teco-customer-churn-eda

October 7, 2024

0.0.1 Exploratory Data Analysis (EDA)

Teco Customer Churn Analysys

Prepared by Feroz Khan

[2]:
```
# import necessary/important libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

[3]:
```
df = pd.read_csv("Customer_Churn.csv")
df.head()
```

[3]:

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	MultipleLines	InternetService	OnlineSecurity	…	DeviceProtection	TechSupport	StreamingTV	StreamingMovies	Contract	PaperlessBilling	PaymentMethod	MonthlyCharges	TotalCharges	Churn
0	7590-VHVEG	Female	0	Yes	No	1	No	No phone service	DSL	No	…	No	No	No	No	Month-to-month	Yes	Electronic check	29.85	29.85	No
1	5575-GNVDE	Male	0	No	No	34	Yes	No	DSL	Yes	…	Yes	No	No	No	One year	No	Mailed check	56.95	1889.5	No
2	3668-QPYBK	Male	0	No	No	2	Yes	No	DSL	Yes	…	No	No	No	No	Month-to-month	Yes	Mailed check	53.85	108.15	Yes
3	7795-CFOCW	Male	0	No	No	45	No	No phone service	DSL	Yes	…	Yes	Yes	No	No	One year	No	Bank transfer (automatic)	42.30	1840.75	No
4	9237-HQITU	Female	0	No	No	2	Yes	No	Fiber optic	No	…	No	No	No	No	Month-to-month	Yes	Electronic check	70.70	151.65	Yes

```
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]
```

[4]:
```
# to inspect the data
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

[5]:
```
# to convert the TotalCharges values to float
df["TotalCharges"] = df["TotalCharges"].replace(" ","0")
df["TotalCharges"] = df["TotalCharges"].astype("float")
```

[6]:
```
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
```

[7]:
```
# to find the null values in the dataset
df.isnull().sum()

#overall total null values
# df.isnull().sum().sum()
```

[7]:
```
customerID          0
gender              0
SeniorCitizen       0
Partner             0
Dependents          0
tenure              0
PhoneService        0
MultipleLines       0
InternetService     0
OnlineSecurity      0
OnlineBackup        0
DeviceProtection    0
TechSupport         0
StreamingTV         0
```

```
StreamingMovies     0
Contract            0
PaperlessBilling    0
PaymentMethod       0
MonthlyCharges      0
TotalCharges        0
Churn               0
dtype: int64
```

[8]:
```
df.describe().T
```

[8]:

	count	mean	std	min	25%	50%	\
SeniorCitizen	7043.0	0.162147	0.368612	0.00	0.00	0.00	
tenure	7043.0	32.371149	24.559481	0.00	9.00	29.00	
MonthlyCharges	7043.0	64.761692	30.090047	18.25	35.50	70.35	
TotalCharges	7043.0	2279.734304	2266.794470	0.00	398.55	1394.55	

	75%	max
SeniorCitizen	0.00	1.00
tenure	55.00	72.00
MonthlyCharges	89.85	118.75
TotalCharges	3786.60	8684.80

[9]:
```
# to find the dulicated values in the dataset
df.duplicated().sum()
```

[9]: 0

to find the duplicated values on the basis of unique column of the data i.e. customerID

[10]:
```
df["customerID"].duplicated().sum()
```

[10]: 0

deal with SeniorCitizen column convert 0 = no and 1 = yes values of SeniorCitizen to make it easier for understanding

