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

df = pd.read_csv(r'C:\Users\scs\Downloads\Customer-Churn-analysis-
main\Customer Churn.csv')
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-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
```

Replace blanks with 0 as tenure is 0

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

df.info()

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RangeIndex: 7043 entries, 0 to 7042
Data columns (total 21 columns):
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```

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 10  OnlineBackup      7043 non-null   object
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 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()
```

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

```
0
```

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

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

Converted 0 and 1 as yes and no respectively of SeniorCitizen Column for easier to understand

```
df.head()

   customerID  gender SeniorCitizen Partner Dependents  tenure
PhoneService  \
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No
1  5575-GNVDE    Male            no      No         No      34
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  TechSupport StreamingTV StreamingMovies        Contract
PaperlessBilling  \
0          No          No              No  Month-to-month
Yes
1          No          No              No        One year
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2          No          No              No  Month-to-month
Yes
3         Yes          No              No        One year
No
4          No          No              No  Month-to-month
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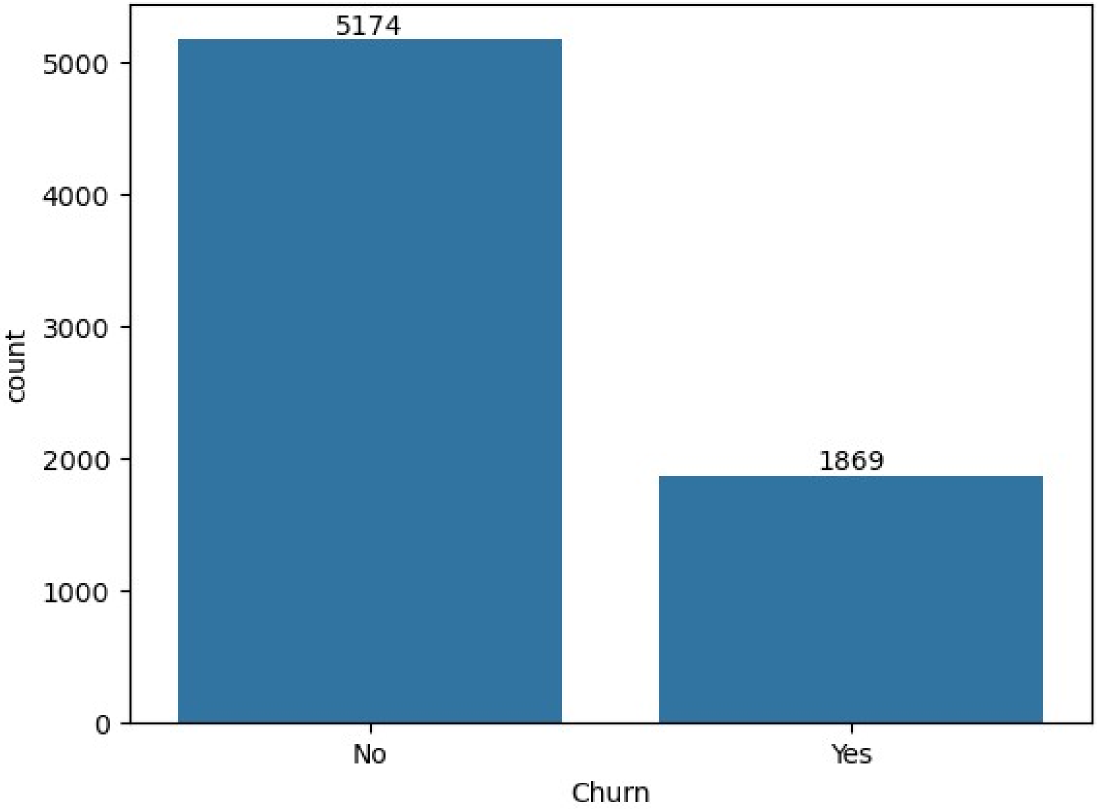
```

