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

df = pd.read_csv("Customer Churn.csv")
df.head(5)
```

```
   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-CFOCW    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
```

#there are some blank values in totalcharges so we replaced with 0 and change the datatype to float

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

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   float64
 20  Churn             7043 non-null   object 
dtypes: float64(2), int64(2), object(17)
memory usage: 1.1+ MB
```

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

```
np.int64(0)
```

```
df.describe()
```

```
       SeniorCitizen       tenure  MonthlyCharges  TotalCharges
count    7043.000000  7043.000000     7043.000000   7043.000000
mean        0.162147    32.371149       64.761692   2279.734304
std         0.368612    24.559481       30.090047   2266.794470
min         0.000000     0.000000       18.250000      0.000000
25%         0.000000     9.000000       35.500000    398.550000
50%         0.000000    29.000000       70.350000   1394.550000
75%         0.000000    55.000000       89.850000   3786.600000
max         1.000000    72.000000      118.750000   8684.800000
```

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

```
np.int64(0)
```

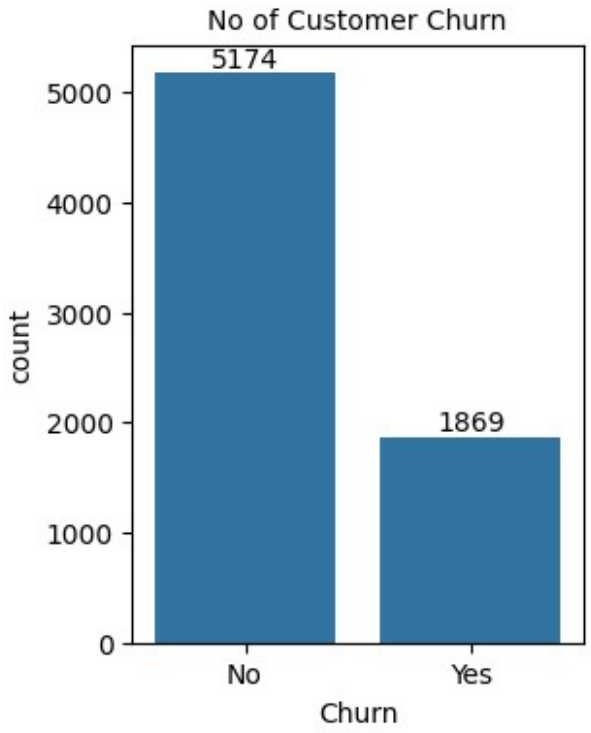
```
df["customerID"].duplicated().sum()
```

```
np.int64(0)
```

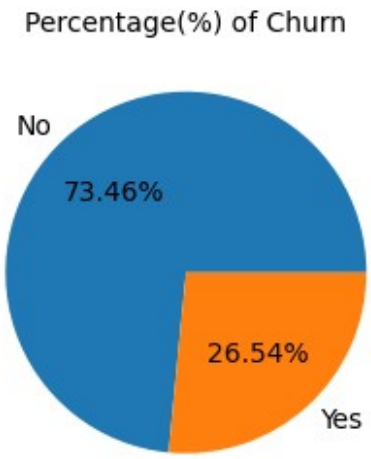
```
def conv(value):
    if value == 1:
        return "yes"
    else:
        return "no"

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

#coverted the 0 annd 1 values of senior citizen with yes and no

```
plt.figure(figsize=(3,4))
ax = sns.countplot(data = df , x = "Churn")

ax.bar_label(ax.containers[0])
plt.title("No of Customer Churn",fontsize = 10)
plt.show()
```

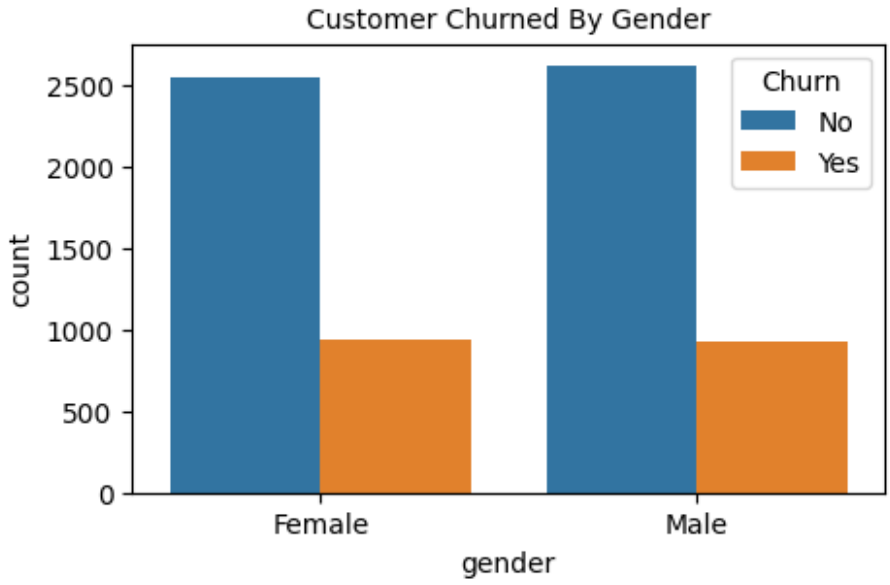



```
plt.figure(figsize=(3,4))
gb = df.groupby("Churn").agg({"Churn":"count"})
plt.pie(gb["Churn"],labels=gb.index,autopct="%1.2f%%")
plt.title("Percentage(%) of Churn",fontsize = 10)
plt.show()
```



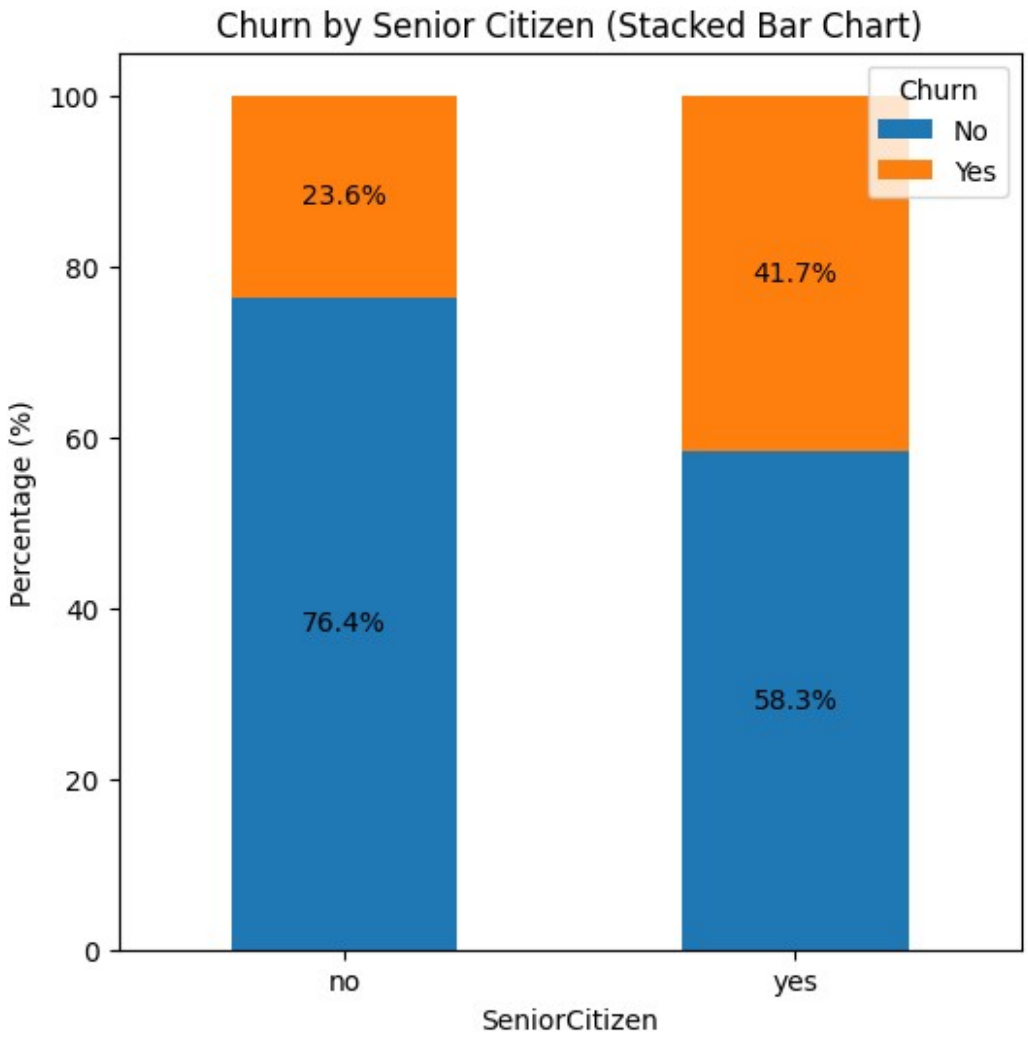
- from the given pie chart we can conclude that 26.54% of our customer churned out

```
plt.figure(figsize=(5,3))
sns.countplot(data = df , x = "gender", hue="Churn")
plt.title("Customer Churned By Gender", fontsize = 10)
plt.show()
```



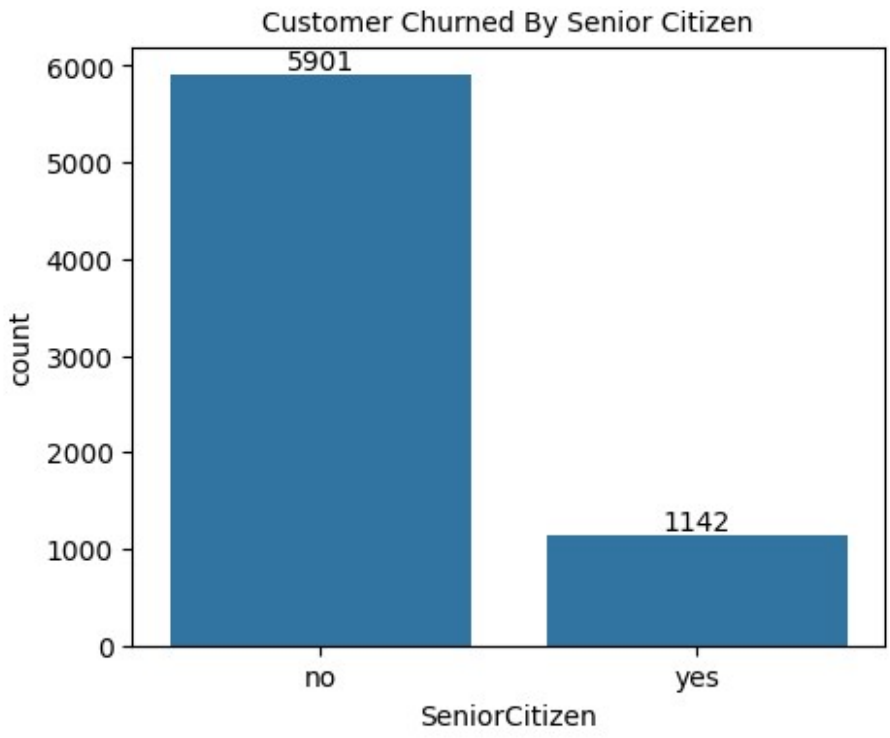

```
# Group the data by 'SeniorCitizen' and calculate churn percentages
total_counts = df.groupby('SeniorCitizen')
['Churn'].value_counts(normalize=True).unstack() * 100

# Set up the figure and axis with a specified size
fig, ax = plt.subplots(figsize=(6, 6))  # Adjust figsize for better
visualization
```

```
# Plot the bars with a stacked bar chart, using custom colors
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')

# Customize the chart labels and legend
plt.title('Churn by Senior Citizen (Stacked Bar Chart)')
plt.xlabel('SeniorCitizen')
plt.ylabel('Percentage (%)')
plt.xticks(rotation=0)
plt.legend(title='Churn', loc='upper right')  # Customize Legend
Location

plt.show()
```



- Comparative a greater percentage of people in senior category have churned out

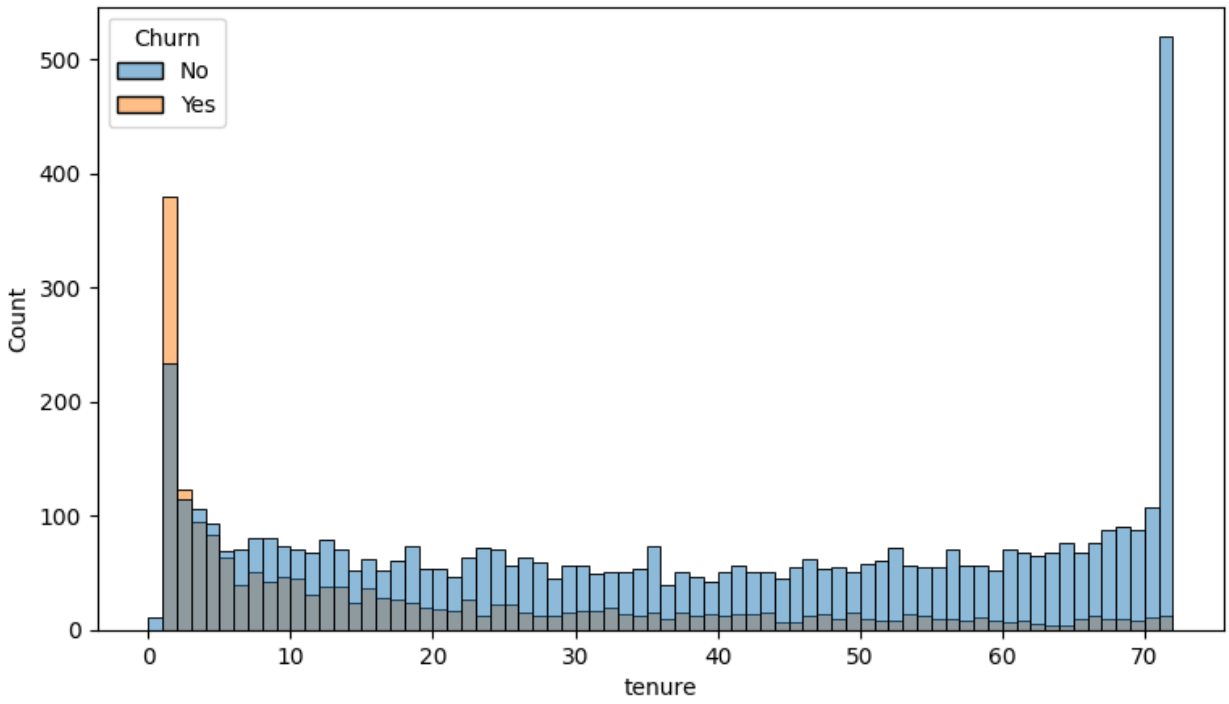
```
plt.figure(figsize=(5,4))
ax=sns.countplot(data = df , x = "SeniorCitizen" )
ax.bar_label(ax.containers[0])
plt.title("Customer Churned By Senior Citizen", fontsize = 10)
plt.show()
```



*this needs to be fixed because the sinior cotizen data is not found

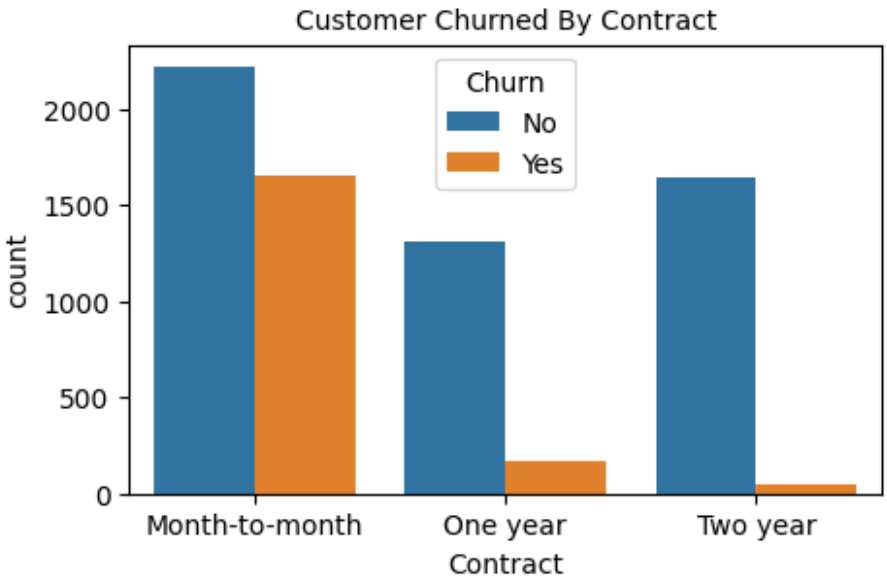
```
plt.figure(figsize =(9,5))
sns.histplot( data = df , x ="tenure",bins = 72 , hue = "Churn")
plt.show
```

```
<function matplotlib.pyplot.show(close=None, block=None)>
```



- people who have used our servies for a long time have styed and people who have used our servies for short time have churned out

```
plt.figure(figsize=(5,3))
sns.countplot(data = df , x = "Contract", hue="Churn")
plt.title("Customer Churned By Contract", fontsize = 10)
plt.show()
```

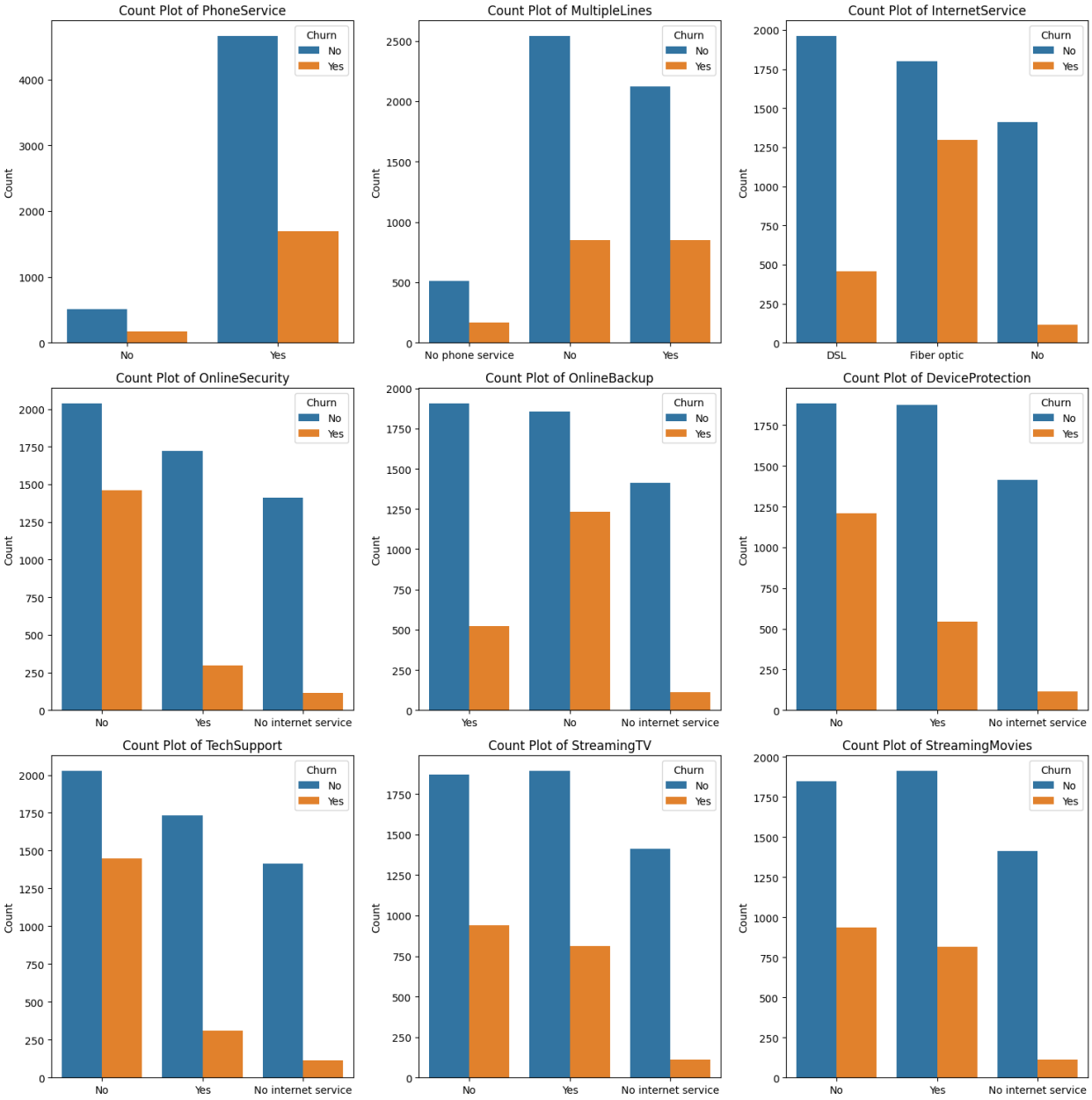


- most of the customer who have churned is on monthly contract
- we can covence them to take longer tenure contrcat

```
df.columns.values
```

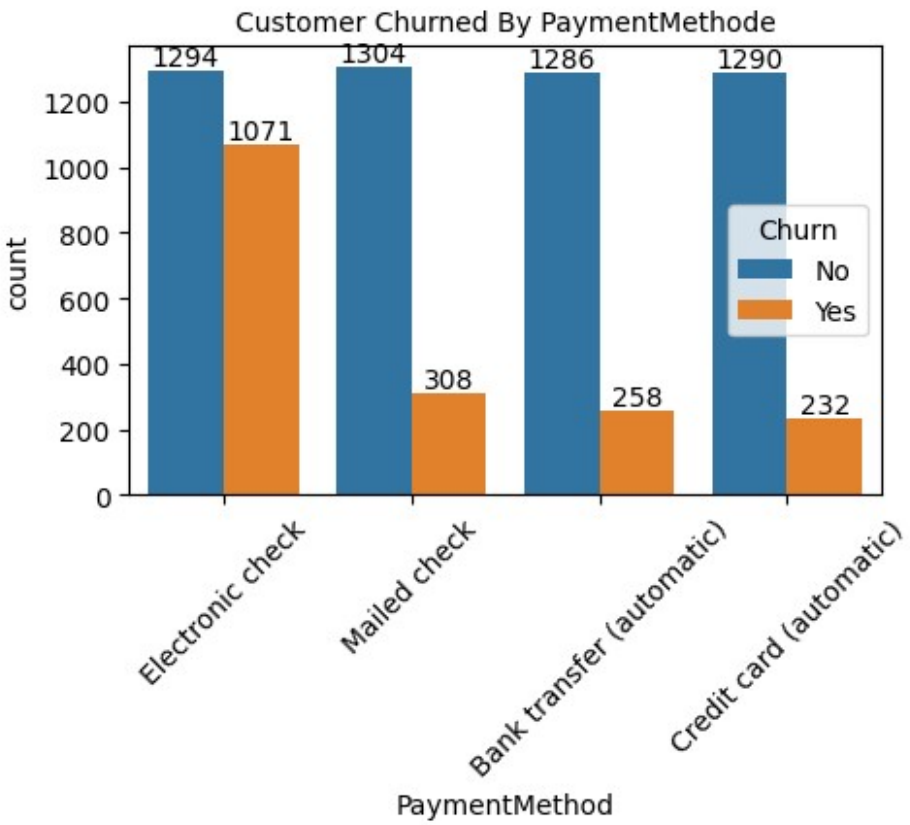
```
array(['customerID', 'gender', 'SeniorCitizen', 'Partner',
'Dependents',
       'tenure', 'PhoneService', 'MultipleLines', 'InternetService',
       'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
       'TechSupport', 'StreamingTV', 'StreamingMovies', 'Contract',
       'PaperlessBilling', 'PaymentMethod', 'MonthlyCharges',
       'TotalCharges', 'Churn'], dtype=object)
```

```
import matplotlib.pyplot as plt
import seaborn as sns

# List of columns for which we want to create count plots
columns = [
    'PhoneService', 'MultipleLines', 'InternetService',
    'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
    'TechSupport', 'StreamingTV', 'StreamingMovies'
]

# Set up the figure size and grid layout for subplots
fig, axes = plt.subplots(nrows=3, ncols=3, figsize=(15, 15))  # Adjust
rows and columns based on the number of columns

# Flatten the axes array for easy iteration
axes = axes.flatten()

# Loop through each column and create a count plot
for i, col in enumerate(columns):
    sns.countplot(data=df, x=col, ax=axes[i], hue = df["Churn"])  #
Create a count plot for each column
    axes[i].set_title(f'Count Plot of {col}')  # Set the title for
each subplot
    axes[i].set_xlabel('')  # Optionally remove x-axis label for
clarity
    axes[i].set_ylabel('Count')  # Set y-axis label

# Adjust layout for better spacing between plots
plt.tight_layout()

# Display the plots
plt.show()
```



- The majority of customers who do not churn tend to havee servies like PhoneService, InternateService(Particularly,DSL) and OnilneSecurity enabled.For servies like OnlineBackup, TechSupport and StreamingTV, churn rate is noticeably higher when these servises not used or Unavilable.

```
plt.figure(figsize=(5,3))
ax=sns.countplot(data = df , x = "PaymentMethod", hue = "Churn" )
ax.bar_label(ax.containers[0])
ax.bar_label(ax.containers[1])
plt.title("Customer Churned By PaymentMethode", fontsize = 10)
plt.xticks(rotation = 45)
plt.show()
```



- Customer more likely to churn when they are using electronic checks as payment methode