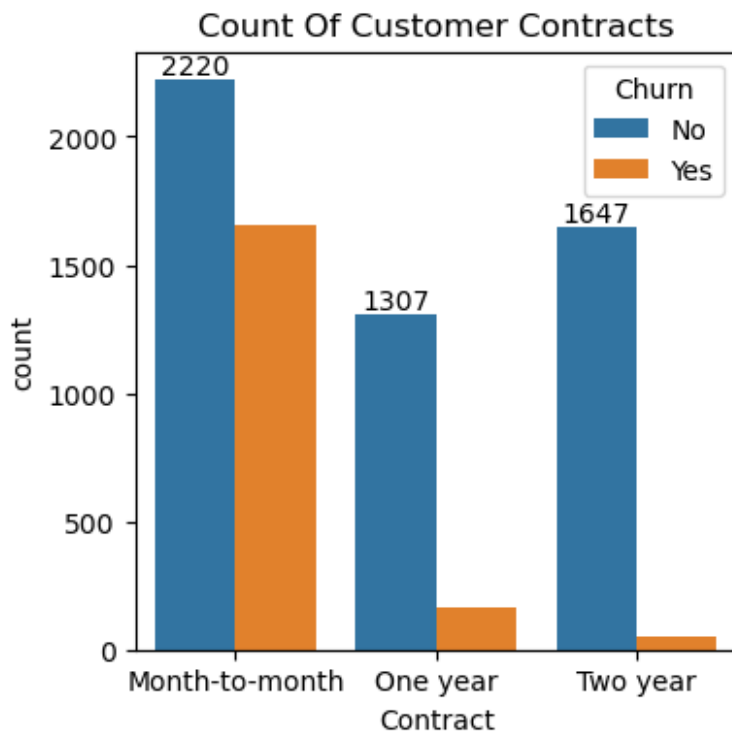
#comparative a greater percentage of People in senior citizen category have churned.

```
plt.figure(figsize=(9,4))
sns.histplot(x='tenure',data=df,bins=72,hue='Churn')
plt.show()
```