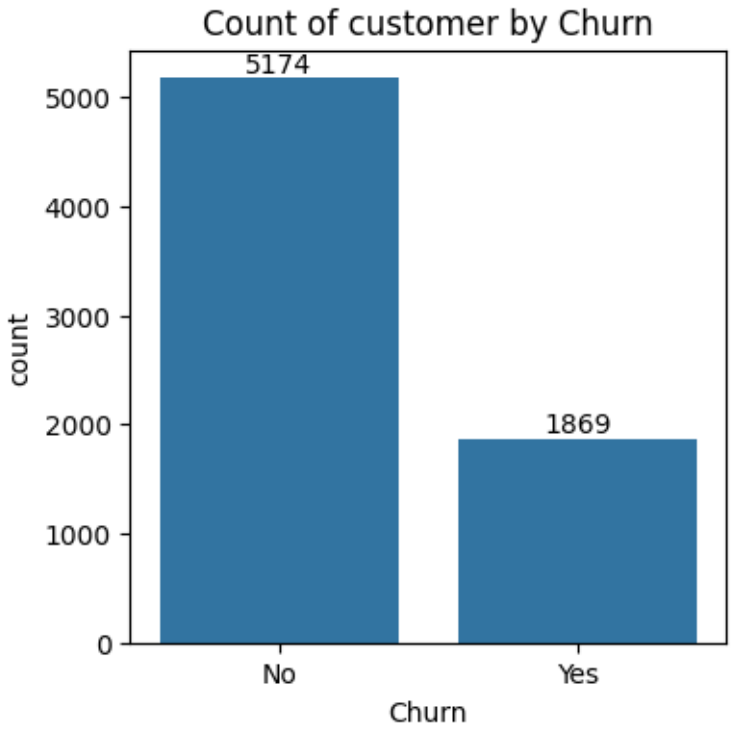
[11]:
```
def conv(value):
    if value == 1:
        return "yes"
    else:
        return "no"

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

[12]:
```
df.head()
```

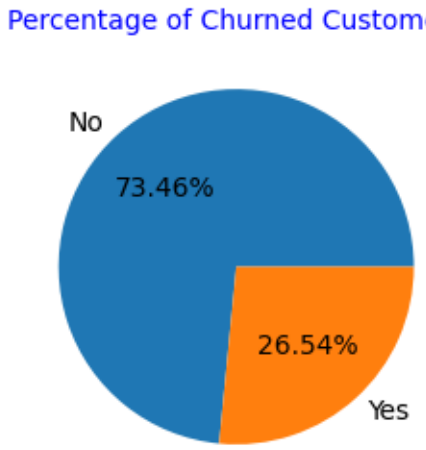
[12]:
```
   customerID  gender SeniorCitizen Partner Dependents  tenure PhoneService  \
0  7590-VHVEG  Female            no     Yes         No       1           No
1  5575-GNVDE    Male            no      No         No      34          Yes
2  3668-QPYBK    Male            no      No         No       2          Yes
3  7795-CFOCW    Male            no      No         No      45           No
4  9237-HQITU  Female            no      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       1889.50    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]
```

to deal with Churn Column how many customers left the service and how many not left the service

[14]:
```
plt.figure(figsize=(4,4))
ax = sns.countplot(data=df, x = 'Churn')

ax.bar_label(ax.containers[0])
plt.title("Count of customer by Churn")
plt.show()
```



[15]:
```
# to show/plot it %age vise using pie chart
plt.figure(figsize=(3,3))
gb = df.groupby('Churn').agg({'Churn':"count"})
plt.pie(gb['Churn'], labels=gb.index, autopct="%1.2f%%")
plt.title("Percentage of Churned Customers", fontsize=10, color="blue")
plt.show()
```

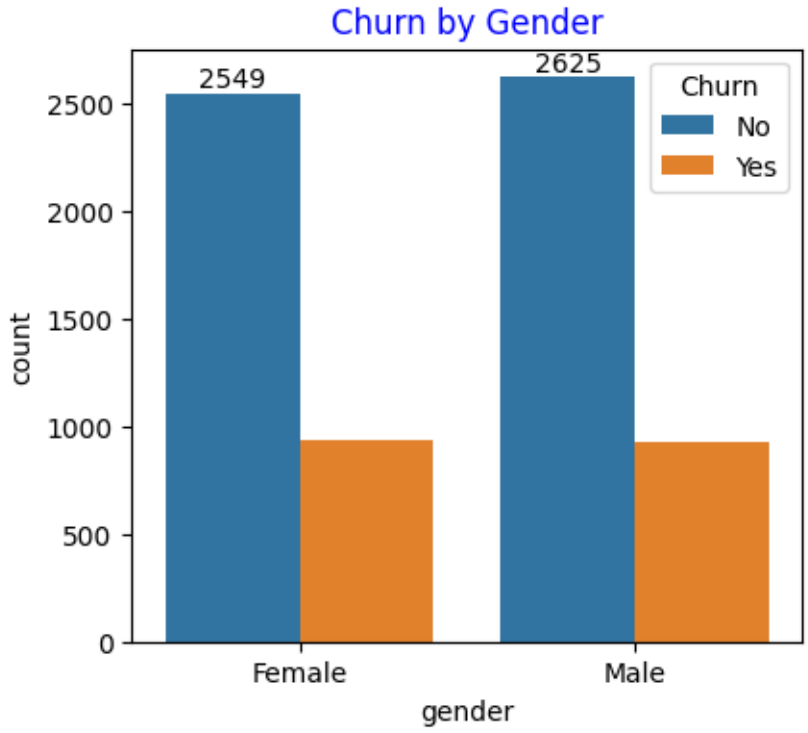


#from the given pie chart we can conclude that 26.54% of customers have churned out

#now let's explore the reason behind it

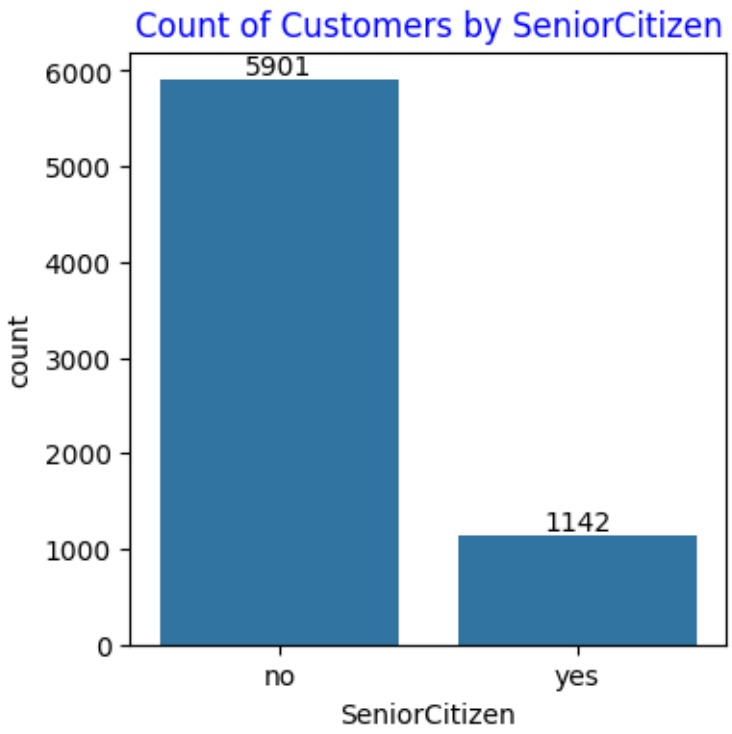
Now deal with the gender column

[16]:
```
plt.figure(figsize=(4.5,4))
bx = sns.countplot(data=df, x = "gender", hue='Churn')
bx.bar_label(bx.containers[0])
plt.title("Churn by Gender", color="Blue")
plt.show()
```

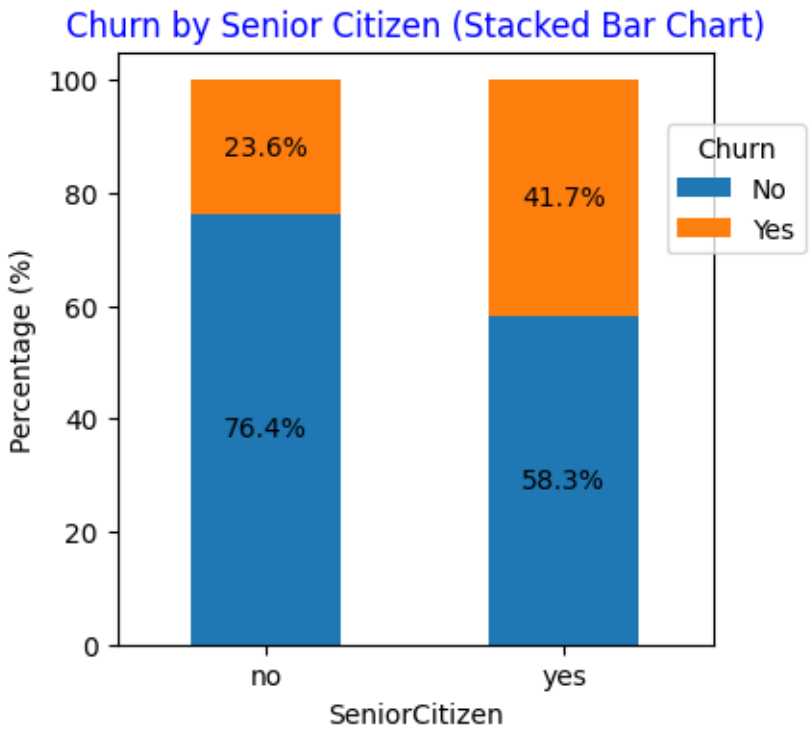


Now deal with SeniorCitizen column

[17]:
```
plt.figure(figsize=(4,4))
cs = sns.countplot(data=df, x = 'SeniorCitizen')
cs.bar_label(cs.containers[0])
plt.title("Count of Customers by SeniorCitizen", color="blue")
plt.show()
```



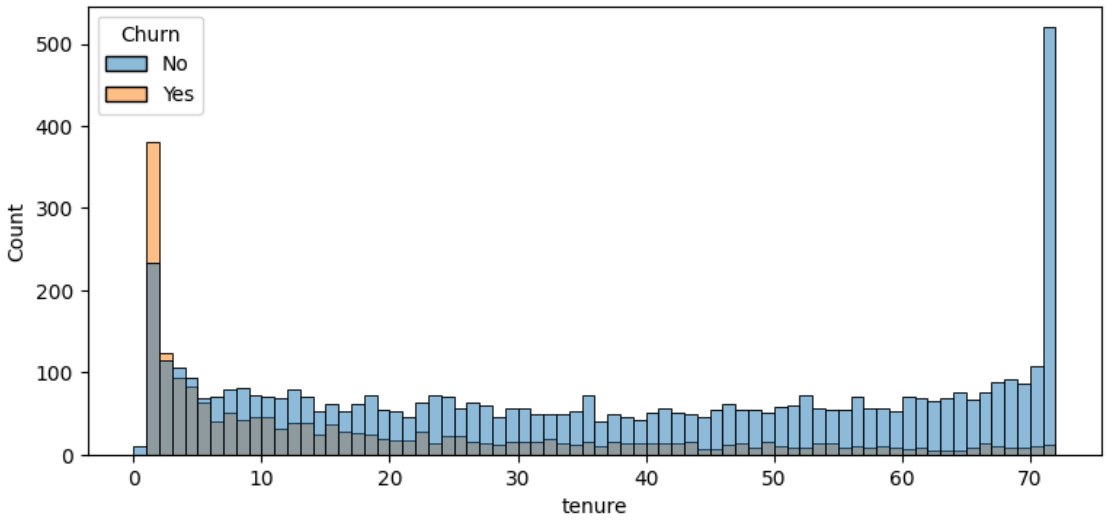
[18]:
```
total_counts = df.groupby('SeniorCitizen')['Churn'].
 ↪value_counts(normalize=True).unstack() * 100

# Plot
fig, ax = plt.subplots(figsize=(4, 4))

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

# 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)', color='blue')
plt.xlabel('SeniorCitizen')
plt.ylabel('Percentage (%)')
plt.xticks(rotation=0)
plt.legend(title='Churn', bbox_to_anchor = (0.9,0.9))

plt.show()
```



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

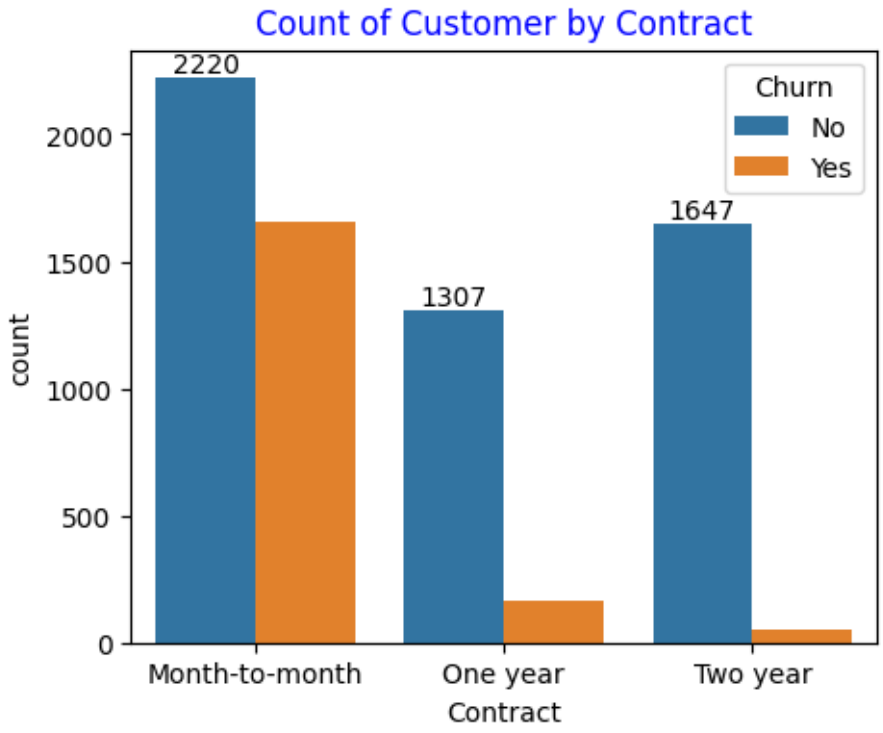
#now deal with tenure column

[19]:
```
plt.figure(figsize=(9,4))
sns.histplot(data=df, x="tenure", bins=72, hue="Churn")
plt.show()
```



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

[20]:
```
plt.figure(figsize=(5,4))
ac = sns.countplot(data=df, x = "Contract", hue="Churn")
ac.bar_label(ac.containers[0])
plt.title("Count of Customer by Contract", color="blue")
plt.show()
```

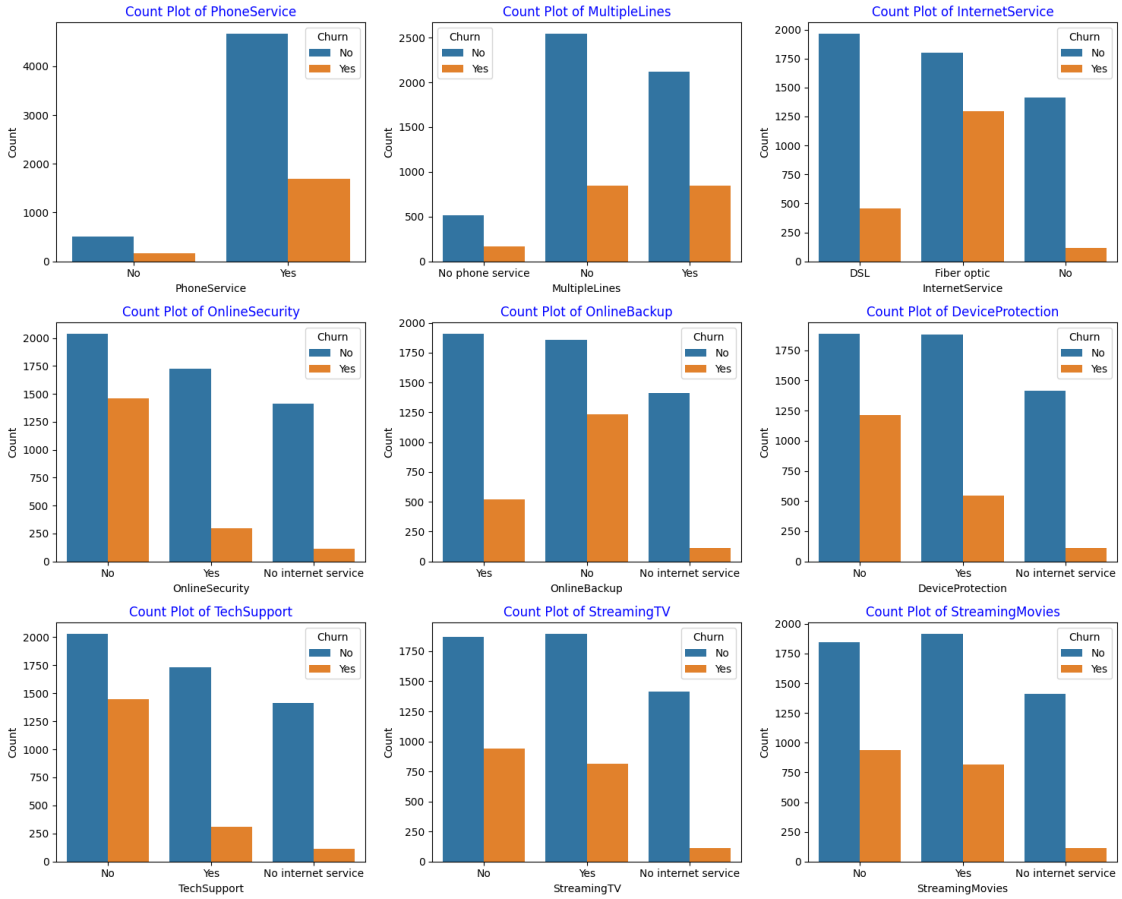


#people who have month to month contract are likely to churn then from those who have 1 or 2 years of contract

[21]:
```
df.columns.values
```

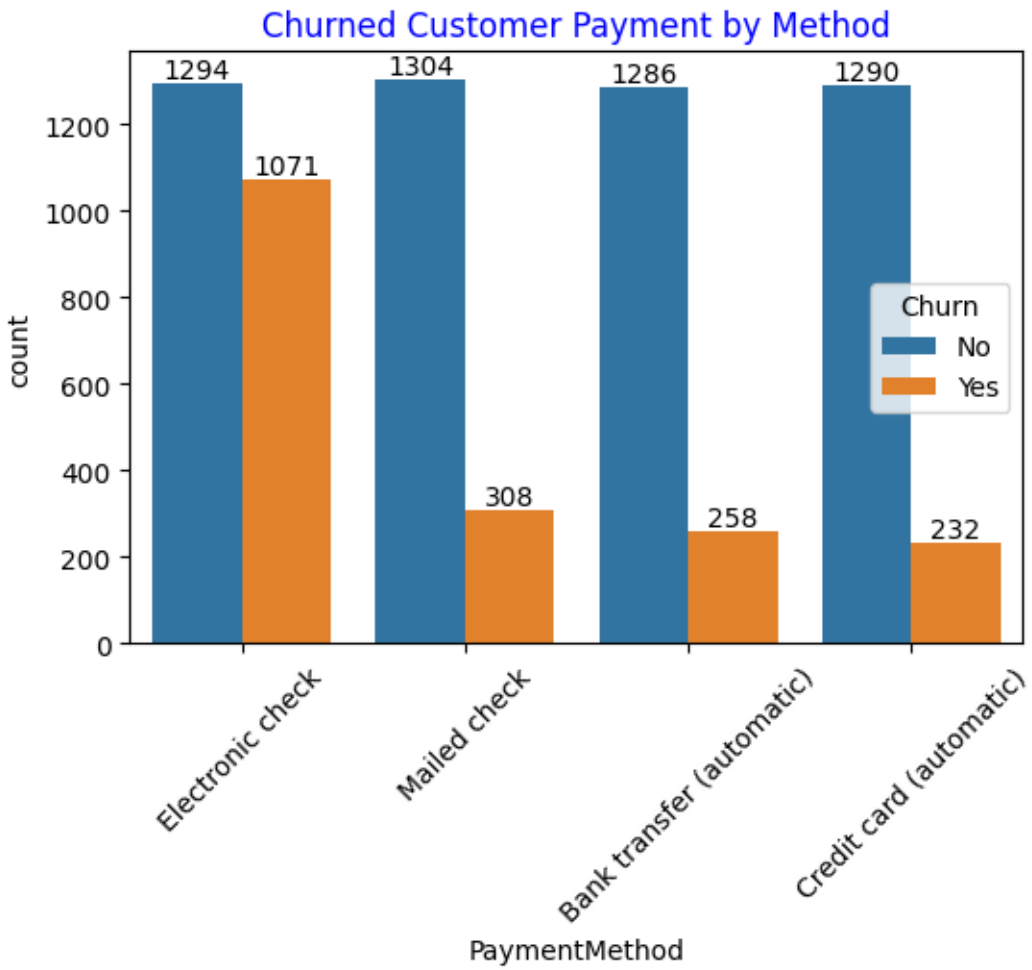
[21]:
```
array(['customerID', 'gender', 'SeniorCitizen', 'Partner', 'Dependents',
       'tenure', 'PhoneService', 'MultipleLines', 'InternetService',
       'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
       'TechSupport', 'StreamingTV', 'StreamingMovies', 'Contract',
       'PaperlessBilling', 'PaymentMethod', 'MonthlyCharges',
       'TotalCharges', 'Churn'], dtype=object)
```

[22]:
```
columns = ['PhoneService', 'MultipleLines', 'InternetService', 'OnlineSecurity',
           'OnlineBackup', 'DeviceProtection', 'TechSupport', 'StreamingTV',␣
 ↪'StreamingMovies']

# Number of columns for the subplot grid (you can change this)
n_cols = 3
n_rows = (len(columns) + n_cols - 1) // n_cols  # Calculate number of rows␣
 ↪needed

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

# Flatten the axes array for easy iteration (handles both 1D and 2D arrays)
axes = axes.flatten()

# Iterate over columns and plot count plots
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}',color='blue')
    axes[i].set_xlabel(col)
    axes[i].set_ylabel('Count')

# Remove empty subplots (if any)
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 PhoneService, InternetService (particularly DSL), and OnlineSecurity enabled. For services like OnlineBackup, TechSupport, and StreamingTV, churn rates are noticeably higher when these services are not used or are unavailable.

[23]:
```
plt.figure(figsize=(6,4))
cp = sns.countplot(data=df, x="PaymentMethod",hue='Churn')
cp.bar_label(cp.containers[0])
cp.bar_label(cp.containers[1])
plt.title("Churned Customer Payment by Method", color="blue")
plt.xticks(rotation=45)
plt.show()
```



#customer is likely to churn when he is using electronic check as a payment method.