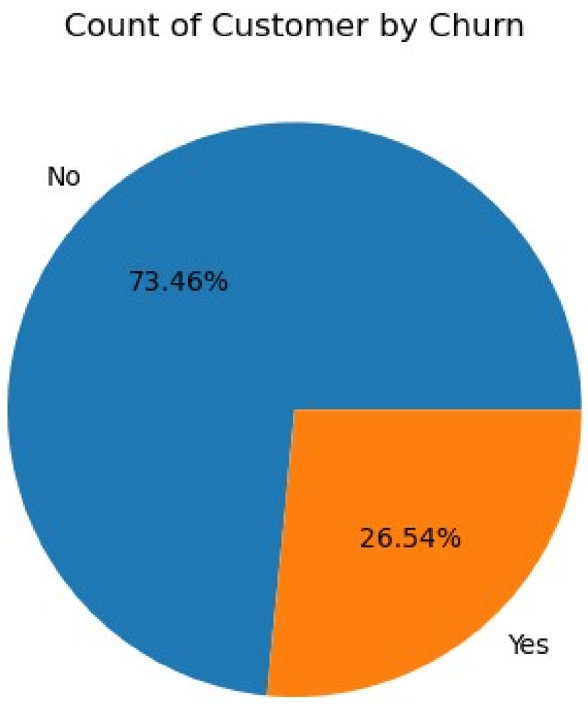
```
                PaymentMethod MonthlyCharges  TotalCharges  Churn
0            Electronic check          29.85         29.85     No
1                Mailed check          56.95       1889.50     No
2                Mailed check          53.85        108.15    Yes
3   Bank transfer (automatic)          42.30       1840.75     No
4            Electronic check          70.70        151.65    Yes

[5 rows x 21 columns]
```

```
ax = sns.countplot(x = "Churn", data = df)
ax.bar_label(ax.containers[0]);
```



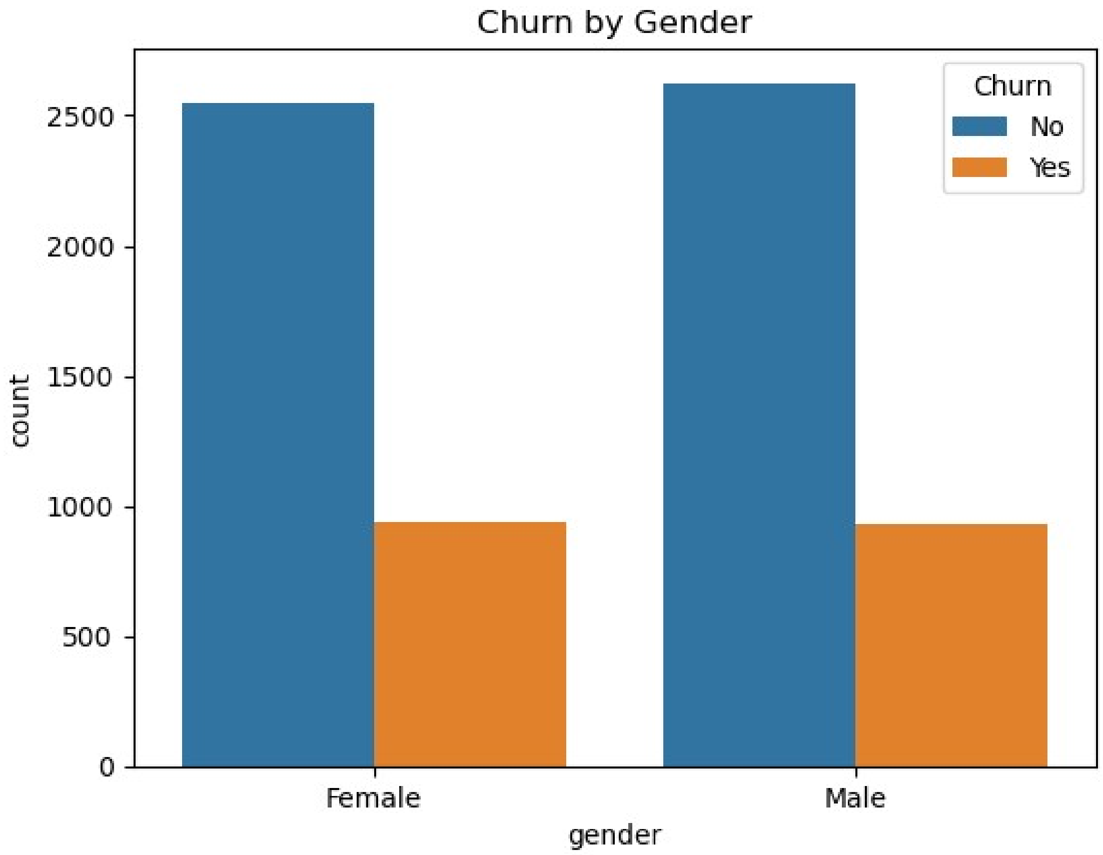
```
gb = df["Churn"].value_counts()
plt.title("Percentage of Churn")
plt.title("Count of Customer by Churn")
plt.pie(gb,labels = gb.index, autopct = "%.2f%%");
```



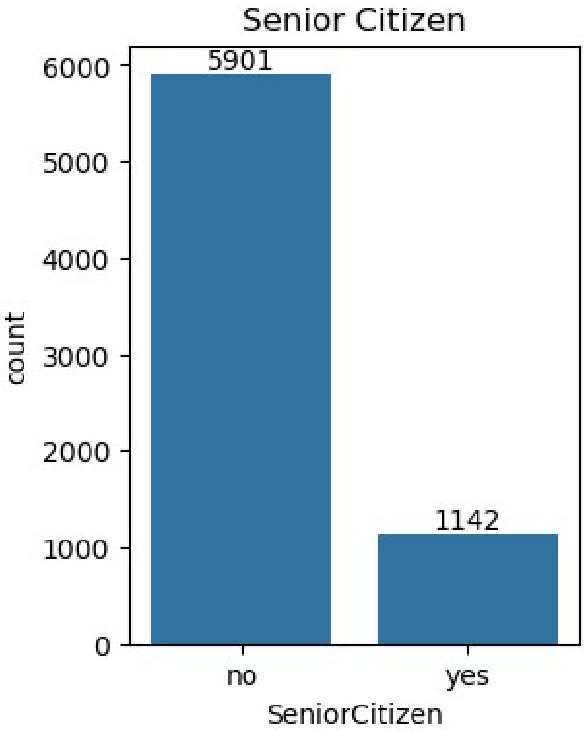
from the given pie chart we can conclude that 26.54% of customers have churned out

now lets explore the reason behind it

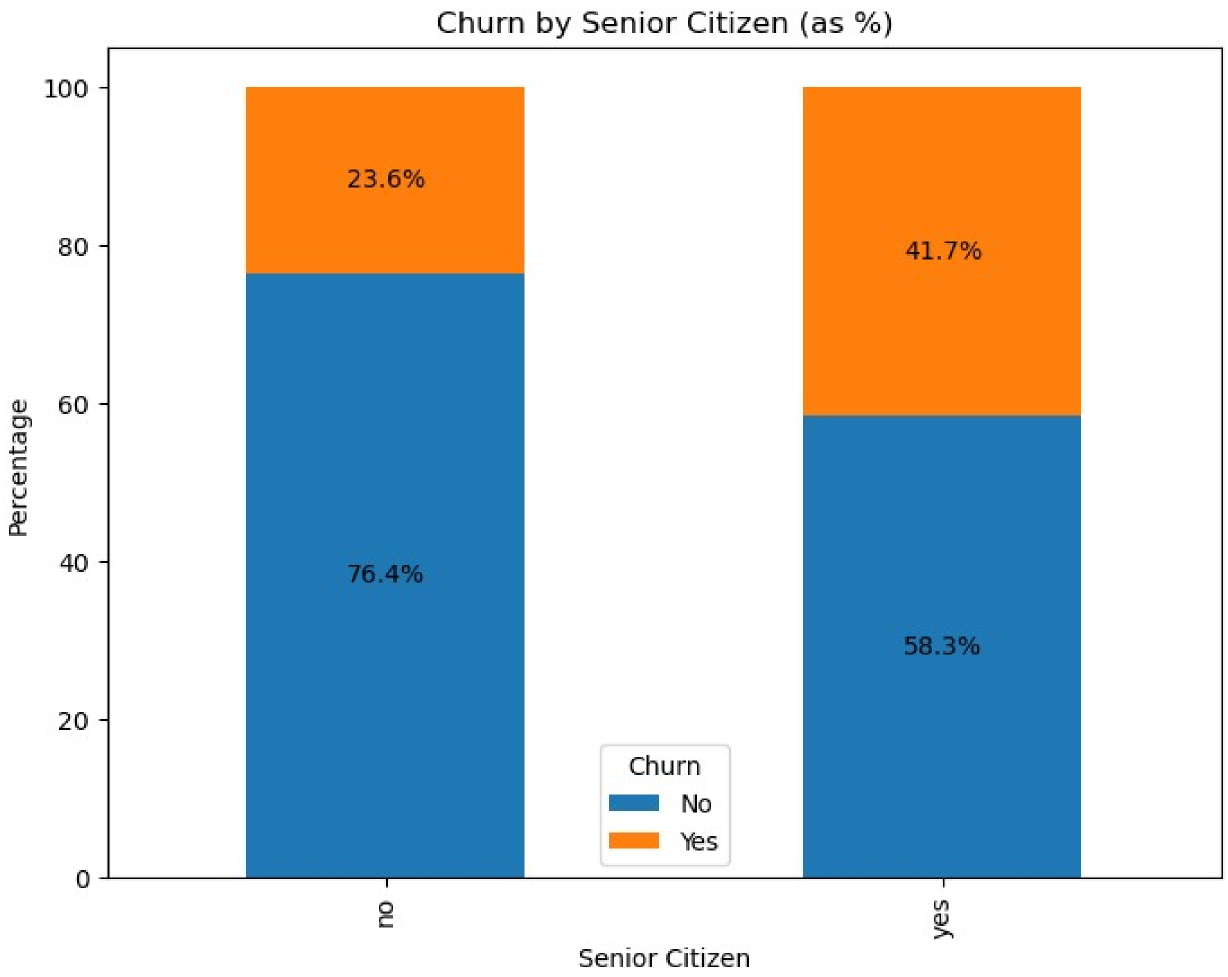
```
ax = sns.countplot(x = "gender", data = df, hue = "Churn")
plt.title("Churn by Gender")
plt.show()
```



```python
plt.figure(figsize = (3,4))
ax = sns.countplot(x = "SeniorCitizen", data = df)
ax.bar_label(ax.containers[0]);
plt.title("Senior Citizen")
plt.show()
```

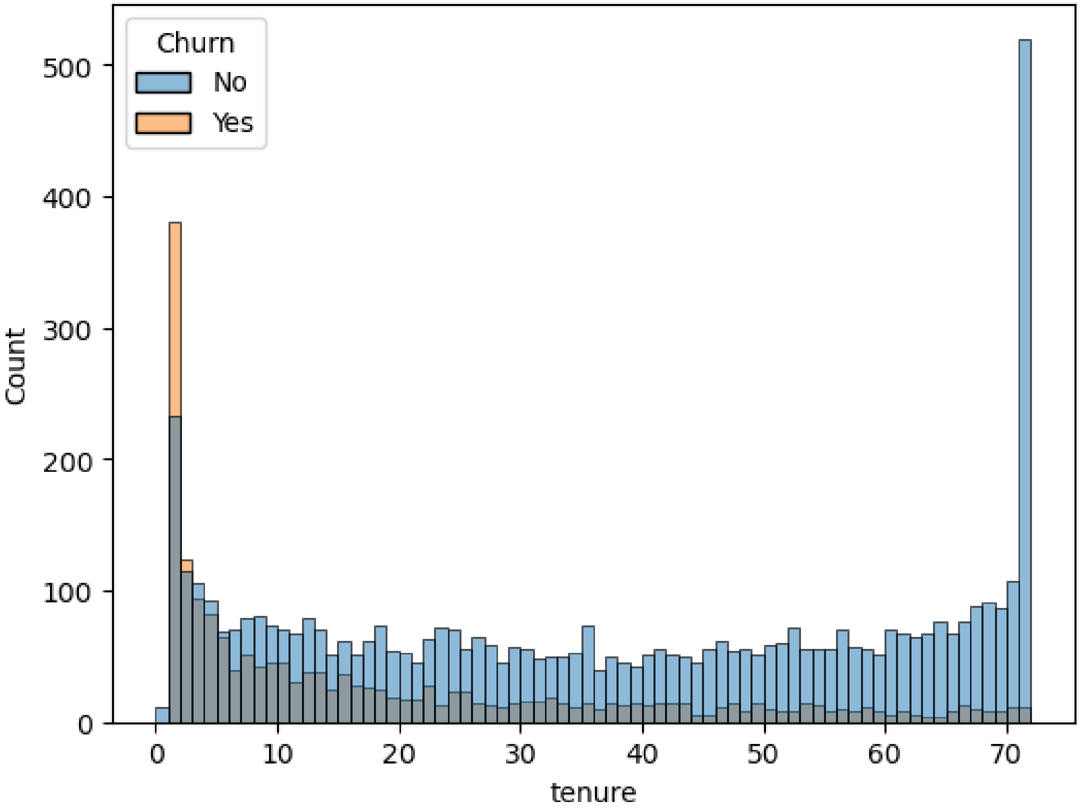


```python
# Calculate the percentage of Churn for Senior Citizens and Non-Senior Citizens
churn_counts = df.groupby(["SeniorCitizen", "Churn"]).size().unstack()
churn_percent = churn_counts.div(churn_counts.sum(axis=1), axis=0) * 100

# Plot the stacked bar chart
fig, ax = plt.subplots(figsize=(8, 6))
churn_percent.plot(kind='bar', stacked=True, color=['#1f77b4', '#ff7f0e'], ax=ax)

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

# Title and labels
plt.title("Churn by Senior Citizen (as %)")
plt.xlabel("Senior Citizen")
plt.ylabel("Percentage")
plt.legend(title="Churn", labels=["No", "Yes"])
plt.show()
```



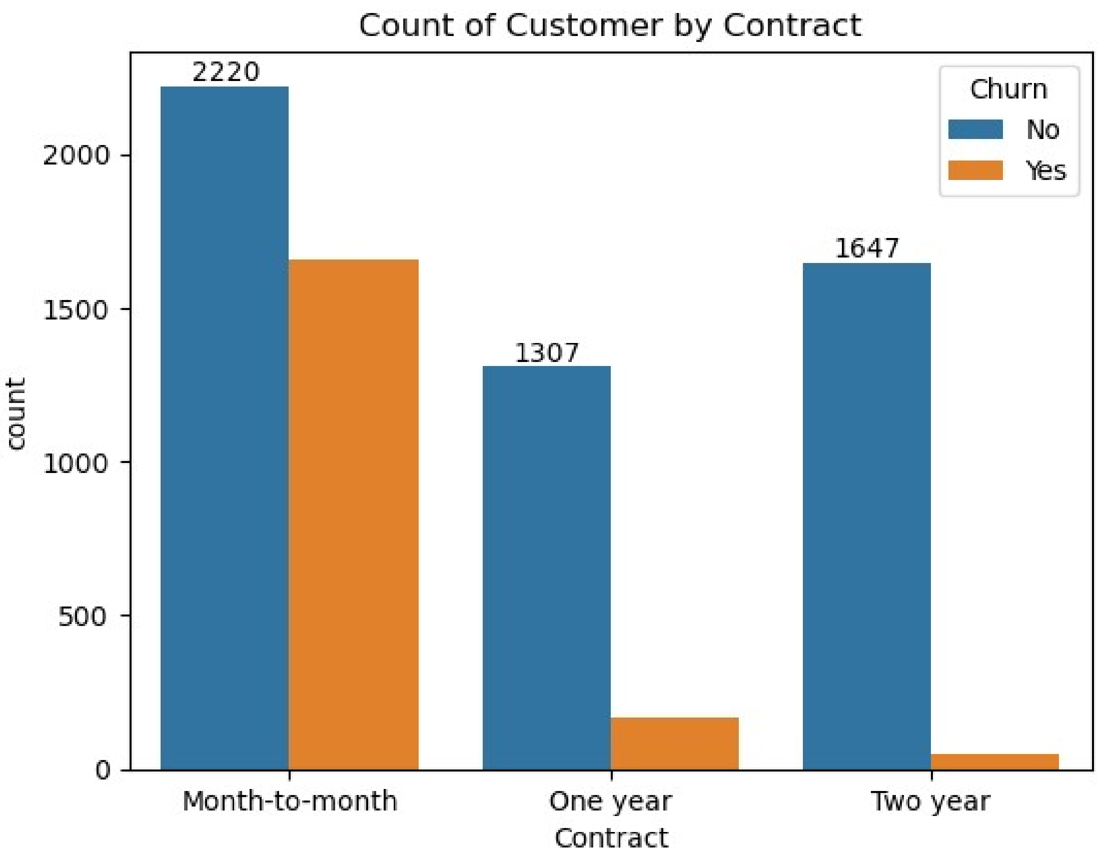
Comparetively a greater percentage of people in senior citizen category have curned.

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



People who have used our services for a long time have stayed and people who have used our services for 1 or 2 months have churned.

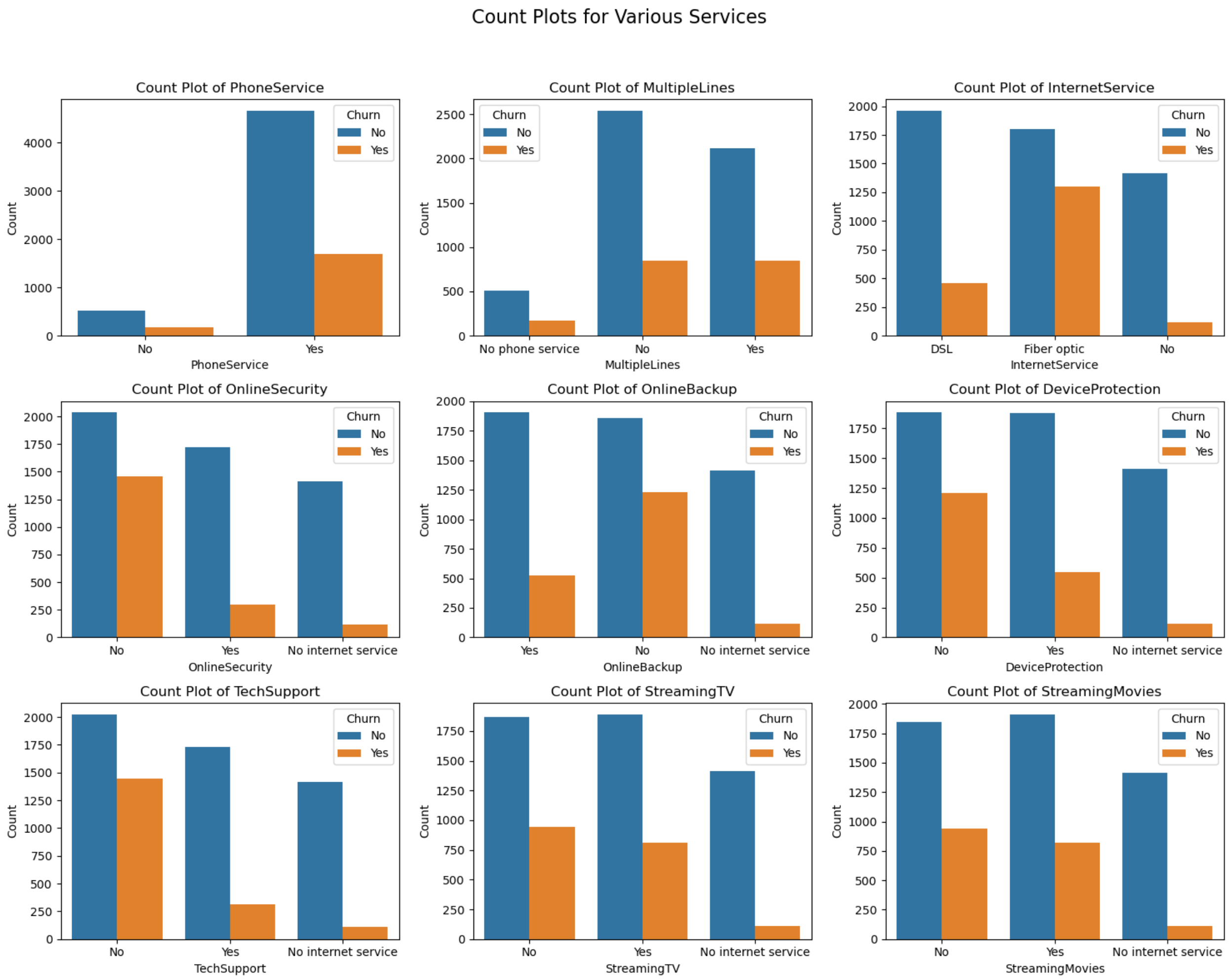
```
ax = sns.countplot(x = "Contract", data = df, hue = "Churn")
ax.bar_label(ax.containers[0])
plt.title("Count of Customer by Contract")
plt.show()
```



People who have month to month contract are likely to churn than from those who have one or two years of contract.

```
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)

# List of columns to plot
columns = ['PhoneService', 'MultipleLines', 'InternetService',
           'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
           'TechSupport', 'StreamingTV', 'StreamingMovies']

# Set up the figure and axes for subplots
```

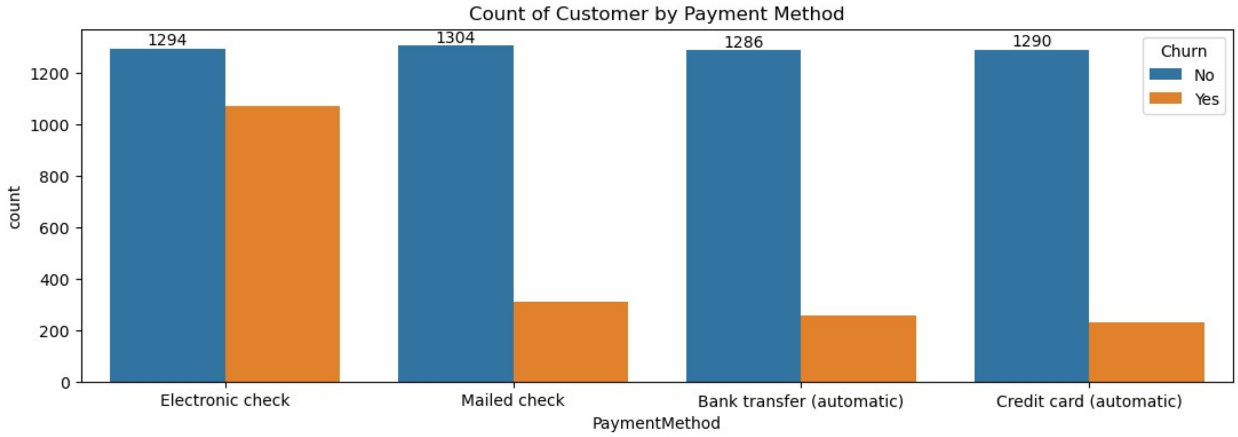
```python
fig, axes = plt.subplots(nrows=3, ncols=3, figsize=(15, 12))  # Adjust rows and columns as needed
fig.suptitle("Count Plots for Various Services", fontsize=16)

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

# Loop over each column and create a count plot
for i, col in enumerate(columns):
    sns.countplot(x=col, data=df, ax=axes[i], hue = "Churn")
    axes[i].set_title(f'Count Plot of {col}')
    axes[i].set_xlabel(col)  # Add x-label for each plot
    axes[i].set_ylabel('Count')

# Hide any unused subplots (in case the number of plots is less than rows*cols)
for j in range(i + 1, len(axes)):
    fig.delaxes(axes[j])

plt.tight_layout(rect=[0, 0, 1, 0.95])  # Adjust layout for title
plt.show()
```



Summary of the Count Plots:

Phone Service & Multiple Lines: Most customers have phone service, and churn is more prominent among those who have no phone service or multiple lines. Internet Services: Customers with fiber optic internet service have higher churn compared to DSL users, indicating potential dissatisfaction. Online Services (Security, Backup, Device Protection, Tech Support): Churn is significantly higher among customers who do not subscribe to these services, highlighting their importance in customer retention. Streaming Services (TV & Movies): Customers without streaming services tend to churn less compared to those with access to streaming TV or movies.

```
plt.figure(figsize = (13,4))
ax = sns.countplot(x = "PaymentMethod", data = df, hue = "Churn")
ax.bar_label(ax.containers[0])
plt.title("Count of Customer by Payment Method")
plt.show()
```



Customers are likely to churn when they using Electronic Check as a payment method.