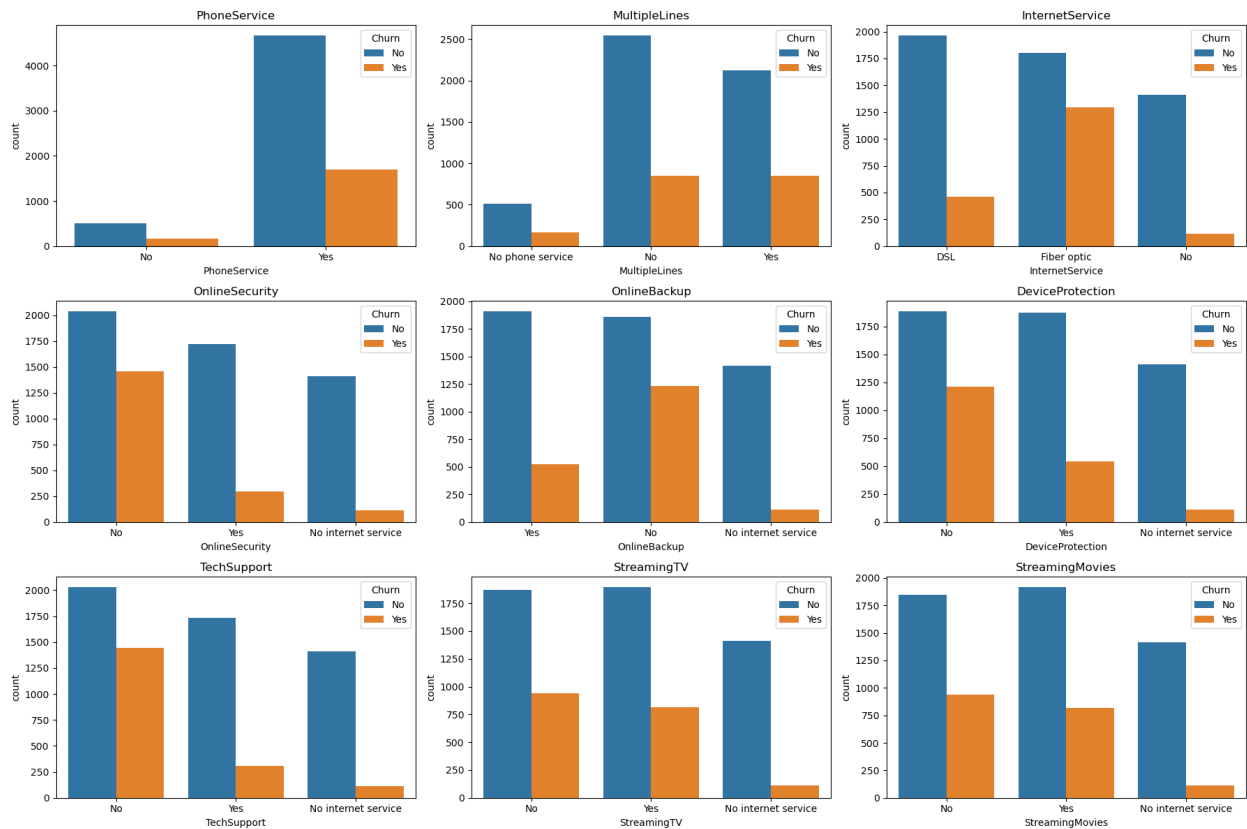
People who have use our services for long period of time have stayed and still used our services and people who use our short term services (for 1-2 moths) have churned

```
plt.figure(figsize=(4,4))
ax=sns.countplot(x="Contract",data=df,hue="Churn")
ax.bar_label(ax.containers[0])
plt.title("Count Of Customer Contracts")
plt.show()
```



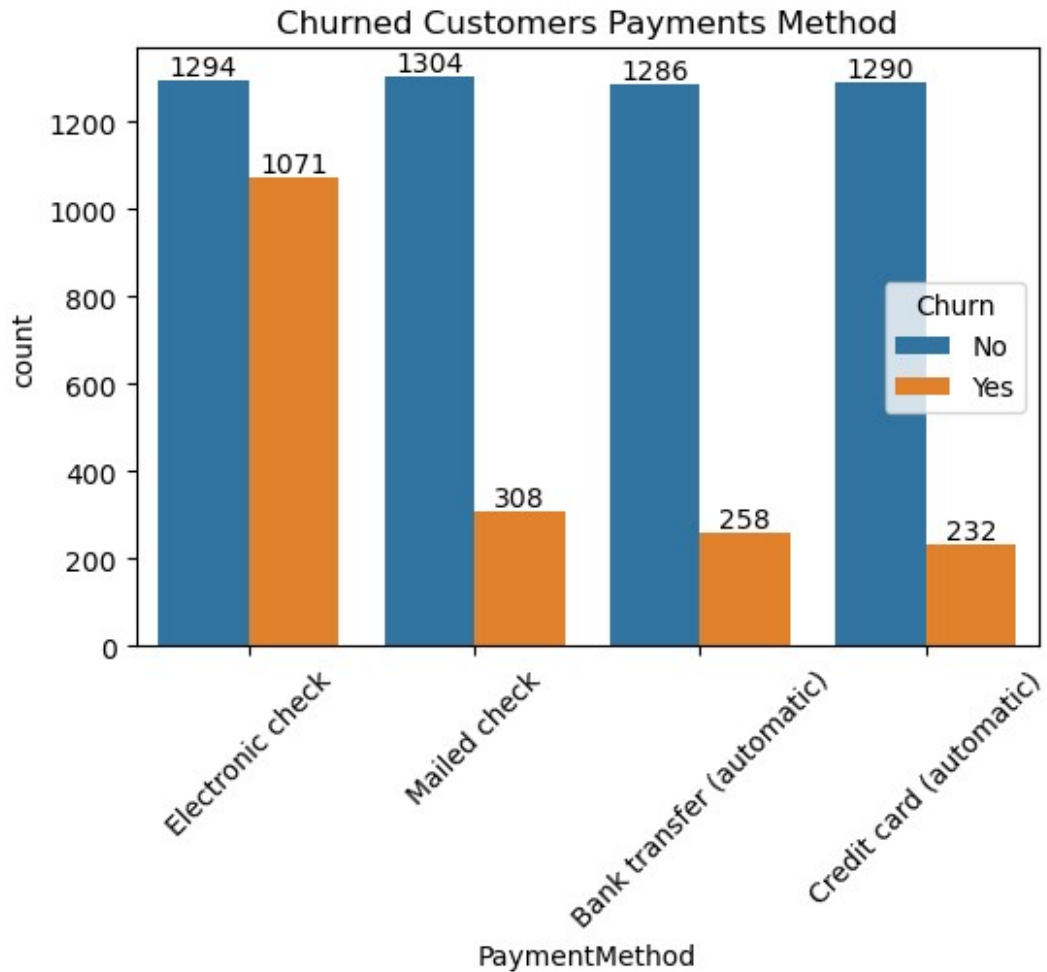
People who have One year or more Than one Year Contract are likely to stay with our services  
But People who get short term contract(on Monthly basis) their chances more likely to churn

```
df.columns.values  
array(['customerID', 'gender', 'SeniorCitizen', 'Partner',  
      'Dependents',  
      'tenure', 'PhoneService', 'MultipleLines', 'InternetService',  
      'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',  
      'TechSupport', 'StreamingTV', 'StreamingMovies', 'Contract',  
      'PaperlessBilling', 'PaymentMethod', 'MonthlyCharges',  
      'TotalCharges', 'Churn'], dtype=object)  
  
# Sample dataframe (replace this with your actual dataset)  
# df = pd.read_csv("your_file.csv")  
  
# Your target columns  
cols = [  
    'PhoneService', 'MultipleLines', 'InternetService',  
    'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',  
    'TechSupport', 'StreamingTV', 'StreamingMovies'  
]  
  
# Define subplot grid  
rows = 3  
cols_per_row = 3  
fig, axes = plt.subplots(rows, cols_per_row, figsize=(18, 12))  
axes = axes.flatten() # Flatten for easy indexing  
  
# Create a countplot for each column  
for idx, column in enumerate(cols):  
    sns.countplot(data=df, x=column, ax=axes[idx], hue='Churn')  
    axes[idx].set_title(column)  
    axes[idx].tick_params(axis='x', rotation=0)  
  
# Hide any unused subplots (if any)  
for i in range(len(cols), len(axes)):  
    fig.delaxes(axes[i])  
  
plt.tight_layout()  
plt.show()
```



Customers using Fiber optic Internet, and those without OnlineSecurity or TechSupport, show the highest churn rates, indicating these are major churn drivers. Services like dsl internet service, OnlineBackup and DeviceProtection are linked to lower churn, helping with retention. Features like StreamingTV/Movies and MultipleLines show moderate impact, while PhoneService has minimal effect on churn behavior.

```
plt.figure(figsize=(6,4))
ax= sns.countplot(x="PaymentMethod",data=df,hue='Churn')
ax.bar_label(ax.containers[0])
ax.bar_label(ax.containers[1])
plt.xticks(rotation=45)
plt.title("Churned Customers Payments Method")
plt.show()
```



Customers who uses Electronic Checks as paymentMethod has more likely to Churned

#### Key Takeaways

- Focus on long-term contracts to reduce churn.
- Encourage adoption of security, tech support, and device protection services.
- Re-evaluate packages for Fiber Optic users to enhance satisfaction.
- Add more personalization or support for users of entertainment services to improve retention.