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

df = pd.read_csv('C:/Users/india/Desktop/Projects/Customer Churn
Project/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
```

```
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
```

#Replacing Blanks With 0 as 'Tenure' is 0 as No TotalCharges are Recorded.

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

```
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
```

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

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

```
def Car(value):
    if value == 1:
        return "Yes"
    else:
        return "NO"
df["SeniorCitizen"] = df["SeniorCitizen"].apply(Car)
```

```
df.head(25)
```

```
    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

       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  ...
```

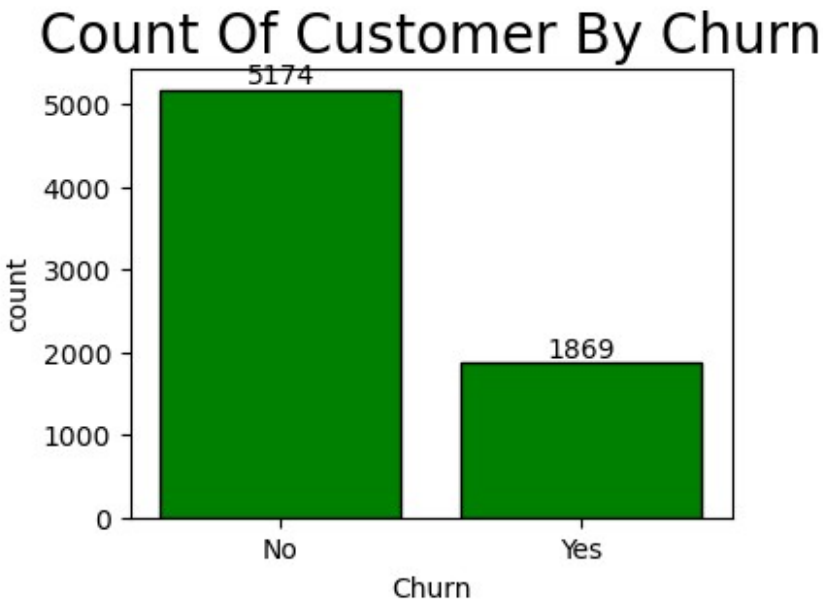
```
19                No     Fiber optic                  No  ...
20  No phone service             DSL                  No  ...
21                No              No  No internet service  ...
22                No              No  No internet service  ...
23               Yes             DSL                  No  ...
24                No             DSL                 Yes  ...

       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

        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
```

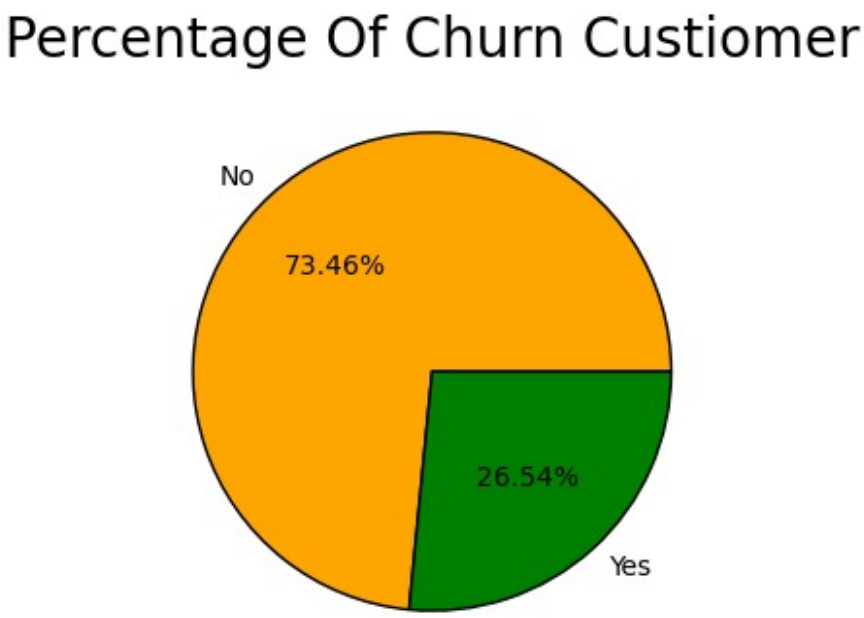
```
                PaymentMethod MonthlyCharges  TotalCharges  Churn
0            Electronic check          29.85         29.85     No
1                Mailed check          56.95       1889.50     No
2                Mailed check          53.85        108.15    Yes
3   Bank transfer (automatic)          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 rows x 21 columns]
```

#Converted SeniorCitizen Value 0 and 1 with Yes/No for easior to Understand.

