eda-customer-churn-analysis-1

November 17, 2024

[41]:

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

[171]:

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

[4]:

```
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
```

1 Replacing blank values to 0 as tenure is 0 and no total charges are recorded

2 Converting datatype from object to float

[43]:

```
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
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 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
```

3 Checking null values

[10]:

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

[10]: 0

[12]:

```
df.describe()
```

```
[12]:        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
```

```
[13]: df.duplicated().sum()
```

```
[13]: 0
```

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

```
[44]: 0
```

4 Converting values of SeniorCitizen to yes/no from 1/0 to make it easier to understand

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

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

```
[45]:     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
5   9305-CDSKC  Female            no      No         No       8          Yes
6   1452-KIOVK    Male            no      No        Yes      22          Yes
7   6713-OKOMC  Female            no      No         No      10           No
8   7892-POOKP  Female            no     Yes         No      28          Yes
9   6388-TABGU    Male            no      No        Yes      62          Yes
10  9763-GRSKD    Male            no     Yes        Yes      13          Yes
11  7469-LKBCI    Male            no      No         No      16          Yes
12  8091-TTVAX    Male            no     Yes         No      58          Yes
13  0280-XJGEX    Male            no      No         No      49          Yes
14  5129-JLPIS    Male            no      No         No      25          Yes
15  3655-SNQYZ  Female            no     Yes        Yes      69          Yes
```

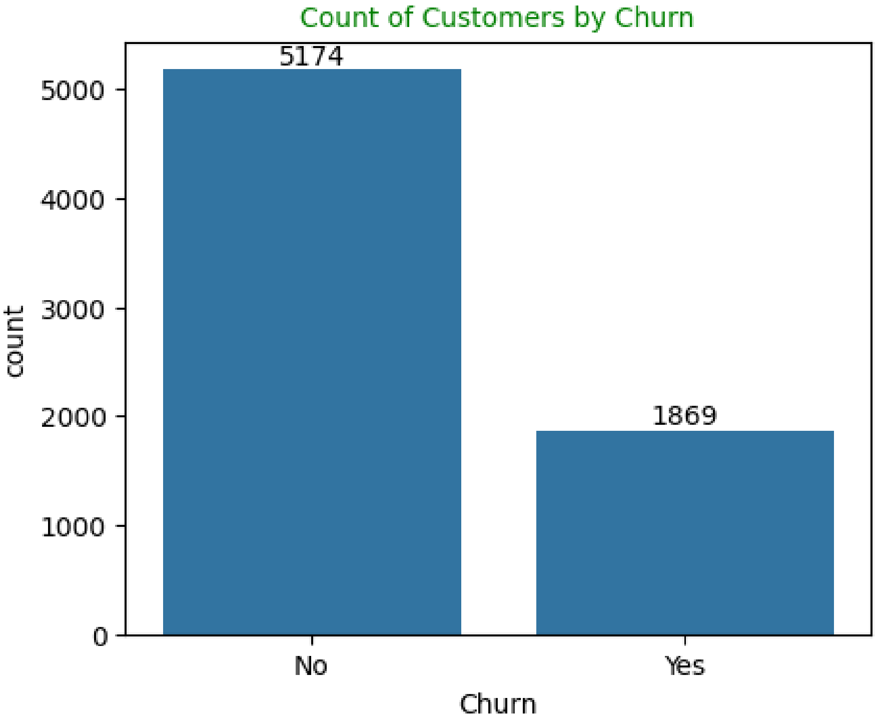
```
16  8191-XWSZG  Female            no      No         No       52         Yes
17  9959-WOFKT    Male            no      No        Yes       71         Yes
18  4190-MFLUW  Female            no     Yes        Yes       10         Yes
19  4183-MYFRB  Female            no      No         No       21         Yes
20  8779-QRDMV    Male           yes      No         No        1          No
21  1680-VDCWW    Male            no     Yes         No       12         Yes
22  1066-JKSGK    Male            no      No         No        1         Yes
23  3638-WEABW  Female            no     Yes         No       58         Yes
24  6322-HRPFA    Male            no     Yes        Yes       49         Yes
25  6865-JZNKO  Female            no      No         No       30         Yes
26  6467-CHFZW    Male            no     Yes        Yes       47         Yes
27  8665-UTDHZ    Male            no     Yes        Yes        1          No
28  5248-YGIJN    Male            no     Yes         No       72         Yes
29  8773-HHUOZ  Female            no      No        Yes       17         Yes

       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  …   
21                No              No  No internet service  …   
22                No              No  No internet service  …   
23               Yes             DSL                   No  …   
24                No             DSL                  Yes  …   
25                No             DSL                  Yes  …   
26               Yes     Fiber optic                   No  …   
27  No phone service             DSL                   No  …   
28               Yes             DSL                  Yes  …   
29                No             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
21  No internet service  No internet service  No internet service
22  No internet service  No internet service  No internet service
23                   No                  Yes                   No
24                   No                  Yes                   No
25                   No                   No                   No
26                   No                   No                  Yes
27                   No                   No                   No
28                  Yes                  Yes                  Yes
29                   No                   No                  Yes

        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
```

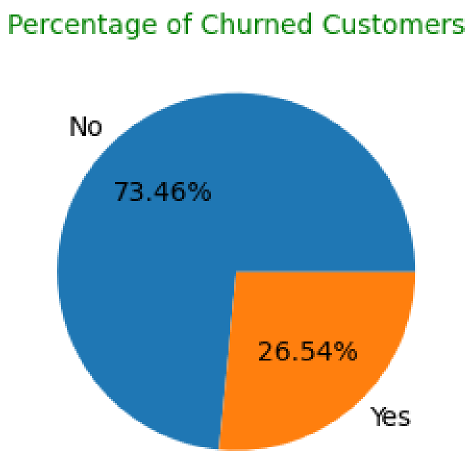
```
14                  Yes  Month-to-month              Yes
15                  Yes        Two year               No
16  No internet service        One year               No
17                  Yes        Two year               No
18                   No  Month-to-month               No
19                  Yes  Month-to-month              Yes
20                  Yes  Month-to-month              Yes
21  No internet service        One year               No
22  No internet service  Month-to-month               No
23                   No        Two year              Yes
24                   No  Month-to-month               No
25                   No  Month-to-month              Yes
26                  Yes  Month-to-month              Yes
27                   No  Month-to-month               No
28                  Yes        Two year              Yes
29                  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  Bank transfer (automatic)          19.80        202.25     No
22               Mailed check          20.15         20.15    Yes
23    Credit card (automatic)          59.90       3505.10     No
24    Credit card (automatic)          59.60       2970.30     No
25  Bank transfer (automatic)          55.30       1530.60     No
26           Electronic check          99.35       4749.15    Yes
27           Electronic check          30.20         30.20    Yes
28    Credit card (automatic)          90.25       6369.45     No
```

```
29                Mailed check          64.70       1093.10     Yes

[30 rows x 21 columns]
```

[150]:
```
plt.figure(figsize=(5,4))
plt.title("Count of Customers by Churn", fontsize=10, color="Green")
ax = sns.countplot(x="Churn", data=df)
ax.bar_label(ax.containers[0])
plt.show()
```



[107]:
```
plt.figure(figsize=(3,4))
plt.title("Percentage of Churned Customers", fontsize=10, color="Green")
gb=df.groupby("Churn").agg({'Churn':'count'})
plt.pie(gb["Churn"], labels=gb.index, autopct='%1.2f%%', color="Red)
plt.show()
```

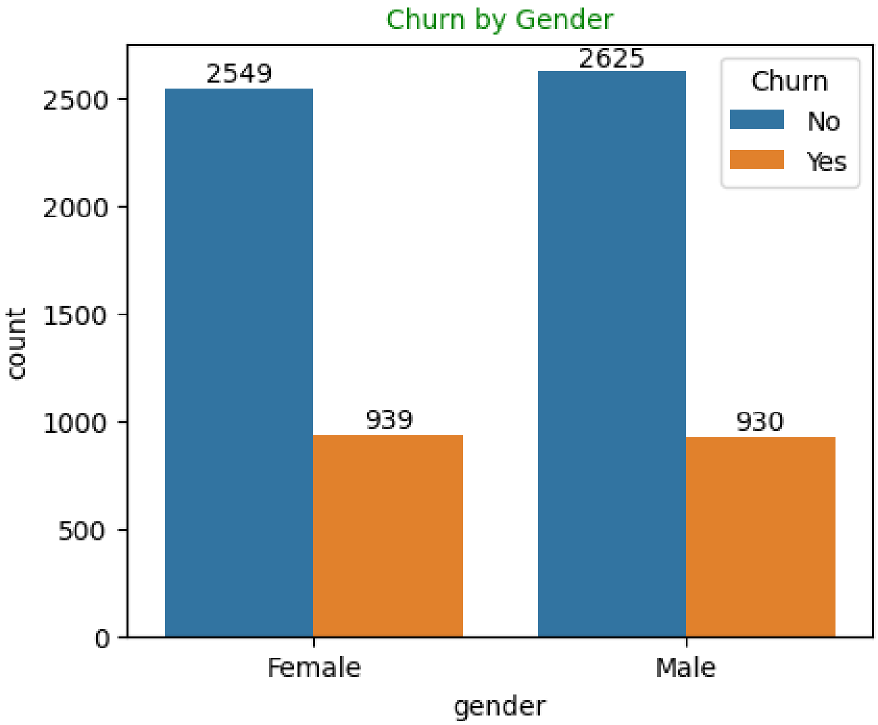


5 From the pie chart we can conclude that 26.54% of our customers have churned out

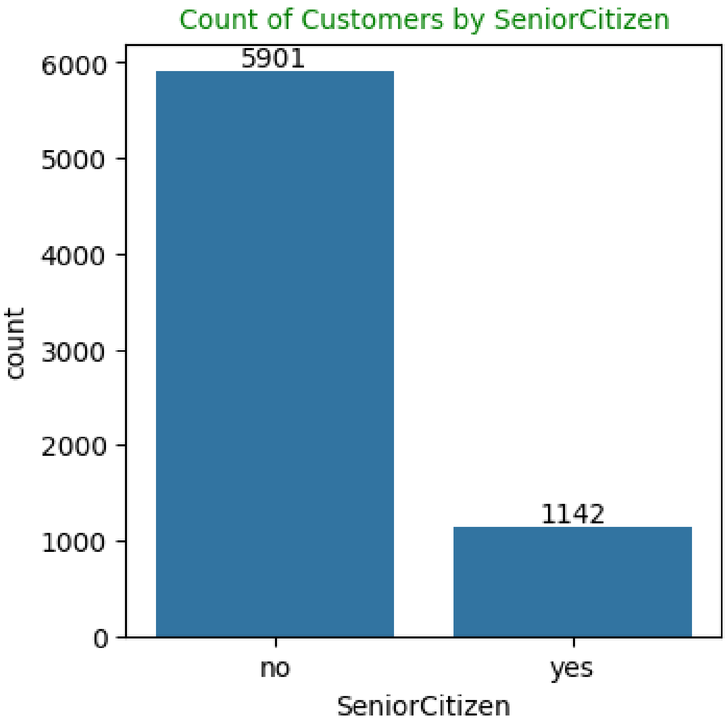
6 Now let's explore the reason behind it

[135]:

```
plt.figure(figsize=(5,4))
ax = sns.countplot(x="gender", data=df, hue="Churn")
ax.bar_label(ax.containers[0])
ax.bar_label(ax.containers[1])
plt.title("Churn by Gender", fontsize=10, color="Green")
plt.show()
```

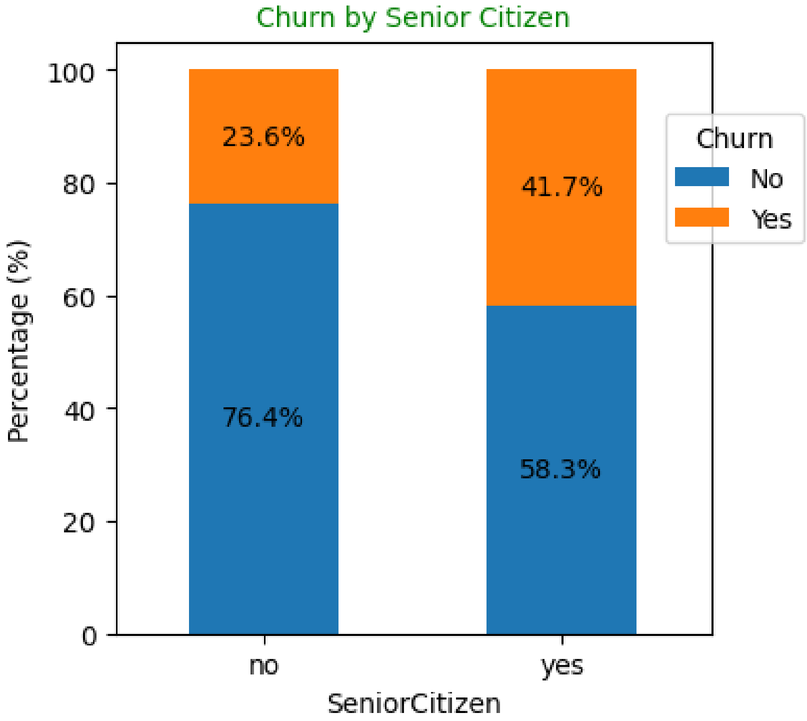


[147]:
```
plt.figure(figsize=(4,4))
ax = sns.countplot(x="SeniorCitizen", data=df)
ax.bar_label(ax.containers[0])
plt.title("Count of Customers by SeniorCitizen", fontsize=10, color="Green")
plt.show()
```



[143]:

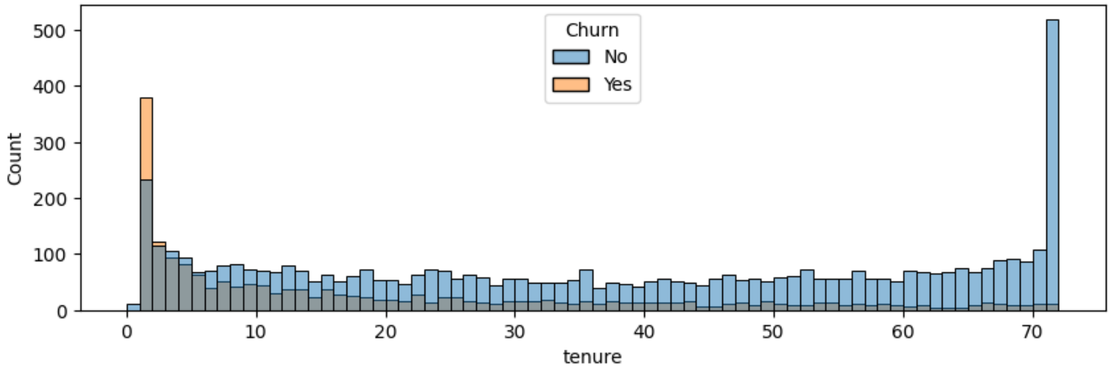
```
total_counts = df.groupby('SeniorCitizen')['Churn'].
  ↪value_counts(normalize=True).unstack() * 100

# Plot
fig, ax = plt.subplots(figsize=(4, 4))  # Adjust figsize for better␣
  ↪visualization

# 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', color="Green", fontsize=10)
plt.xlabel('SeniorCitizen')
plt.ylabel('Percentage (%)')
plt.xticks(rotation=0)
plt.legend(title='Churn', bbox_to_anchor = (0.9,0.9))
plt.show()
```



7 Comparatively a greater percentage of senior citizens have churned.

[159]:

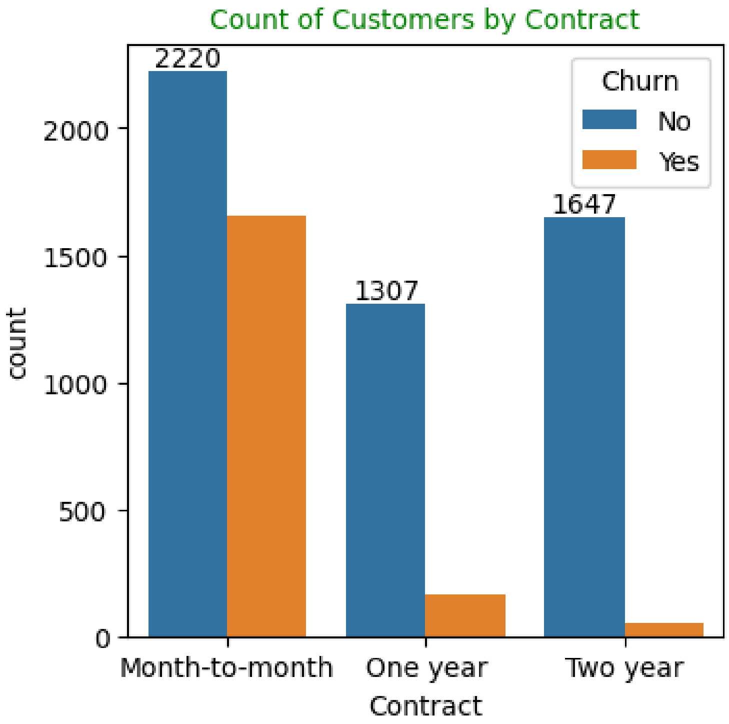
```
plt.figure(figsize=(10,3))
sns.histplot(x="tenure", data=df, bins=72, hue="Churn")
plt.show()
```



8 People who have used our services for long a time have stayed and people who have used our services for a short time have churned.

[161]:

```
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", fontsize=10, color="Green")
plt.show()
```



9 People who have month to month contract are more likely to churn than from those who have 1 or 2 year contract.

[163]:

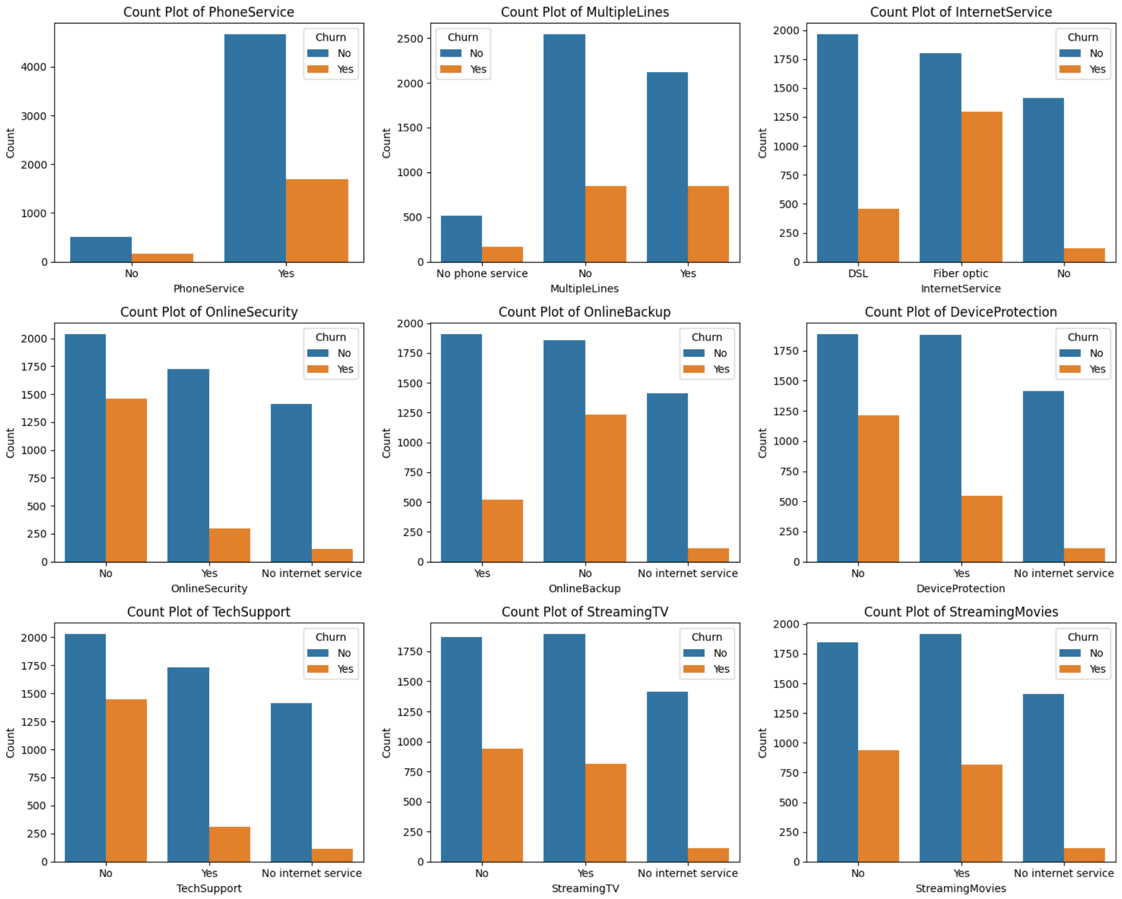
```
df.columns.values
```

[163]:

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

[164]:

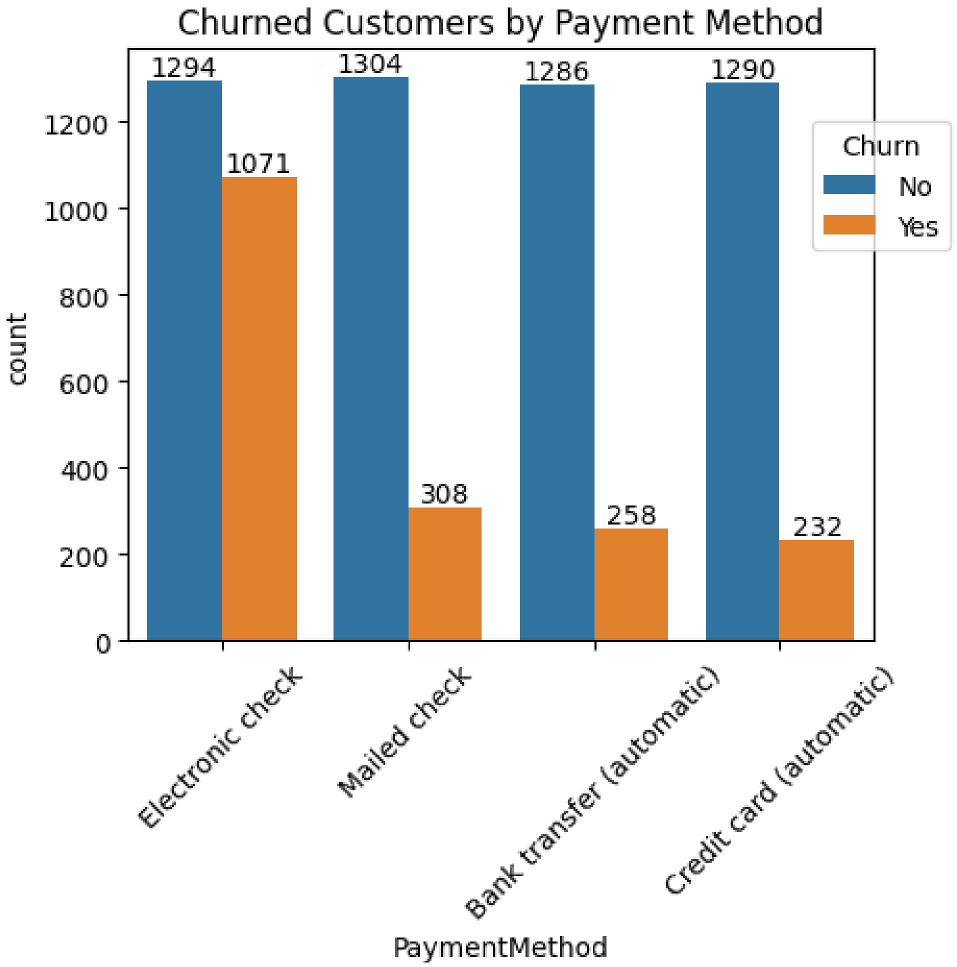
```
columns = ['PhoneService', 'MultipleLines', 'InternetService', 'OnlineSecurity',
           'OnlineBackup', 'DeviceProtection', 'TechSupport', 'StreamingTV',␣
 ↪'StreamingMovies']

# Number of columns for the subplot grid (you can change this)
n_cols = 3
n_rows = (len(columns) + n_cols - 1) // n_cols

# 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}')
    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()
```



10 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.

[170]:

```
plt.figure(figsize = (5,4))
ax = sns.countplot(x = "PaymentMethod", data = df, hue = "Churn")
ax.bar_label(ax.containers[0])
ax.bar_label(ax.containers[1])
plt.title("Churned Customers by Payment Method")
plt.xticks(rotation = 45)
plt.legend(title='Churn', bbox_to_anchor = (0.9,0.9))
plt.show()
```



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

[ ]: