```
import seaborn as sns
print("Seaborn is working!")

Seaborn is working!

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

df = pd.read_csv('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
```

#replacing blanks 0 as tenure is 0 and no total charges are recorded

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

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

```
def conv(x):
    # Example conversion logic
    return "Yes" if x == 1 else "No"

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

#converted 0 and 1 value of senior citizen to yes/no to make it easier to understand

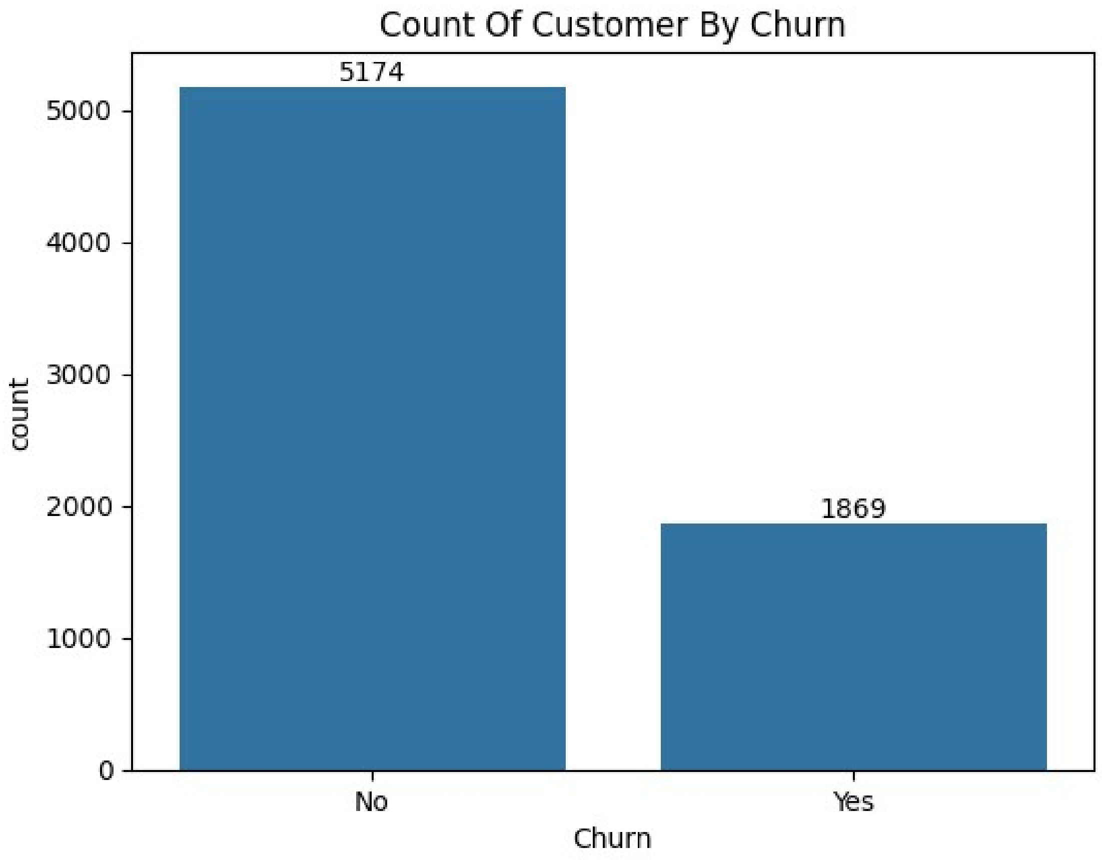
```
df.head(21)

    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   
5   9305-CDSKC  Female              0      No         No       8 
Yes   
6   1452-KIOVK    Male              0      No        Yes      22 
Yes   
7   6713-OKOMC  Female              0      No         No      10 
No   
8   7892-POOKP  Female              0     Yes         No      28 
Yes   
9   6388-TABGU    Male              0      No        Yes      62 
Yes   
10  9763-GRSKD    Male              0     Yes        Yes      13 
Yes   
11  7469-LKBCI    Male              0      No         No      16 
Yes   
12  8091-TTVAX    Male              0     Yes         No      58 
Yes   
13  0280-XJGEX    Male              0      No         No      49 
Yes   
14  5129-JLPIS    Male              0      No         No      25 
Yes   
15  3655-SNQYZ  Female              0     Yes        Yes      69 
Yes   
16  8191-XWSZG  Female              0      No         No      52 
Yes   
17  9959-WOFKT    Male              0      No        Yes      71 
Yes   
18  4190-MFLUW  Female              0     Yes        Yes      10 
Yes   
19  4183-MYFRB  Female              0      No         No      21 
```

```
Yes
20  8779-QRDMV    Male              1      No          No       1
No

       MultipleLines InternetService       OnlineSecurity  ...  \
0   No phone service             DSL                   No  ...
1                 No             DSL                  Yes  ...
2                 No             DSL                  Yes  ...
3   No phone service             DSL                  Yes  ...
4                 No     Fiber optic                   No  ...
5                Yes     Fiber optic                   No  ...
6                Yes     Fiber optic                   No  ...
7   No phone service             DSL                  Yes  ...
8                Yes     Fiber optic                   No  ...
9                 No             DSL                  Yes  ...
10                No             DSL                  Yes  ...
11                No              No  No internet service  ...
12               Yes     Fiber optic                   No  ...
13               Yes     Fiber optic                   No  ...
14                No     Fiber optic                  Yes  ...
15               Yes     Fiber optic                  Yes  ...
16                No              No  No internet service  ...
17               Yes     Fiber optic                  Yes  ...
18                No             DSL                   No  ...
19                No     Fiber optic                   No  ...
20  No phone service             DSL                   No  ...

       DeviceProtection          TechSupport          StreamingTV  \
0                    No                   No                   No
1                   Yes                   No                   No
2                    No                   No                   No
3                   Yes                  Yes                   No
4                    No                   No                   No
5                   Yes                   No                  Yes
6                    No                   No                  Yes
7                    No                   No                   No
8                   Yes                  Yes                  Yes
9                    No                   No                   No
10                   No                   No                   No
11  No internet service  No internet service  No internet service
12                  Yes                   No                  Yes
13                  Yes                   No                  Yes
14                  Yes                  Yes                  Yes
15                  Yes                  Yes                  Yes
16  No internet service  No internet service  No internet service
17                  Yes                   No                  Yes
18                  Yes                  Yes                   No
19                  Yes                   No                   No
20                  Yes                   No                   No
```

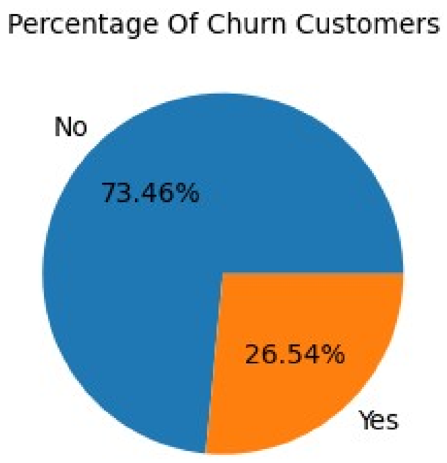
```
       StreamingMovies        Contract PaperlessBilling  \
0                   No  Month-to-month              Yes
1                   No        One year               No
2                   No  Month-to-month              Yes
3                   No        One year               No
4                   No  Month-to-month              Yes
5                  Yes  Month-to-month              Yes
6                   No  Month-to-month              Yes
7                   No  Month-to-month               No
8                  Yes  Month-to-month              Yes
9                   No        One year               No
10                  No  Month-to-month              Yes
11 No internet service        Two year               No
12                 Yes        One year               No
13                 Yes  Month-to-month              Yes
14                 Yes  Month-to-month              Yes
15                 Yes        Two year               No
16 No internet service        One year               No
17                 Yes        Two year               No
18                  No  Month-to-month               No
19                 Yes  Month-to-month              Yes
20                 Yes  Month-to-month              Yes

                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            Electronic check          99.65        820.50    Yes
6     Credit card (automatic)          89.10       1949.40     No
7                Mailed check          29.75        301.90     No
8            Electronic check         104.80       3046.05    Yes
9   Bank transfer (automatic)          56.15       3487.95     No
10               Mailed check          49.95        587.45     No
11    Credit card (automatic)          18.95        326.80     No
12    Credit card (automatic)         100.35       5681.10     No
13  Bank transfer (automatic)         103.70       5036.30    Yes
14           Electronic check         105.50       2686.05     No
15    Credit card (automatic)         113.25       7895.15     No
16               Mailed check          20.65       1022.95     No
17  Bank transfer (automatic)         106.70       7382.25     No
18    Credit card (automatic)          55.20        528.35    Yes
19           Electronic check          90.05       1862.90     No
20           Electronic check          39.65         39.65    Yes

[21 rows x 21 columns]
```

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

```
ax.bar_label(ax.containers[0])
plt.title("Count Of Customer By Churn")
plt.show()
```



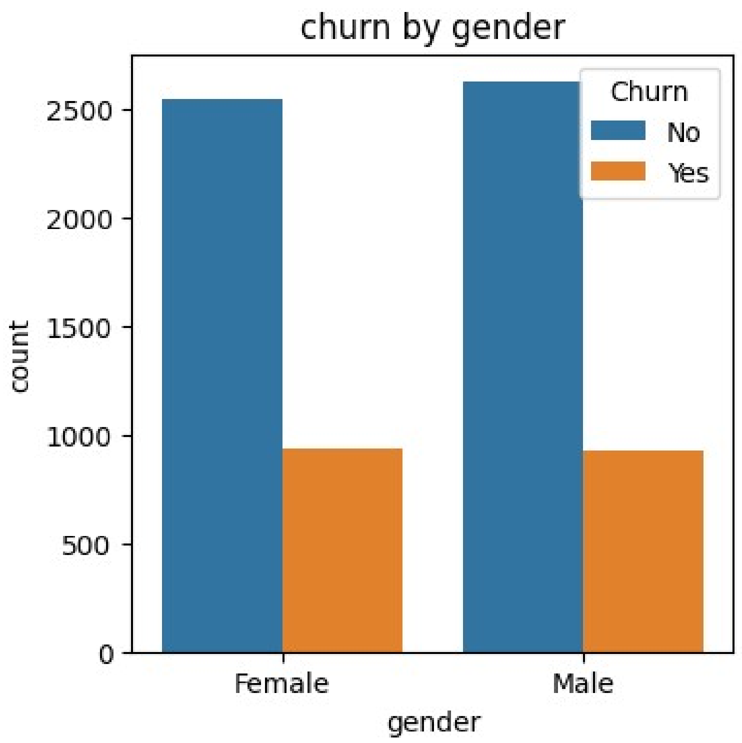
```
plt.figure(figsize = (3,4))
gb = df.groupby("Churn").agg({'Churn':"count"})
plt.pie(gb['Churn'], labels = gb.index, autopct = "%1.2f%%")
plt.title("Percentage Of Churn Customers",fontsize = 10)
plt.show()
```



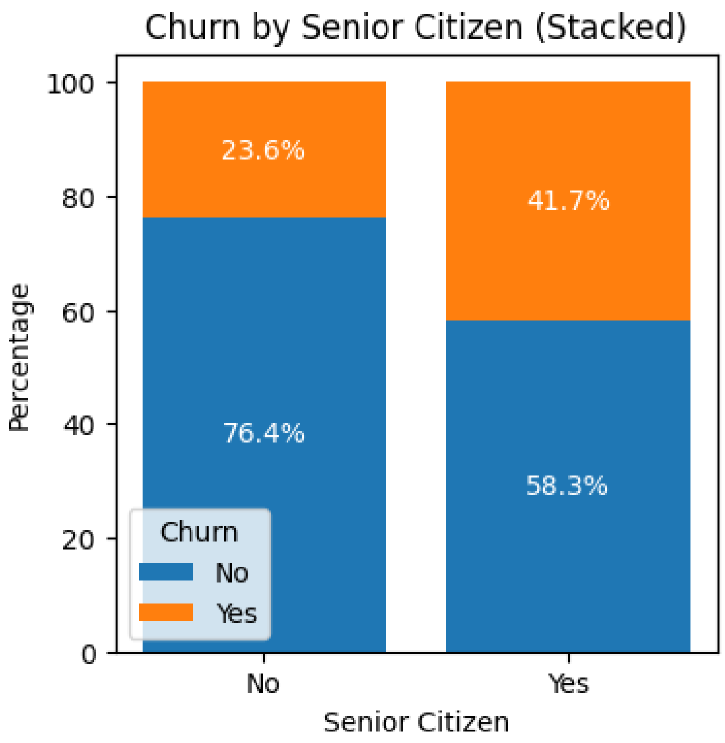
from the given pie chart we can conclude that 26.54% of our have churned out

now let's explore the reason behind it

```
plt.figure(figsize = (4,4))
sns.countplot(x = "gender",data = df, hue = "Churn")
plt.title ("churn by gender")
plt.show()
```

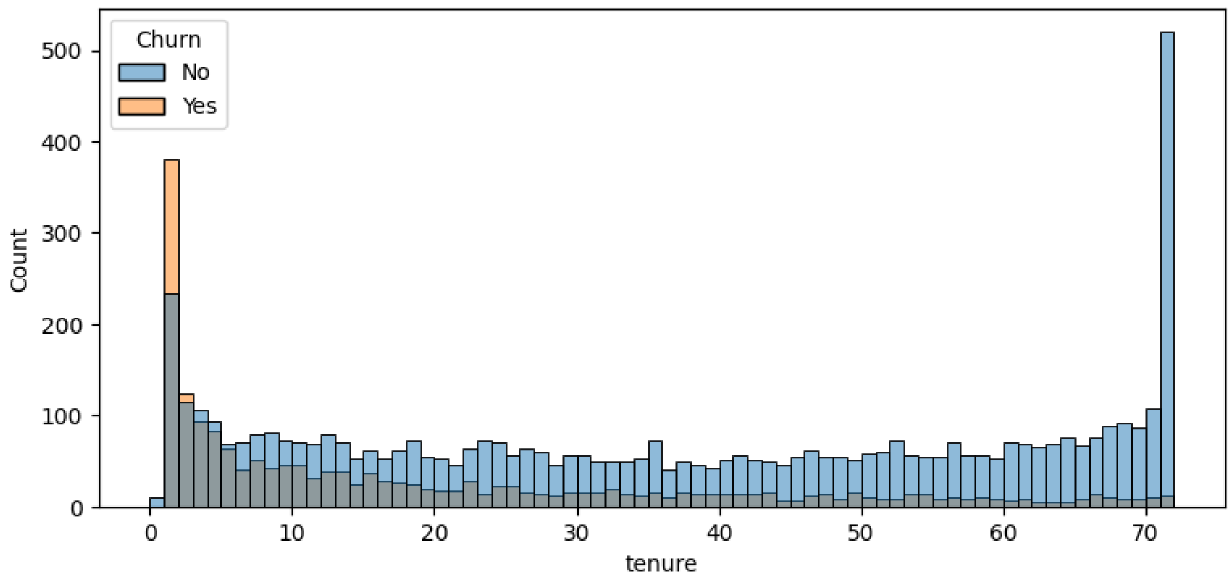


```
counts = df.groupby(["SeniorCitizen", "Churn"]).size().unstack()

# Convert counts to percentages
percentages = counts.div(counts.sum(axis=1), axis=0) * 100

# Plot stacked bar chart
fig, ax = plt.subplots(figsize=(4, 4))  # Adjust size as needed
bottom = None  # Initialize bottom for stacking

# Iterate through each churn category
for churn_status in percentages.columns:
    bars = ax.bar(percentages.index, percentages[churn_status],
bottom=bottom, label=churn_status)
    bottom = percentages[churn_status] if bottom is None else bottom +
percentages[churn_status]

    # Add percentage labels
    for bar in bars:
        height = bar.get_height()
        if height > 0:  # Avoid labeling empty bars
            ax.text(bar.get_x() + bar.get_width() / 2, bar.get_y() +
height / 2,
                    f"{height:.1f}%", ha='center', va='center',
color='white', fontsize=10)

# Labels and title
ax.set_xlabel("Senior Citizen")
ax.set_ylabel("Percentage")
ax.set_title("Churn by Senior Citizen (Stacked)")
ax.legend(title="Churn")

plt.show()
```



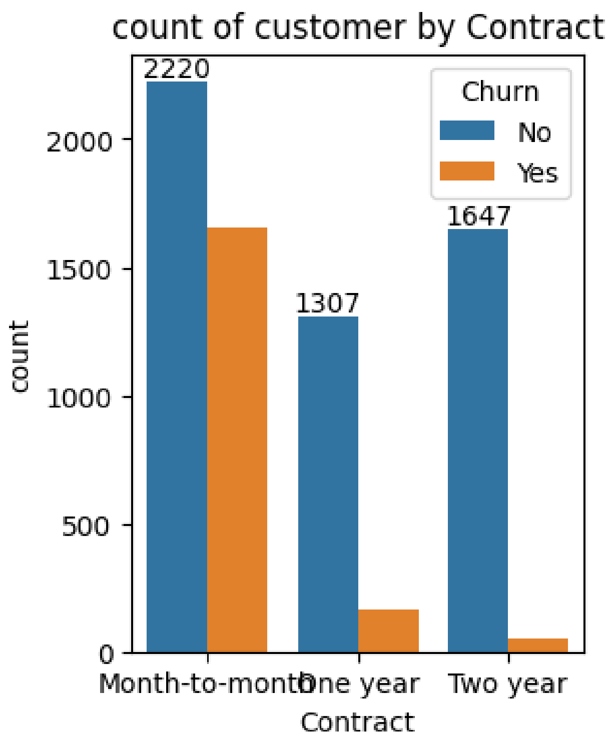
#comparative a greater percentage of people in senior citizen category have churned

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



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

```
plt.figure(figsize = (3,4))
ax = sns.countplot(x = "Contract", data = df, hue = 'Churn')
ax.bar_label(ax.containers[0])
plt.title("count of customer by Contract")
plt.show()
```



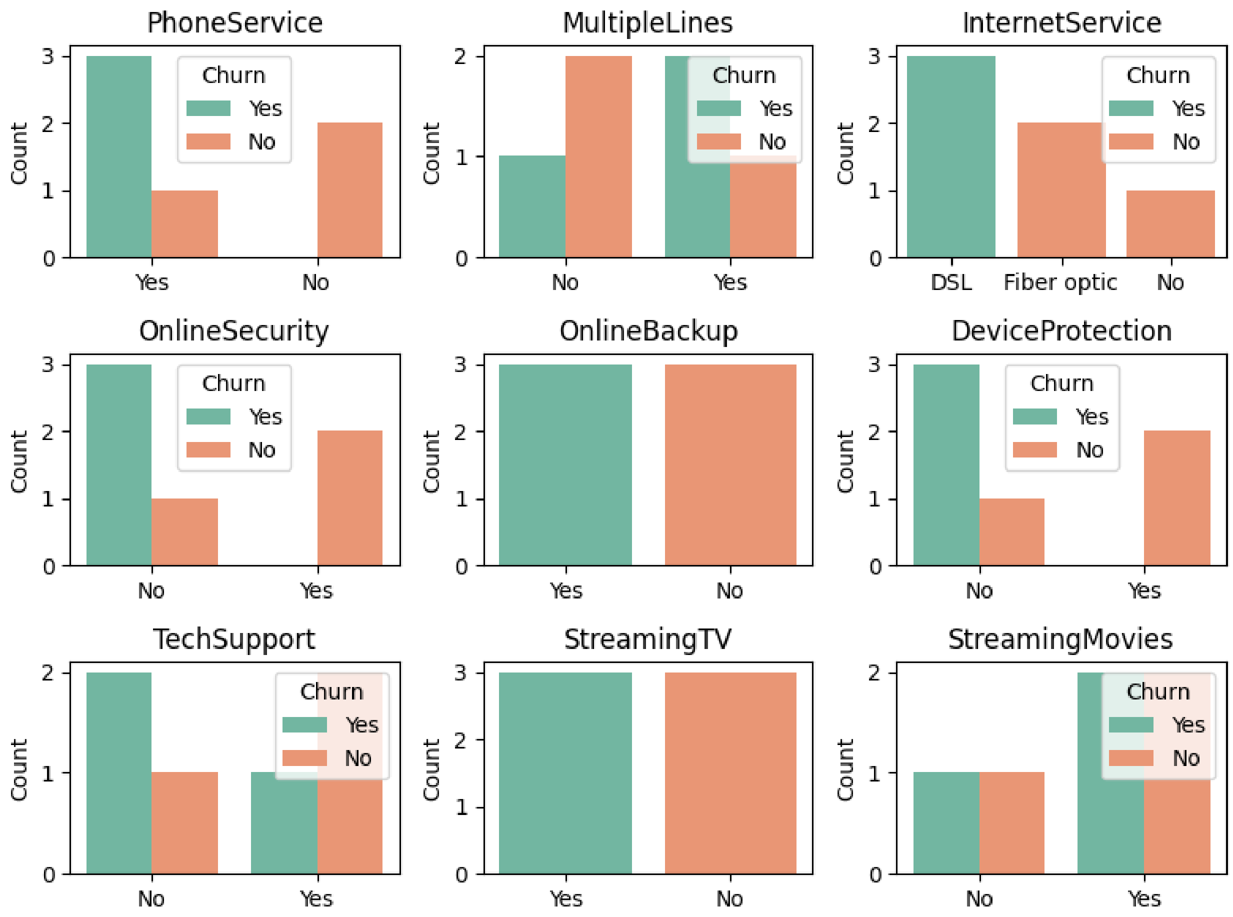
#people who have month to month contract are likely to churn then from those who have 1 or 2 years contract

```
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)
```

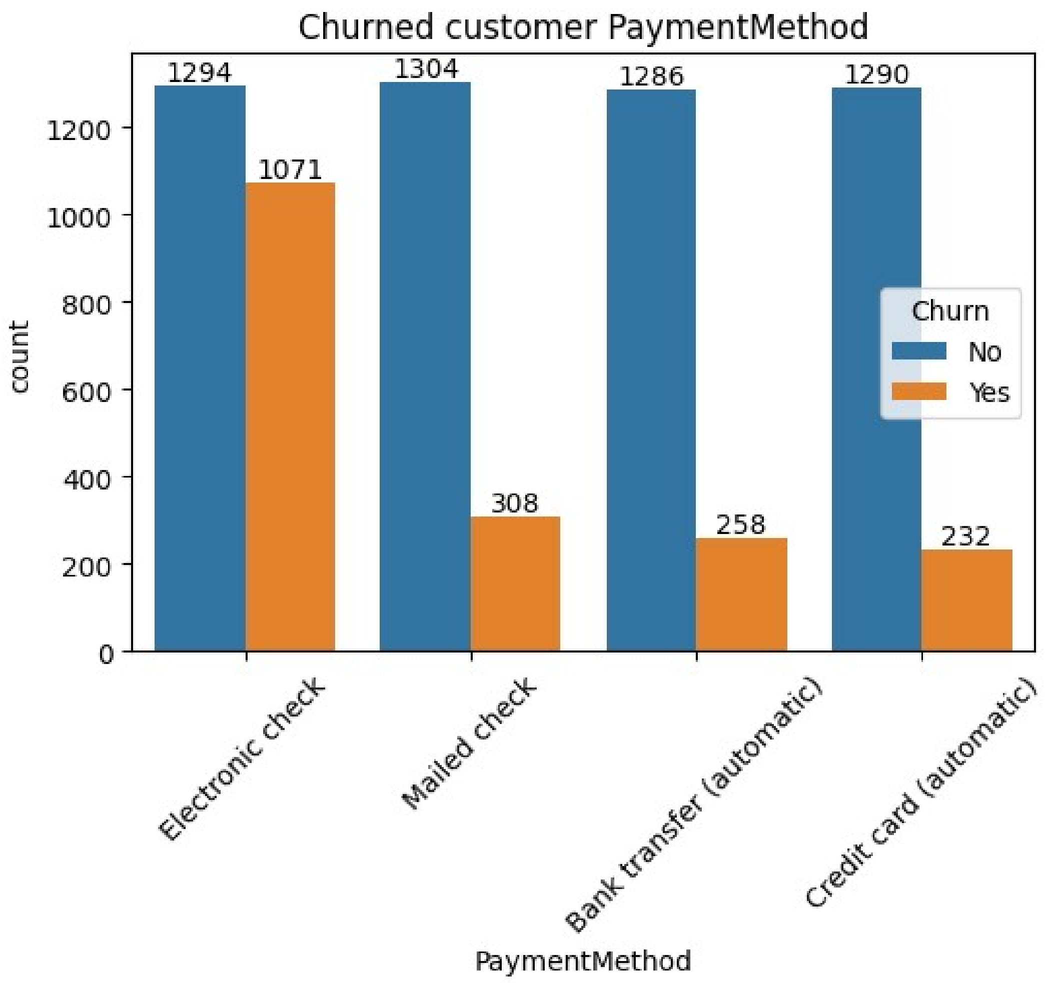
```
# Sample DataFrame (replace with your actual dataset)
data = {
    'PhoneService': ['Yes', 'No', 'Yes', 'Yes', 'No', 'Yes'],
    'MultipleLines': ['No', 'No', 'Yes', 'No', 'Yes', 'Yes'],
    'InternetService': ['DSL', 'Fiber optic', 'DSL', 'No', 'Fiber
optic', 'DSL'],
    'OnlineSecurity': ['No', 'Yes', 'No', 'No', 'Yes', 'No'],
    'OnlineBackup': ['Yes', 'No', 'Yes', 'No', 'No', 'Yes'],
    'DeviceProtection': ['No', 'Yes', 'No', 'Yes', 'No', 'No'],
    'TechSupport': ['No', 'Yes', 'Yes', 'No', 'Yes', 'No'],
    'StreamingTV': ['Yes', 'No', 'Yes', 'No', 'No', 'Yes'],
    'StreamingMovies': ['No', 'Yes', 'Yes', 'No', 'Yes', 'Yes'],
    'Churn': ['Yes', 'No', 'Yes', 'No', 'No', 'Yes']  # Churn column
}

df = pd.DataFrame(data)

# Define the columns for subplots
columns = ['PhoneService', 'MultipleLines', 'InternetService',
           'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
           'TechSupport', 'StreamingTV', 'StreamingMovies']

# Create subplots
fig, axes = plt.subplots(nrows=3, ncols=3, figsize=(8, 6))
axes = axes.flatten()  # Flatten for easy iteration

# Loop through columns and create count plots
for i, col in enumerate(columns):
    sns.countplot(x=df[col], ax=axes[i], hue=df["Churn"],
palette='Set2')
    axes[i].set_title(col)
    axes[i].set_xlabel('')
    axes[i].set_ylabel('Count')

# Adjust layout for better spacing
```

```
plt.tight_layout()
plt.show()
```



#The charts indicate that customers with certain services, such as fiber optic internet and no security services, have higher churn rates.

```
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.title("Churned customer PaymentMethod")
plt.xticks(rotation = 45)
plt.show()
```



#customer is likely to churn when he isusing electronic check as a payment