```
plt.figure(figsize = [4,3])
dan = sns.countplot(x = "Churn", data = df, edgecolor = 'black',
facecolor = 'green')
dan.bar_label(dan.containers[0])
plt.title("Count Of Customer By Churn", fontsize = 20)
plt.show()
```

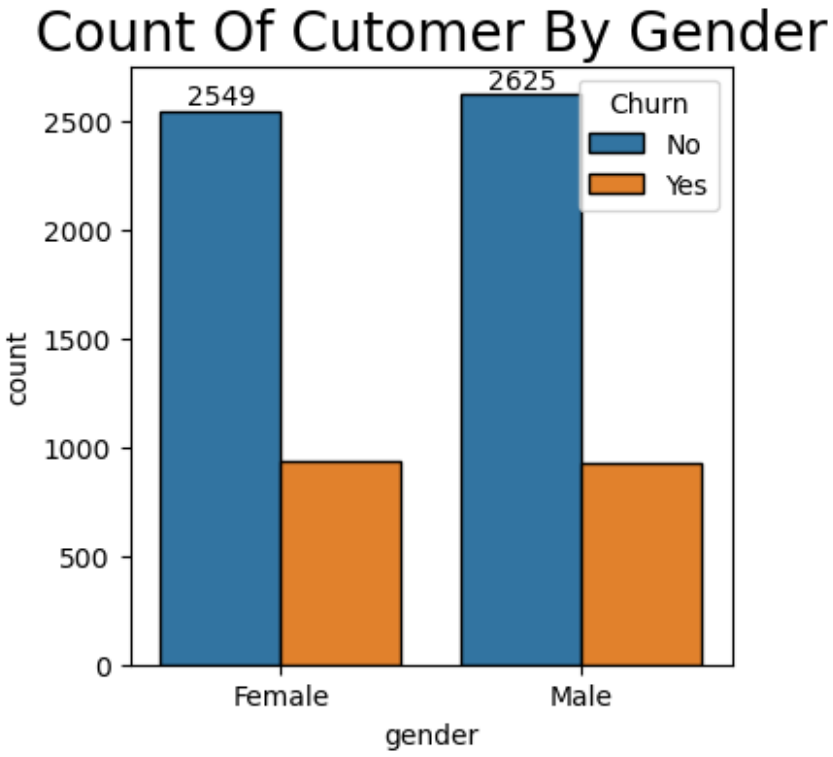



```
plt.figure(figsize = [4,4])
gr = df.groupby('Churn').agg({'Churn':'count'})
plt.pie(gr['Churn'],labels = gr.index, colors = ['orange','green'],
wedgeprops={'edgecolor': 'black'}, autopct = '%1.2f%%')
plt.title("Percentage Of Churn Custiomer", fontsize = 20)
plt.show()
```



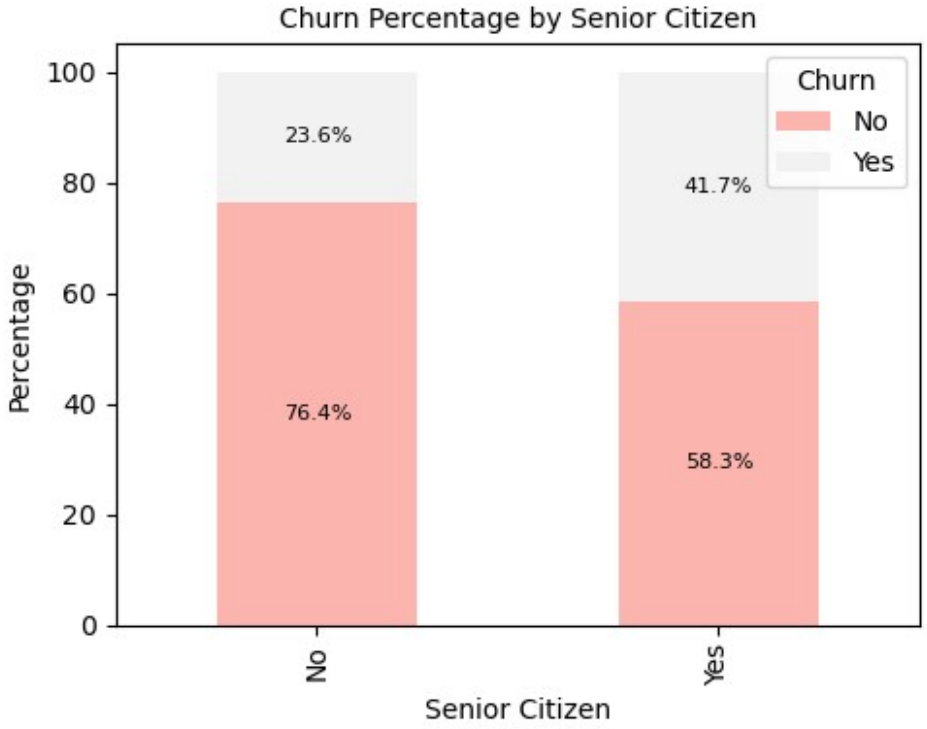
#From the fig Above we conclude that 26.54% customer are churned out. Now let's find out the reason behind it.

