Himanshu Kumar

In [ ]:

```

```

In [12]:

```
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
```

Out[12]:

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	Multip
0	7590-VHVEG	Female	0	Yes	No	1	No	Nc
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	Nc
4	9237-HQITU	Female	0	No	No	2	Yes	
...	...	...	...	...	...	...	...	
7038	6840-RESVB	Male	0	Yes	Yes	24	Yes	
7039	2234-XADUH	Female	0	Yes	Yes	72	Yes	
7040	4801-JZAZL	Female	0	Yes	Yes	11	No	Nc
7041	8361-LTMKD	Male	1	Yes	No	4	Yes	
7042	3186-AJIEK	Male	0	No	No	66	Yes	

7043 rows × 21 columns

In [13]:

```
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

In [25]:

```
df["TotalCharges"] = df["TotalCharges"].replace(" ","0")
df["TotalCharges"] = df["TotalCharges"].astype("float")
```

In [26]:

```
df.info
```

```
Out[26]: <bound method DataFrame.info of       customerID  gender  SeniorCitizen
Partner Dependents  tenure  \
0     7590-VHVEG  Female              0     Yes         No       1
1     5575-GNVDE    Male              0      No         No      34
2     3668-QPYBK    Male              0      No         No       2
3     7795-CFOCW    Male              0      No         No      45
4     9237-HQITU  Female              0      No         No       2
...          ...     ...            ...     ...        ...     ...
7038  6840-RESVB    Male              0     Yes        Yes      24
7039  2234-XADUH  Female              0     Yes        Yes      72
7040  4801-JZAZL  Female              0     Yes        Yes      11
7041  8361-LTMKD    Male              1     Yes         No       4
7042  3186-AJIEK    Male              0      No         No      66

     PhoneService     MultipleLines InternetService OnlineSecurity  ...
\
0              No  No phone service             DSL             No  ...
1             Yes                No             DSL            Yes  ...
2             Yes                No             DSL            Yes  ...
3              No  No phone service             DSL            Yes  ...
4             Yes                No     Fiber optic             No  ...
...           ...               ...             ...            ...  ...
7038          Yes               Yes             DSL            Yes  ...
7039          Yes               Yes     Fiber optic             No  ...
7040           No  No phone service             DSL            Yes  ...
7041          Yes               Yes     Fiber optic             No  ...
7042          Yes                No     Fiber optic            Yes  ...

     DeviceProtection TechSupport StreamingTV StreamingMovies        Co
ntract  \
0                  No          No          No              No  Month-to
-month
1                 Yes          No          No              No        On
e year
2                  No          No          No              No  Month-to
-month
3                 Yes         Yes          No              No        On
e year
4                  No          No          No              No  Month-to
-month
...               ...         ...         ...             ...
...
7038              Yes         Yes         Yes             Yes        On
e year
7039              Yes          No         Yes             Yes        On
e year
7040               No          No          No              No  Month-to
-month
7041               No          No          No              No  Month-to
-month
7042              Yes         Yes         Yes             Yes        Tw
o year

     PaperlessBilling              PaymentMethod MonthlyCharges  TotalC
harges  \
0                 Yes           Electronic check          29.85
29.85
1                  No               Mailed check          56.95         1
889.50
2                 Yes               Mailed check          53.85
108.15
```

```
3                   No  Bank transfer (automatic)          42.30        1
840.75
4                  Yes           Electronic check          70.70
151.65
...                ...                        ...            ...
...
7038               Yes               Mailed check          84.80        1
990.50
7039               Yes    Credit card (automatic)         103.20        7
362.90
7040               Yes           Electronic check          29.60
346.45
7041               Yes               Mailed check          74.40
306.60
7042               Yes  Bank transfer (automatic)         105.65        6
844.50

      Churn
0        No
1        No
2       Yes
3        No
4       Yes
...     ...
7038     No
7039     No
7040     No
7041    Yes
7042     No

[7043 rows x 21 columns]>
```

In [28]:

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

Out[28]:

```
0
```

In [29]:

```
df.describe()
```

Out[29]:

	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

In [33]:

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

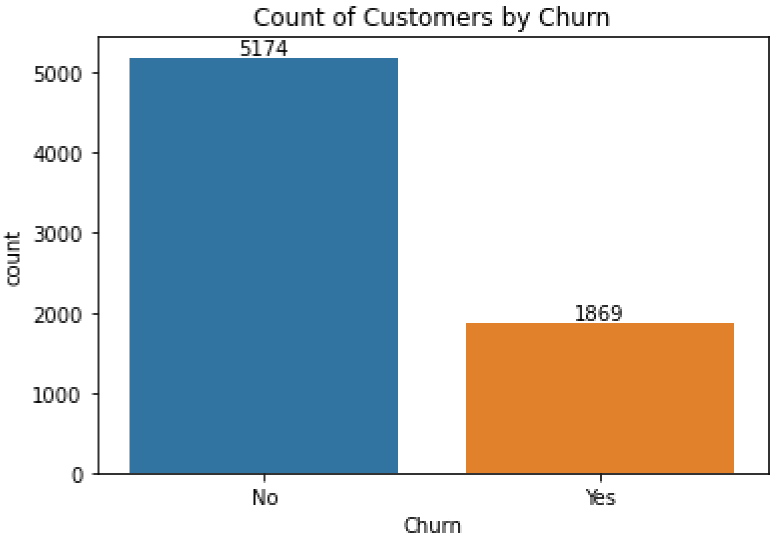
Out[33]:

