```
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(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
```

#replacing blanks with 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()
```

```
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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() # checks that overall data doesnot have the
null values
```

```
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() #data has 0 duplicates
```

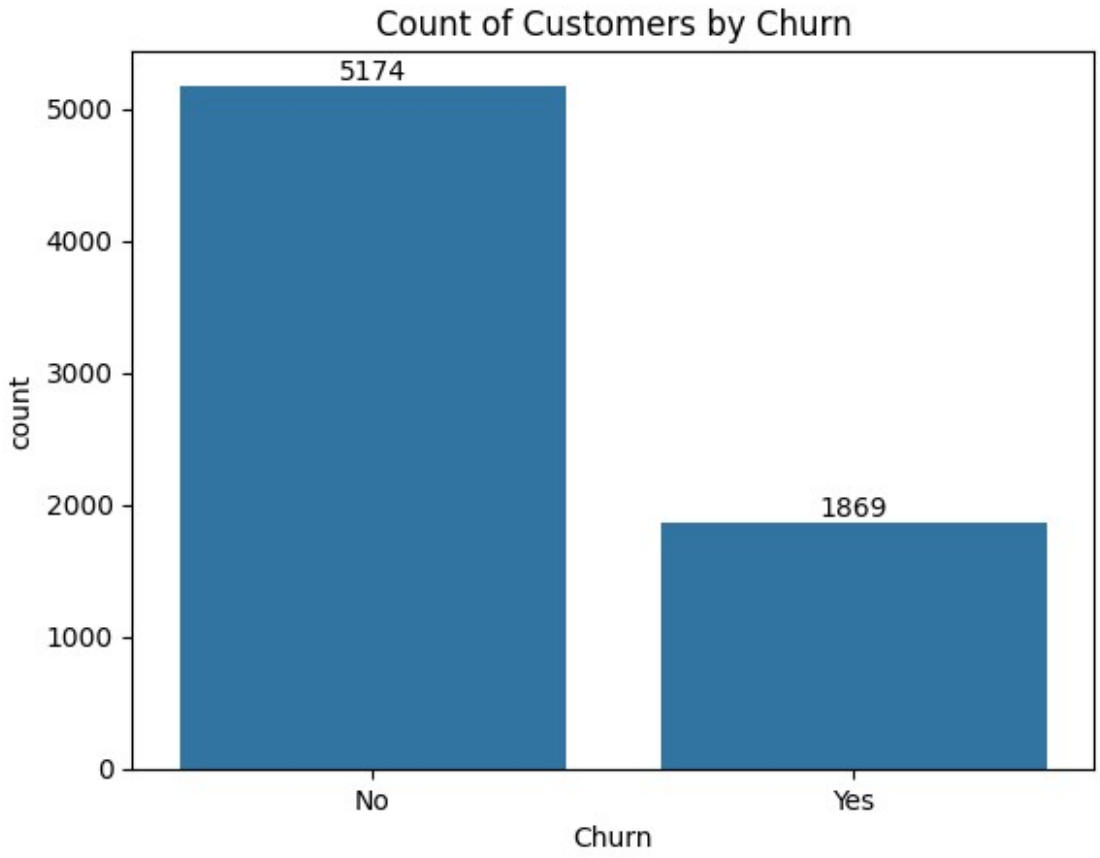
```
np.int64(0)
```

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

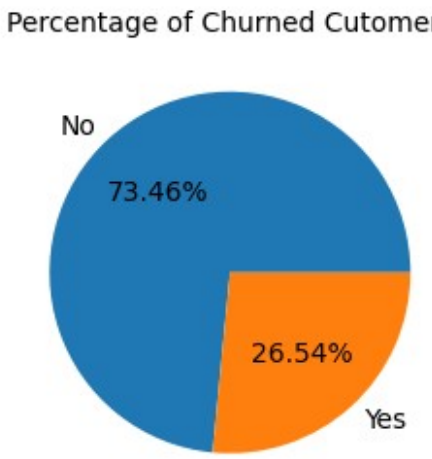
```
np.int64(0)
```

```
# conerted 0 and 1 values of senior citizen to yes/no to make it
easier to understand
def conv(value):
```

```
    if value == 1:
        return "yes"
    else:
        return "no"
df['SeniorCitizen'] = df ["SeniorCitizen"].apply(conv)

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



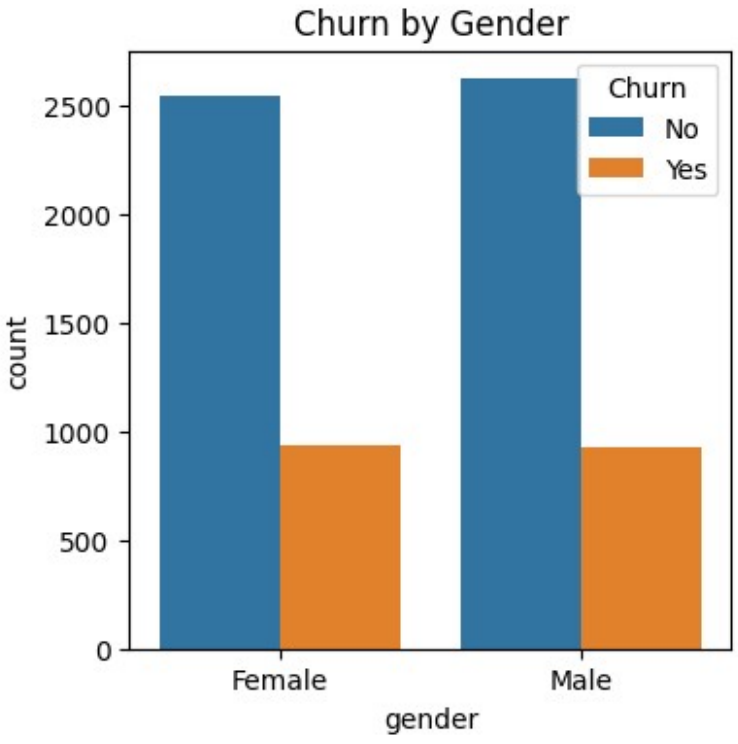

```
plt.figure(figsize=(3,4))
gb=df.groupby("Churn").agg({"Churn":"count"})
plt.pie(gb['Churn'],labels=gb.index , autopct ="%1.2f%%")
plt.title("Percentage of Churned Cutomers",fontsize=10)
plt.show()
```



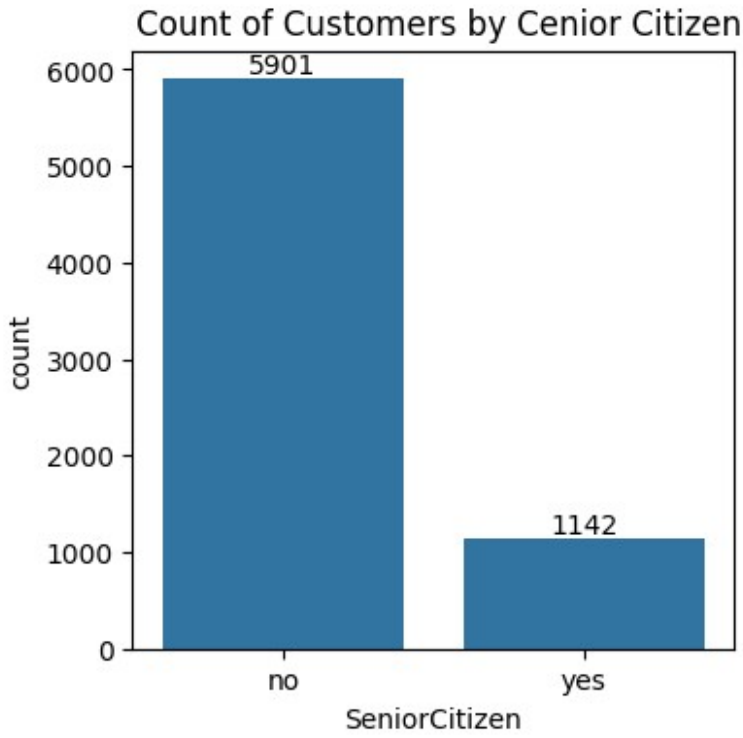
#form the given pie chart we can conclude that 26.54% of our customers have churned out.

#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()
```

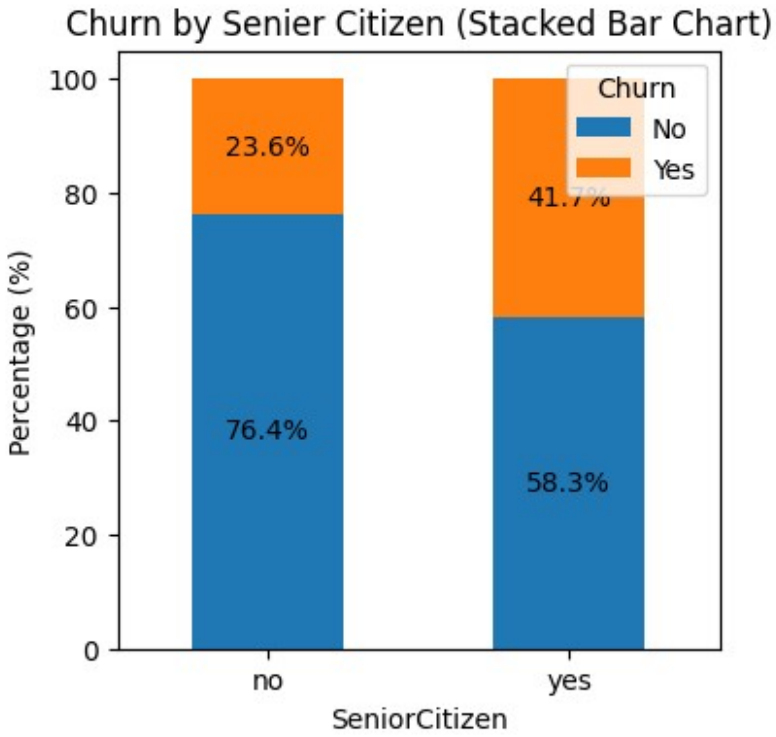


```
plt.figure(figsize=(4,4))
ax=sns.countplot(x="SeniorCitizen",data=df )
ax.bar_label(ax.containers[0])
plt.title(" Count of Customers by Cenior Citizen")
plt.show()
```



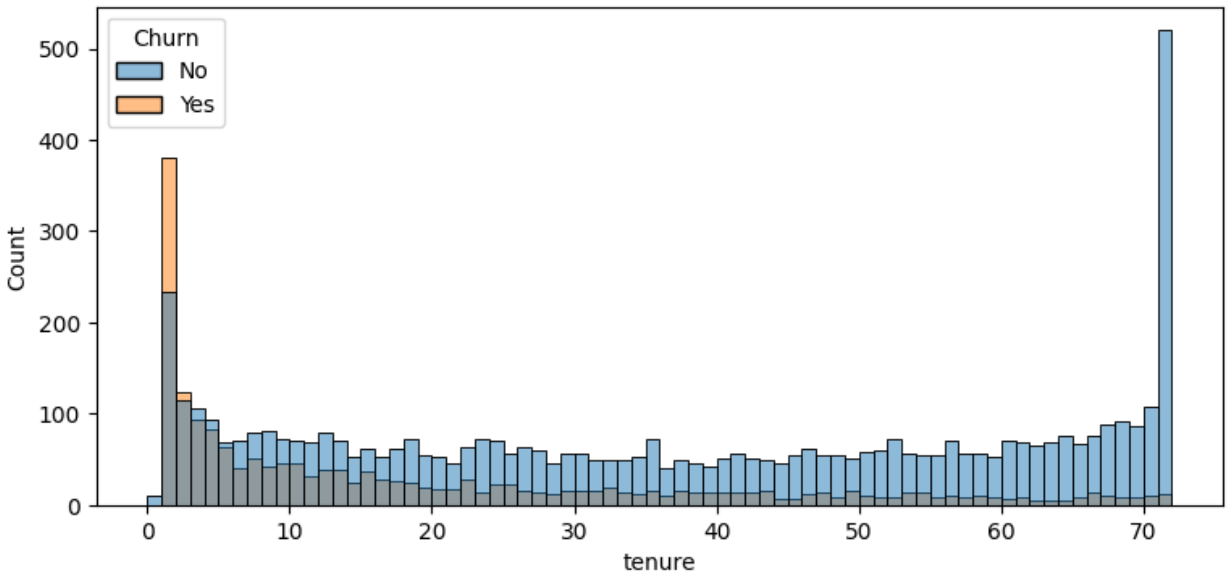

```
total_counts=df.groupby('SeniorCitizen')
["Churn"].value_counts(normalize=True).unstack()*100
#plot
fig,ax=plt.subplots(figsize=(4,4))

#plot the bars
total_counts.plot(kind='bar',stacked=True,ax=ax,color=['#1f77b4','#ff7
f0e'])

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 Senier Citizen (Stacked Bar Chart)')
plt.xlabel("SeniorCitizen")
plt.ylabel('Percentage (%)')
plt.xticks(rotation=0)
```

```
plt.legend(title ="Churn",loc='upper right')
plt.show()
```



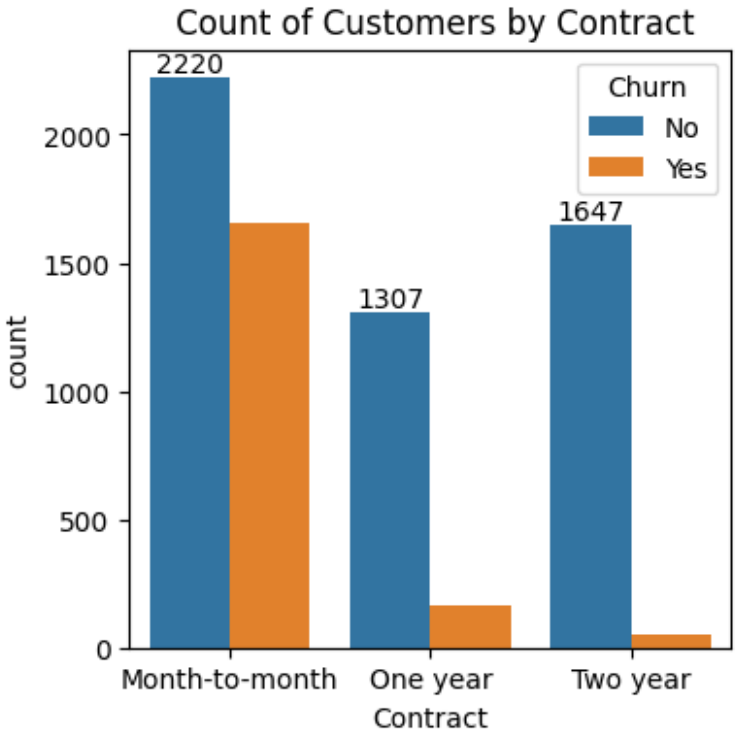
#comparatively a greater percnetage of people in senior citizen category have churned

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



#people who have use dour services for a long time have stayed and people who have used our services 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 Customers by Contract")
plt.show()
```



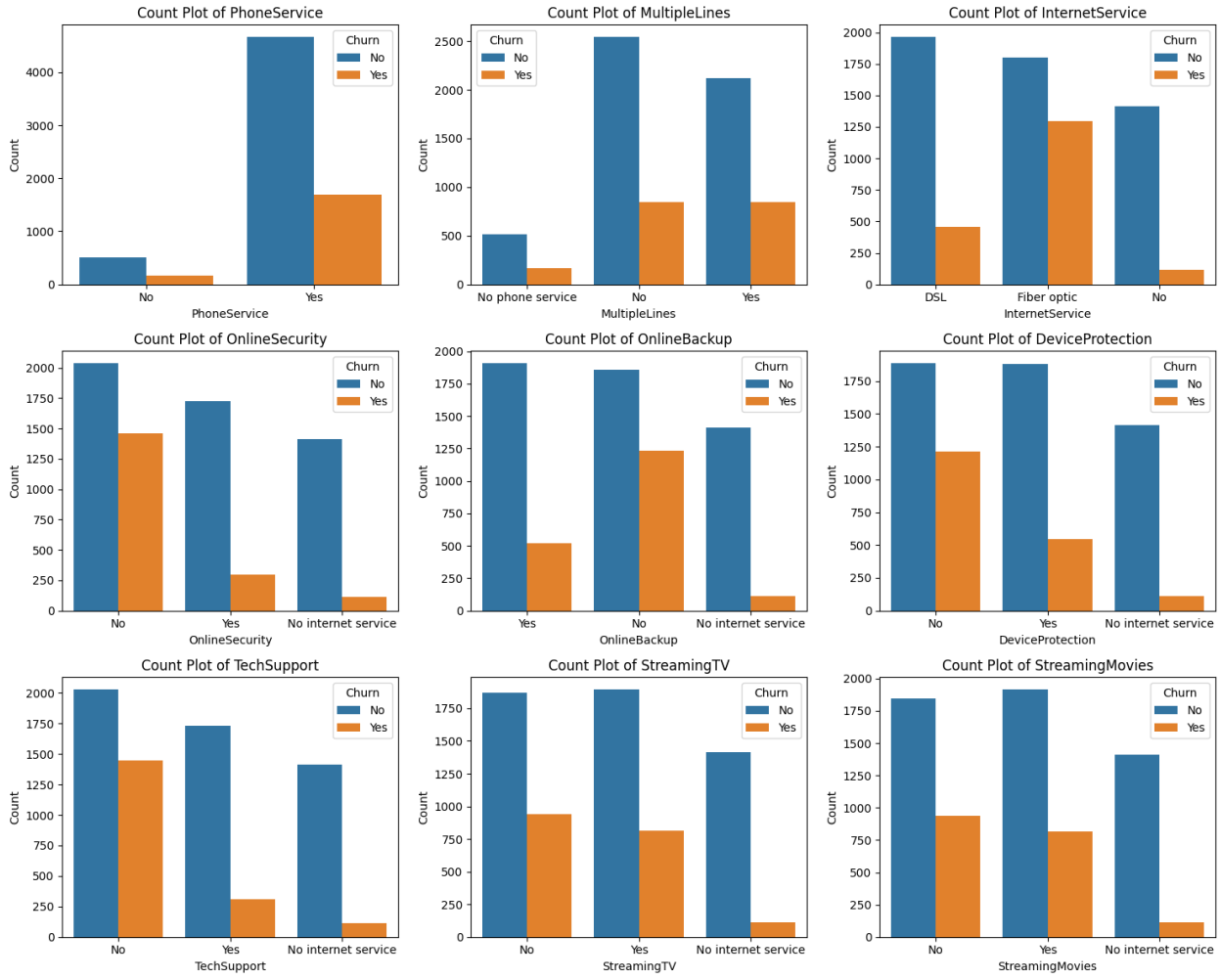
#people who have month to month contract are likely to churn then thir=se eho have 1 or 2 years of contract

```
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)
```

```
columns =['PhoneService', 'MultipleLines', 'InternetService',
       'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
       'TechSupport', 'StreamingTV', 'StreamingMovies']
n_cols =3
n_rows =(len(columns) + n_cols -1) // n_cols
```

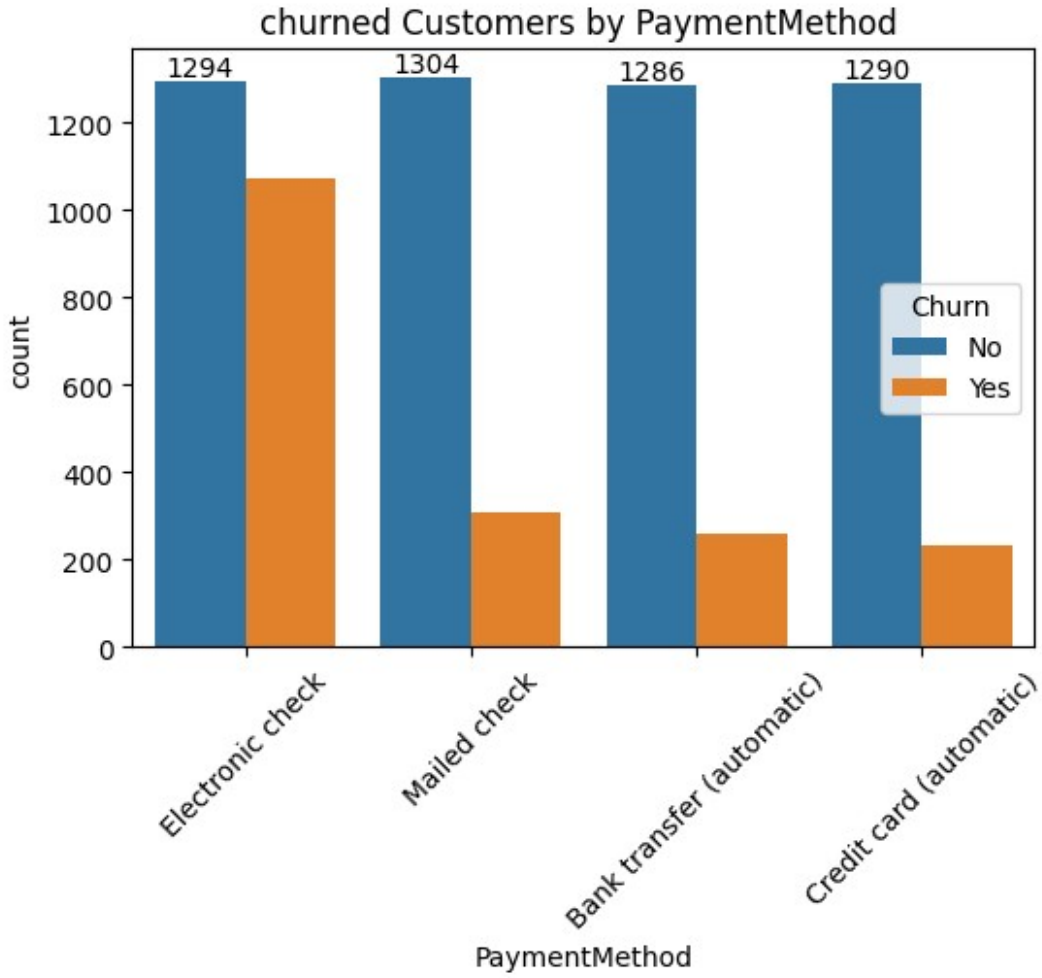
```
# Create subplots
fig, axes = plt.subplots(n_rows,n_cols, figsize=(15, n_rows*4))
axes = axes.flatten()

# Plot each column as a countplot
for i, col in enumerate(columns):
    sns.countplot(x=col,data=df, ax=axes[i],hue=df["Churn"])
    axes[i].set_title(f'Count Plot of {col}')
    axes[i].set_xlabel(col)
    axes[i].set_ylabel('Count')
# Remove empty subplots
for j in range(i + 1, len(axes)):
    fig.delaxes(axes[j])

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



#The majority of customers who do not churn tend to have services like phoneservices , internetservices, and onlinesecurity enabled, for services like onlinebackup,techsupport and

streaming tv, churn rates are noticeably highter when these services are not used or are unavailable

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




```
#customer is likely to churn when he is using elec
```