```
plt.figure(figsize = [4,4])
lab = sns.countplot(x = 'gender', data = df, hue = 'Churn', edgecolor
= 'black')
lab.bar_label(lab.containers[0])
plt.title('Count Of Cutomer By Gender', fontsize = 20)
plt.show()
```



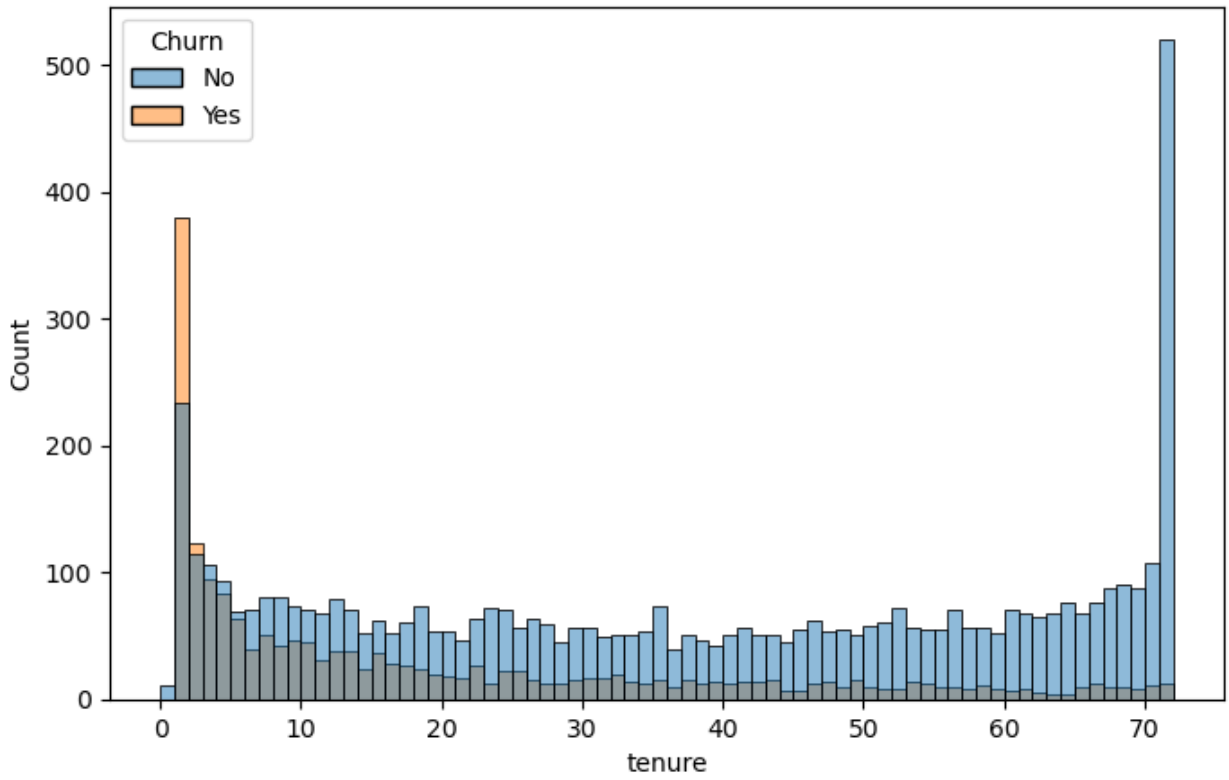

```
cross_tab = pd.crosstab(df['SeniorCitizen'], df['Churn'])

# 2. Convert counts to percentages (row-wise)
percent_tab = cross_tab.div(cross_tab.sum(axis=1), axis=0) * 100

# 3. Plot the stacked bar chart
ax = percent_tab.plot(kind='bar', stacked=True, figsize=(5, 4),
colormap='Pastel1')

# 4. Add percentage labels on each bar segment
for i, row in enumerate(percent_tab.values):
    y_offset = 0
    for j, val in enumerate(row):
        if val > 0:
            ax.text(i, y_offset + val / 2, f'{val:.1f}%', ha='center',
va='center', fontsize=8)
            y_offset += val

# 5. Final touches
```

```
plt.title('Churn Percentage by Senior Citizen', fontsize=10)
plt.xlabel('Senior Citizen')
plt.ylabel('Percentage')
plt.xticks(ticks=[0, 1], labels=['No', 'Yes'])  # Assuming 0 = No, 1 = Yes
plt.legend(title='Churn', loc='upper right')
plt.tight_layout()
plt.show()
```



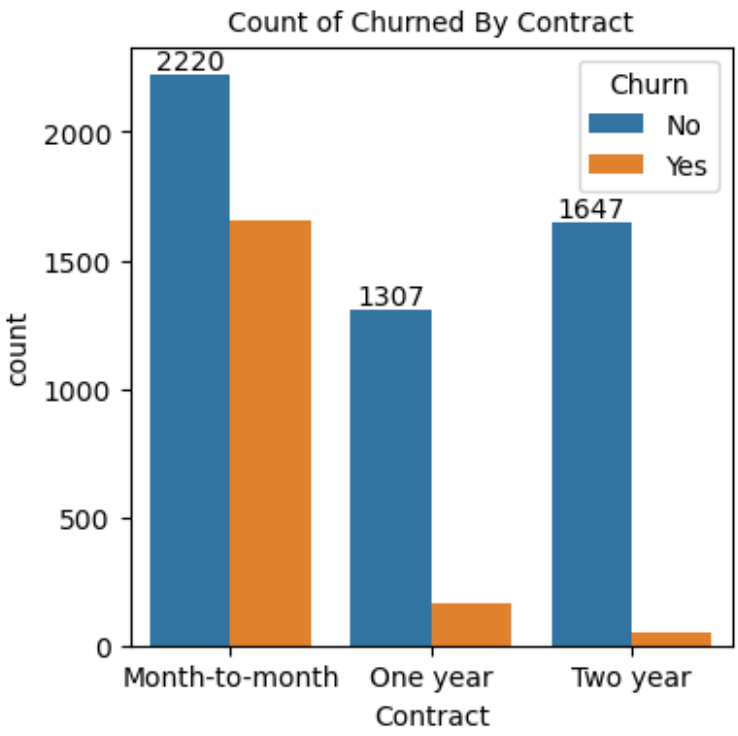
#Comparatively a Grater Percentage of people from 'SeniorCitizen' are Churned Out

```
plt.figure(figsize = [8,5])
sns.histplot(x = 'tenure', data = df, bins = 72, stat = 'count', hue = 'Churn')
plt.show()
```



#People who used used our sevice for a long period have stayed and People who used service one and two months are churned.

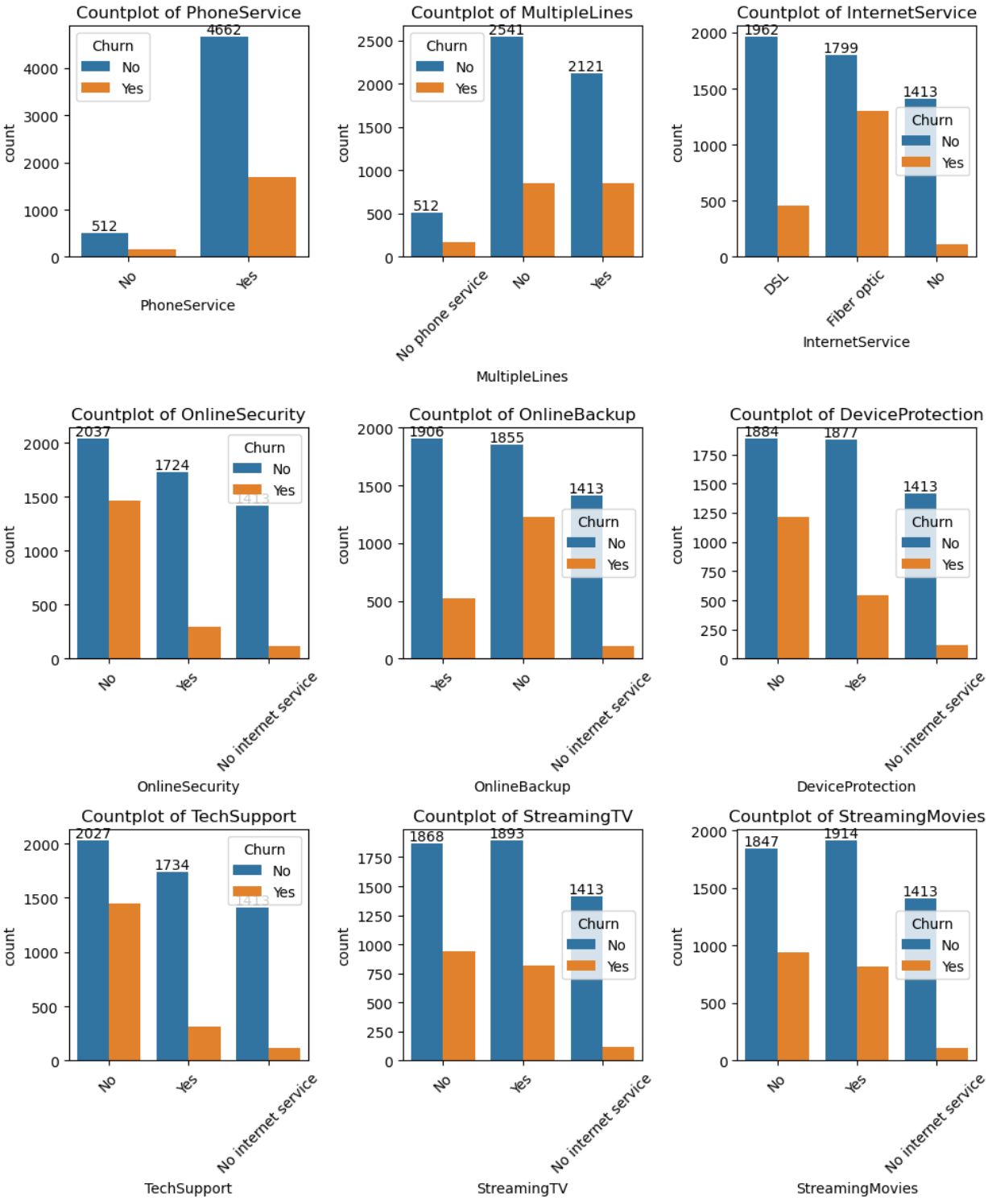
```
plt.figure(figsize = (4,4))
lab = sns.countplot(x = 'Contract',data = df, hue = 'Churn')
lab.bar_label(lab.containers[0])
plt.title("Count of Churned By Contract",fontsize = 10)
plt.show()
```



#People who have contract of 'Month to Month' are highly churned compare to 'One/Two Year'.

```
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)

cols = ['PhoneService', 'MultipleLines', 'InternetService',
        'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
        'TechSupport', 'StreamingTV', 'StreamingMovies']

# Set up the subplot grid (adjust rows/cols based on number of
features)
n_cols = 3
n_rows = (len(cols) + n_cols - 1) // n_cols

# Create subplots
fig, axes = plt.subplots(nrows=n_rows, ncols=n_cols,
figsize=(10,n_rows*4))
axes = axes.flatten()  # Flatten in case of multiple rows

# Loop through each column and draw countplot
```

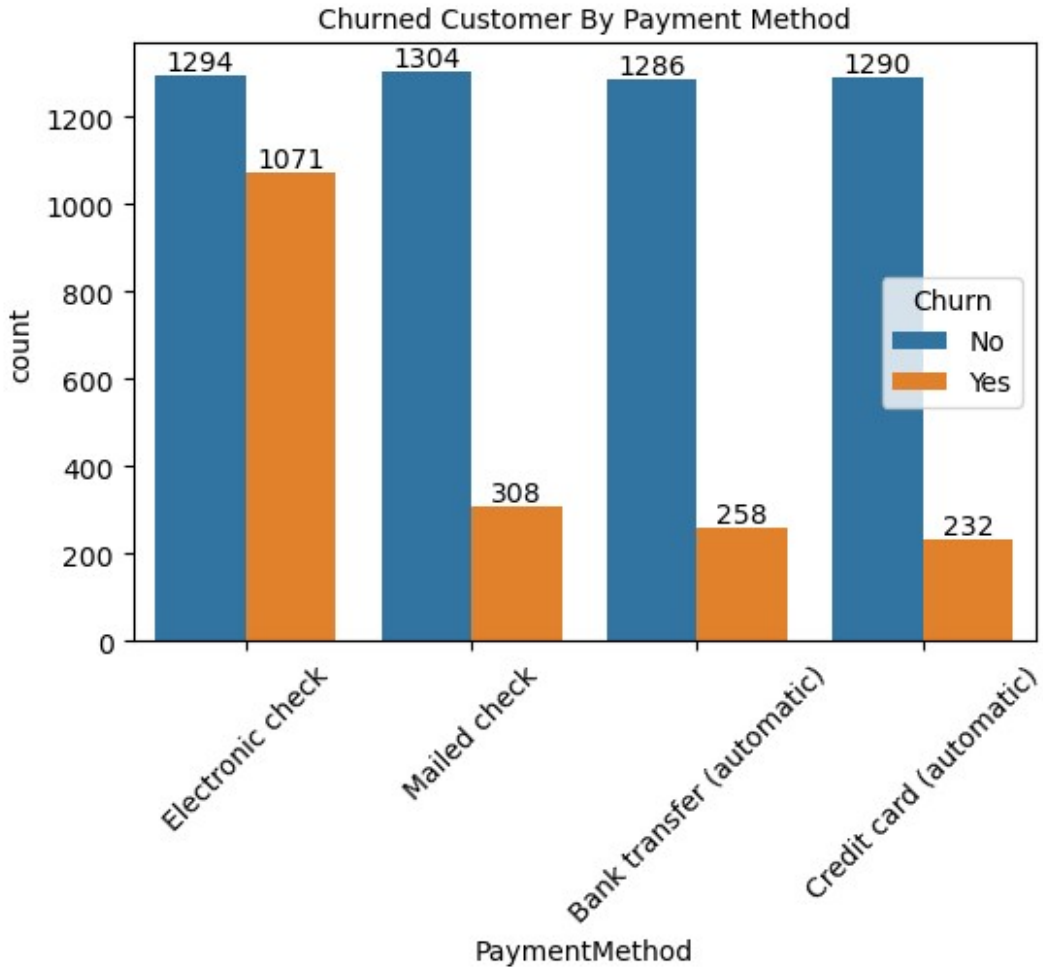
```
for i, col in enumerate(cols):
    sns.countplot(data=df, x=col, ax=axes[i], hue = 'Churn')
    axes[i].set_title(f'Countplot of {col}')
    axes[i].tick_params(axis='x', rotation=45)
    axes[i].bar_label(axes[i].containers[0])  # Show count on bars

# Remove unused subplots
for j in range(len(cols), len(axes)):
    fig.delaxes(axes[j])

# Adjust layout
plt.tight_layout()
plt.show()
```



 Customers without internet-based services (like OnlineSecurity, TechSupport, etc.) show very low churn, indicating non-internet users are more stable. Across most features, the "No" category has higher churn compared to "Yes", showing that lack of service (e.g., no backup, no tech support) may lead to dissatisfaction. In cases like StreamingTV and StreamingMovies, churn is higher for those not using the services, suggesting these features may contribute to

retention. Overall, customers using more services (especially internet-based) tend to churn less, highlighting service engagement as a key to retention.

```
plt.figure(figsize = (6,4))
lab = sns.countplot(x = 'PaymentMethod',data = df, hue = 'Churn')
lab.bar_label(lab.containers[0])
lab.bar_label(lab.containers[1])
plt.title("Churned Customer By Payment Method",fontsize = 10)
plt.xticks(rotation = 45)
plt.show()
```



#Customer Is Mostly Churned When they using 'Electronic Check' as PaymentMethod as Compare to Others Method.