```
0
```

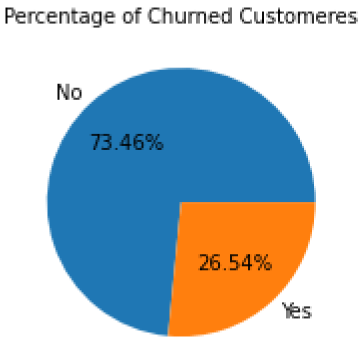
In [39]:
```
def conv(value):
    if value == 1:
        return "yes"
    else:
        return "no"
df['seniorCitizen'] = df["SeniorCitizen"].apply(conv)
```

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

In [41]:
```
ax = sns.countplot(x = 'Churn', data = df)

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



In [42]:
```
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 Customeres", fontsize = 10)
plt.show()
```



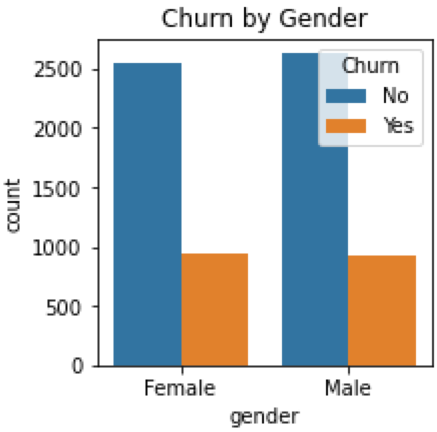
from the given pie chart we can conclude that 26.54% of our customers have churned

out.

not let's explore the reason behind it

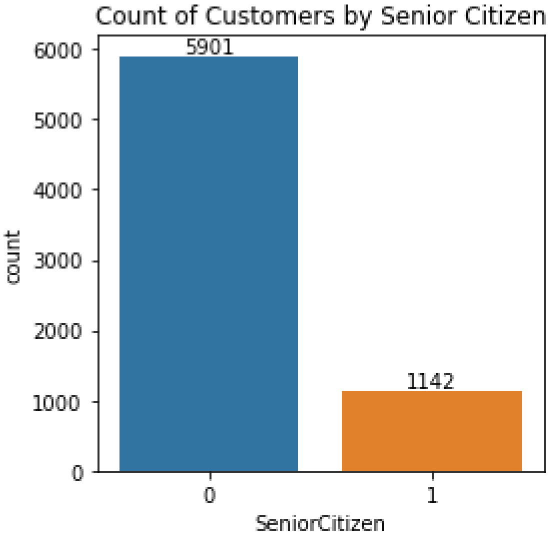
In [43]:

```python
plt.figure(figsize = (3,3))
sns.countplot(x = "gender", data = df, hue = "Churn")
plt.title("Churn by Gender")
plt.show()
```



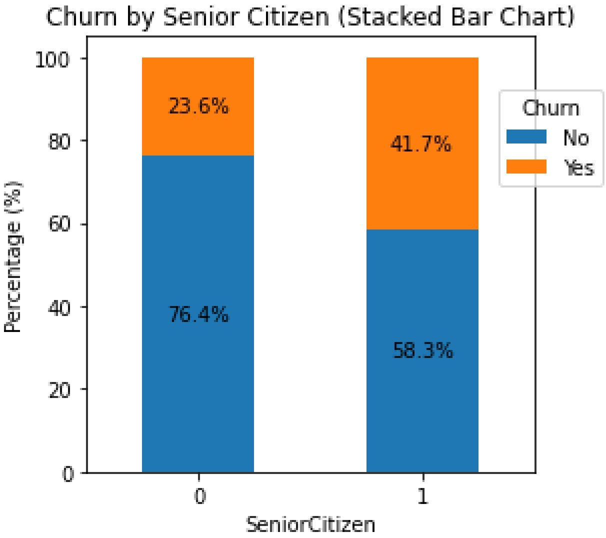
In [44]:

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



In [45]:

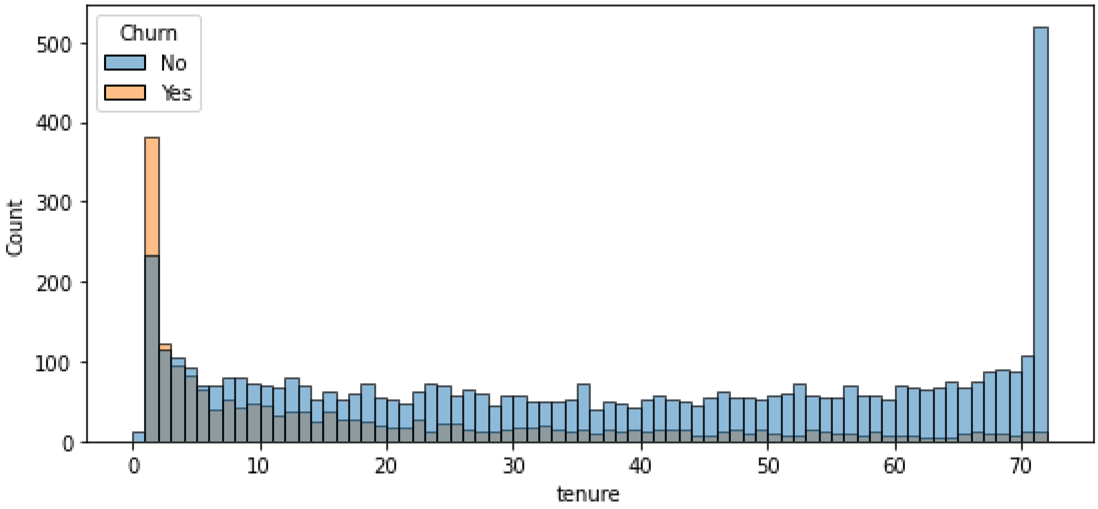
```
total_counts = df.groupby('SeniorCitizen')['Churn'].value_counts(normali

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

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

# 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'

plt.title('Churn by Senior Citizen (Stacked Bar Chart)')
plt.xlabel('SeniorCitizen')
plt.ylabel('Percentage (%)')
plt.xticks(rotation=0)
plt.legend(title='Churn', bbox_to_anchor = (0.9,0.9))  # Customize legen

plt.show()
```



comparative a greater pecentage of people in senior citizen category have churned

In [46]:

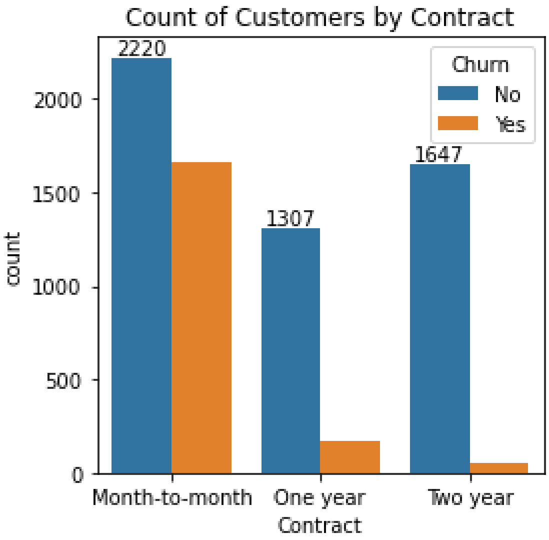
```
plt.figure(figsize = (9,4))
sns.histplot(x = "tenure", data = df, bins = 72, hue = "Churn")
plt.show()
```



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

In [48]:

```
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 from those who have 1 or 2 years or contract.

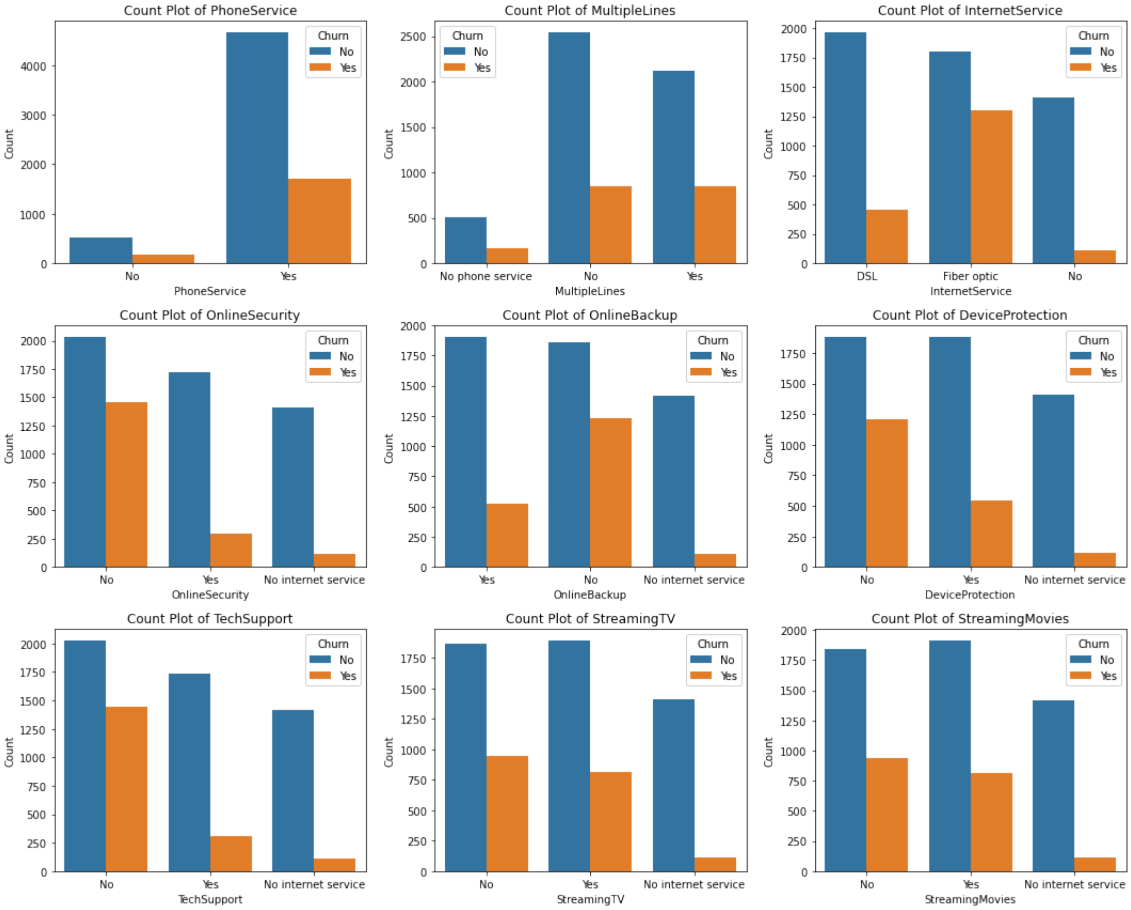
In [49]:

```
df.columns.values
```

Out[49]:

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

```
In [50]: columns = ['PhoneService', 'MultipleLines', 'InternetService', 'OnlineSe
                    'OnlineBackup', 'DeviceProtection', 'TechSupport', 'Streaming

         # 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 ro

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

         # Flatten the axes array for easy iteration (handles both 1D and 2D arra
         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()
```

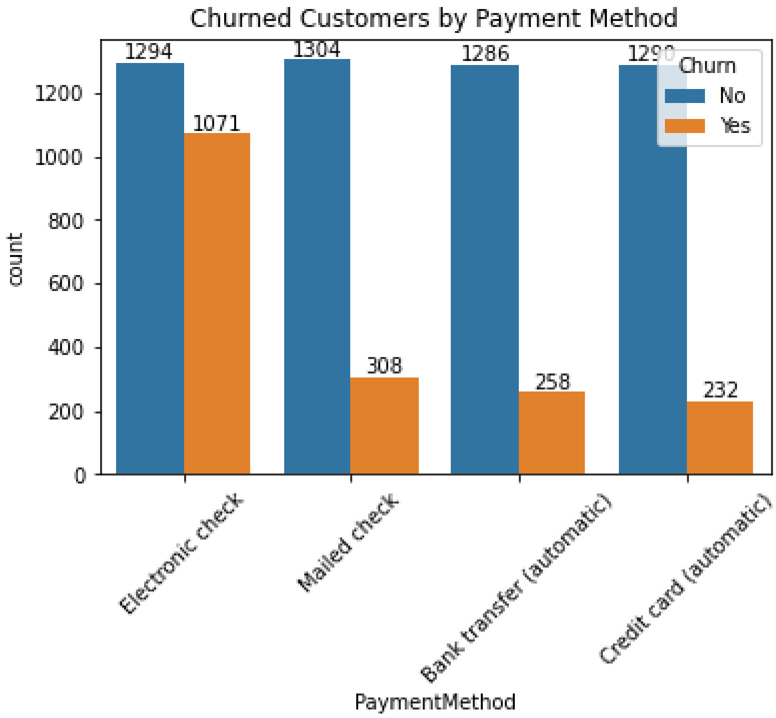


The majority of customers who do not churn tend to have services like PhoneService, InternetService (particularly DSL), and

OnlineSecurity enabled. For services like OnlineBackup, TechSupport, and StreamingTV, churn rates are noticeably higher when these services are not used or are unavailable.

In [51]:

```
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 Customers by Payment Method")
plt.xticks(rotation = 45)
plt.show()
```



In [ ]: