In [4]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [6]:
```
df = pd.read_csv('Customer Churn.csv')
df.head()
```

Out[6]:

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	MultipleLines	InternetService	OnlineSecurity	...	Devi
0	7590-VHVEG	Female	0	Yes	No	1	No	No phone service	DSL	No	...	
1	5575-GNVDE	Male	0	No	No	34	Yes	No	DSL	Yes	...	
2	3668-QPYBK	Male	0	No	No	2	Yes	No	DSL	Yes	...	
3	7795-CFOCW	Male	0	No	No	45	No	No phone service	DSL	Yes	...	
4	9237-HQITU	Female	0	No	No	2	Yes	No	Fiber optic	No	...	

5 rows × 21 columns

In [7]:
```
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
```

In [8]:
```
df["TotalCharges"] = df["TotalCharges"].replace(" ","0")
df["TotalCharges"] = df["TotalCharges"].astype("float")
```

In [9]:
```
df.info
```

Out[9]:
```
<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        Contract  \
0                  No          No          No              No  Month-to-month
1                 Yes          No          No              No        One year
2                  No          No          No              No  Month-to-month
3                 Yes         Yes          No              No        One year
4                  No          No          No              No  Month-to-month
...               ...         ...         ...             ...             ...
7038              Yes         Yes         Yes             Yes        One year
7039              Yes          No         Yes             Yes        One year
7040               No          No          No              No  Month-to-month
7041               No          No          No              No  Month-to-month
7042              Yes         Yes         Yes             Yes        Two year

     PaperlessBilling              PaymentMethod MonthlyCharges  TotalCharges  \
0                 Yes           Electronic check          29.85         29.85
1                  No               Mailed check          56.95       1889.50
2                 Yes               Mailed check          53.85        108.15
3                  No  Bank transfer (automatic)          42.30       1840.75
4                 Yes           Electronic check          70.70        151.65
...               ...                        ...            ...           ...
7038              Yes               Mailed check          84.80       1990.50
7039              Yes    Credit card (automatic)         103.20       7362.90
7040              Yes           Electronic check          29.60        346.45
7041              Yes               Mailed check          74.40        306.60
7042              Yes  Bank transfer (automatic)         105.65       6844.50

      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 [10]:
```
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
```

In [11]:
```
df.isnull().sum().sum()
```

Out[11]:
```
np.int64(0)
```

In [12]:
```
df.isnull().sum()
```

Out[12]:
```
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
```

In [13]:
```
df.describe()
```

Out[13]:

	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 [14]:
```
df["customerID"].duplicated().sum()
```

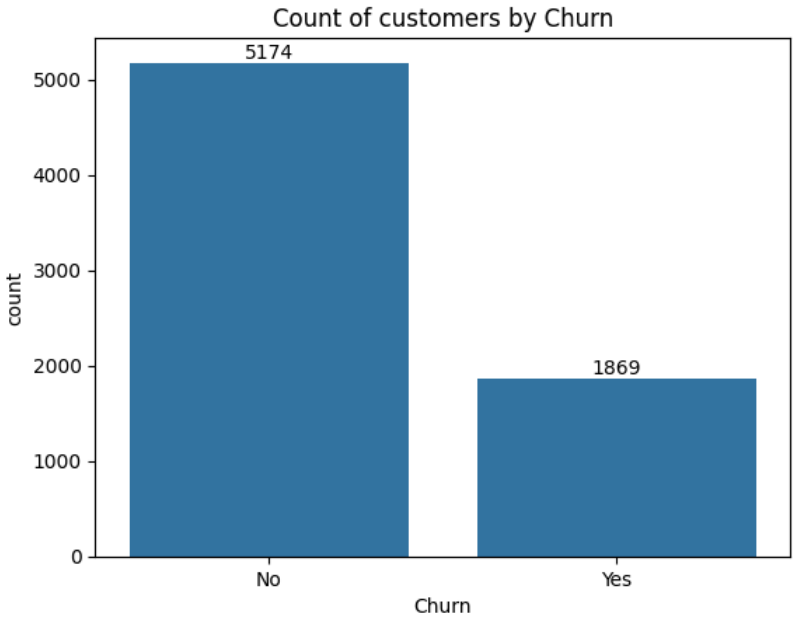
Out[14]: np.int64(0)

In [15]:
```
def convert(value):
    if value ==1:
       return "Yes"
    else:
       return "No"
df["SeniorCitizen"]=df["SeniorCitizen"].apply(convert)
```

In [16]:
```
df.info()
```

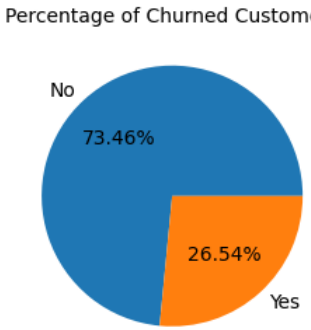
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7043 entries, 0 to 7042
Data columns (total 21 columns):
 #   Column            Non-Null Count  Dtype  
---  ------            --------------  -----  
 0   customerID        7043 non-null   object 
 1   gender            7043 non-null   object 
 2   SeniorCitizen     7043 non-null   object 
 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(1), object(18)
memory usage: 1.1+ MB
```

In [17]:
```
ax = sns.countplot(x='Churn',data=df)
ax.bar_label(ax.containers[0])
plt.title("Count of customers by Churn")
plt.show()
```



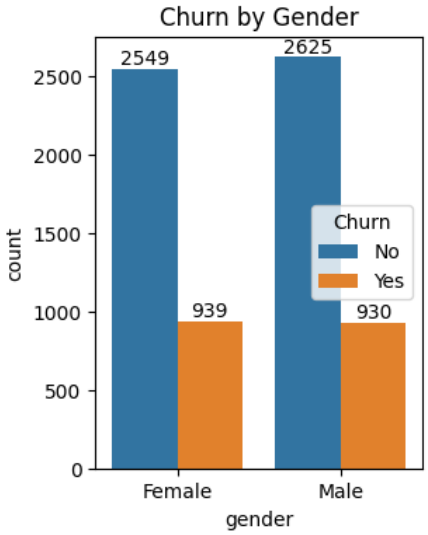
In [18]:
```
plt.figure(figsize = (3,4))
gb = df.groupby("Churn").agg({'Churn':"count"})
plt.pie(gb['Churn'],labels = gb.index, autopct = "%1.2f%%")
plt.title("Percentage of Churned Customers",fontsize = 10)
plt.show
```

Out[18]: <function matplotlib.pyplot.show(close=None, block=None)>



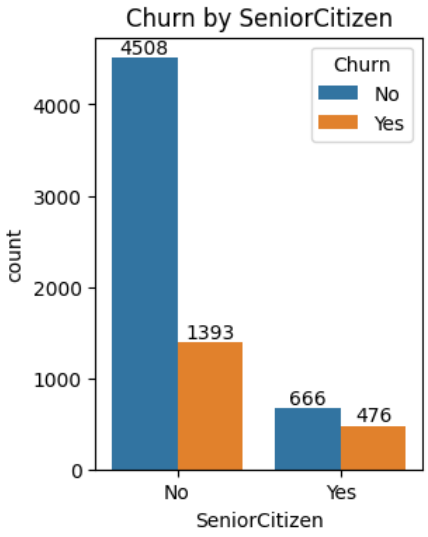
In [19]:
```
plt.figure(figsize = (3,4))
ax = sns.countplot(x="gender",data =df,hue = "Churn")
for container in ax.containers:
    ax.bar_label(container)
plt.title("Churn by Gender")
```

Out[19]: Text(0.5, 1.0, 'Churn by Gender')

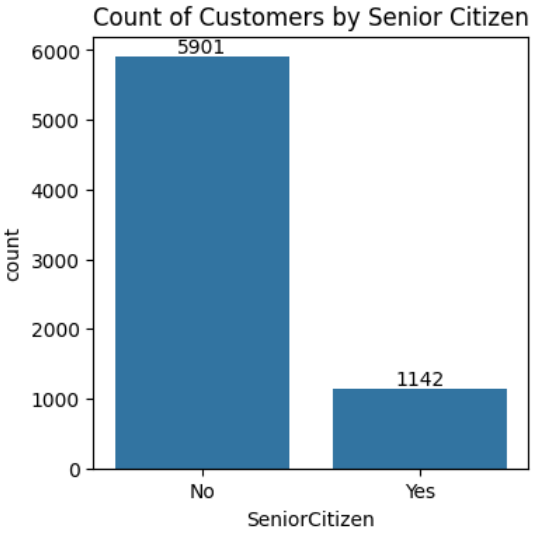


In [20]:
```
plt.figure(figsize = (3,4))
ax = sns.countplot(x="SeniorCitizen",data =df,hue = "Churn")
for container in ax.containers:
    ax.bar_label(container)
plt.title("Churn by SeniorCitizen")
```

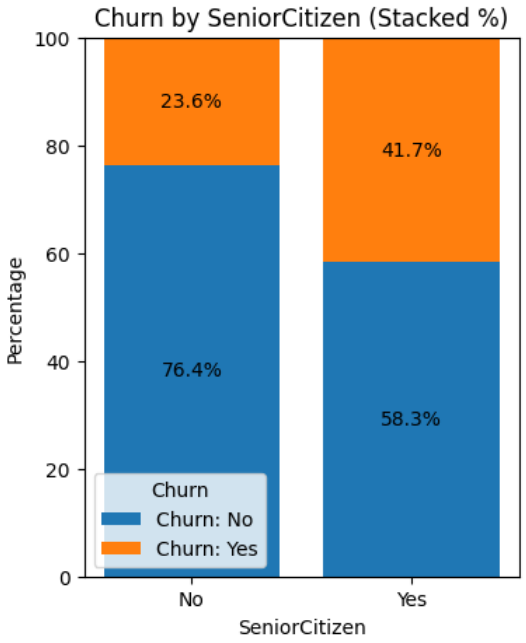
Out[20]: Text(0.5, 1.0, 'Churn by SeniorCitizen')



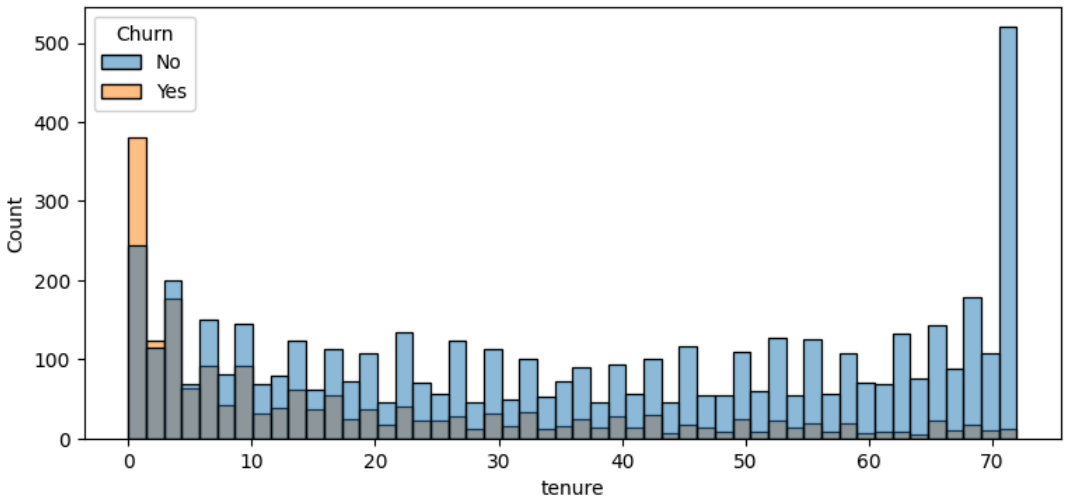
In [21]:
```
plt.figure(figsize = (4,4))
ax = sns.countplot(x = "SeniorCitizen" , data = df)
ax.bar_label(ax.containers[0])
plt.title("Count of Customers by Senior Citizen")
plt.show()
```



In [22]:
```
import matplotlib.pyplot as plt
import seaborn as sns
import pandas as pd

# Compute counts
count_data = df.groupby(["SeniorCitizen", "Churn"]).size().unstack()

# Convert to percentages
count_data_percentage = count_data.div(count_data.sum(axis=1), axis=0) * 100

# Plot stacked bar chart
fig, ax = plt.subplots(figsize=(4, 5))

# Plot bars for each category in the hue
bottom = None  # Keeps track of the stacked position
for churn_category in count_data_percentage.columns:
    bars = ax.bar(count_data_percentage.index, count_data_percentage[churn_category],
                  label=f"Churn: {churn_category}", bottom=bottom)

    # Label each segment inside the bars
    ax.bar_label(bars, fmt="%.1f%%", label_type="center")

    # Update bottom to stack bars correctly
    if bottom is None:
        bottom = count_data_percentage[churn_category]
    else:
        bottom += count_data_percentage[churn_category]

# Formatting
plt.title("Churn by SeniorCitizen (Stacked %)")
plt.xlabel("SeniorCitizen")
plt.ylabel("Percentage")
plt.ylim(0, 100)  # Ensure the chart goes up to 100%
plt.legend(title="Churn")
plt.show()
```

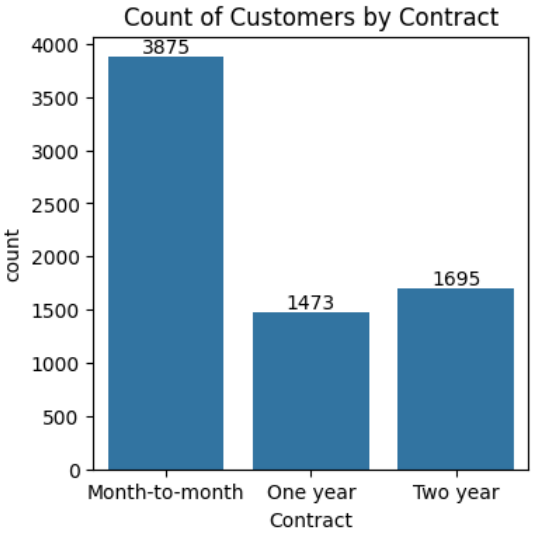


In [23]:
```
plt.figure(figsize = (9,4))
sns.histplot(x="tenure",data = df, bins = 50,hue = "Churn")
plt.show()
#hue is used to give the ratio of the churn (yes/no)
```

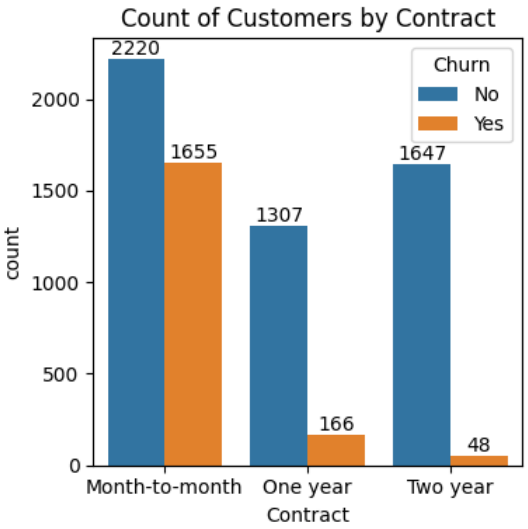


In [24]:
```
plt.figure(figsize =(4,4))
ax = sns.countplot(x = "Contract",data =df)
ax.bar_label(ax.containers[0])
plt.title("Count of Customers by Contract")
plt.show
```

Out[24]:
```
<function matplotlib.pyplot.show(close=None, block=None)>
```



In [30]:
```
plt.figure(figsize=(4, 4))
ax = sns.countplot(x="Contract", data=df, hue="Churn")
ax.bar_label(ax.containers[0])
ax.bar_label(ax.containers[1])
plt.title("Count of Customers by Contract")
plt.tight_layout()
plt.show()
```

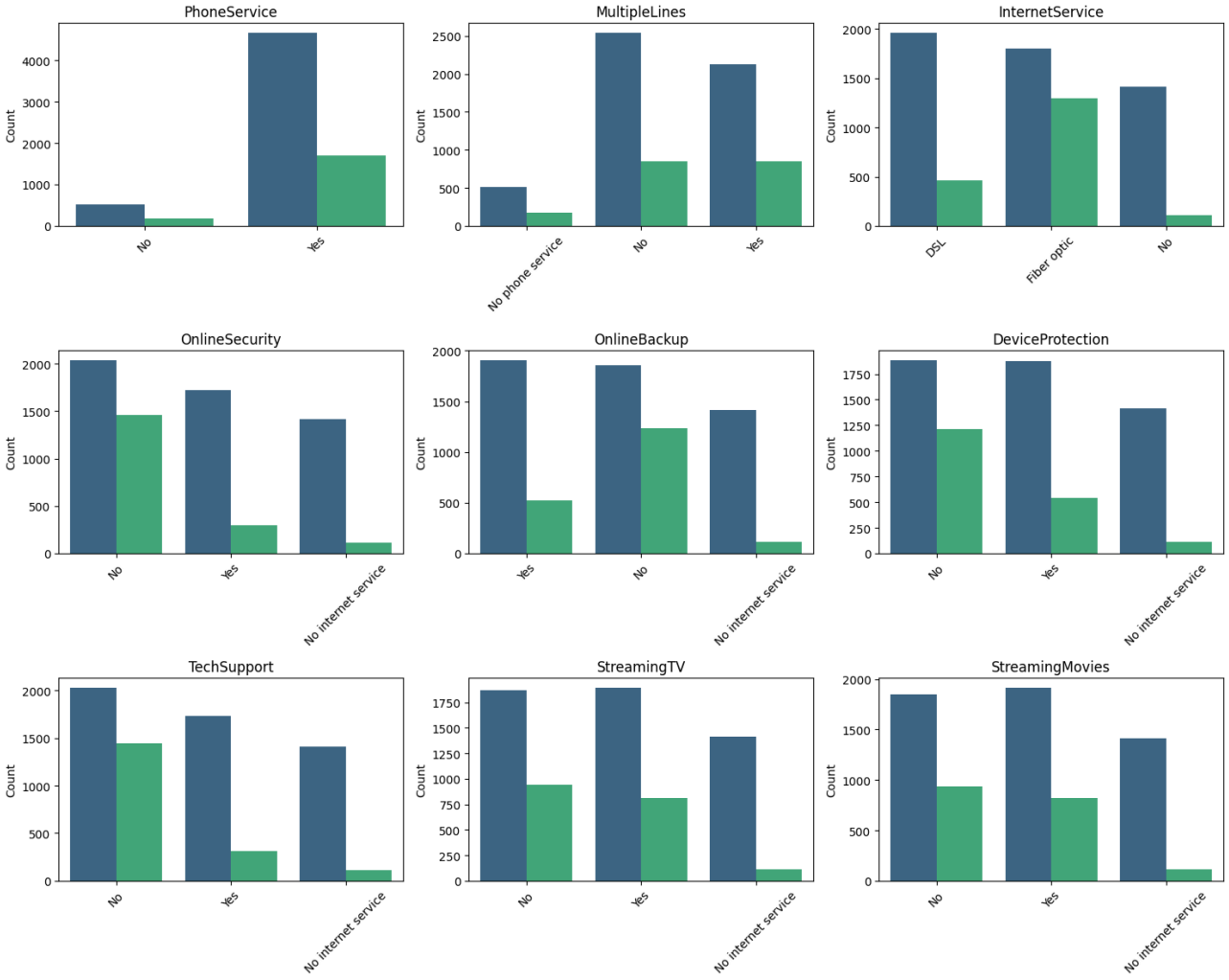


In [31]:
```
df.columns.values
```

Out[31]:
```
array(['customerID', 'gender', 'SeniorCitizen', 'Partner', 'Dependents',
       'tenure', 'PhoneService', 'MultipleLines', 'InternetService',
       'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
       'TechSupport', 'StreamingTV', 'StreamingMovies', 'Contract',
       'PaperlessBilling', 'PaymentMethod', 'MonthlyCharges',
       'TotalCharges', 'Churn'], dtype=object)
```

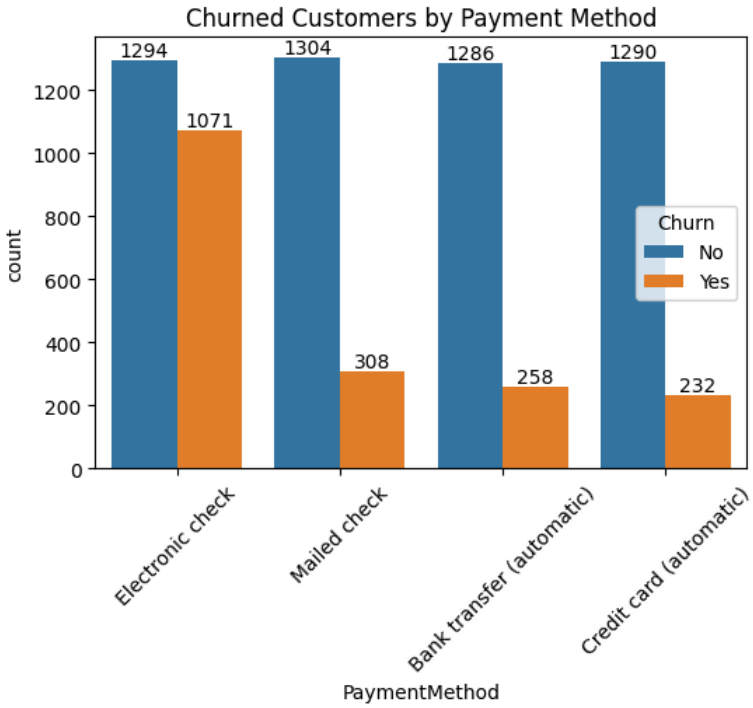
In [32]:
```
# Define columns for count plots
columns = ['PhoneService', 'MultipleLines', 'InternetService',
           'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
           'TechSupport', 'StreamingTV', 'StreamingMovies']

# Set figure size
fig, axes = plt.subplots(3, 3, figsize=(15, 12))  # 3x3 grid

# Flatten axes array for easy iteration
axes = axes.flatten()

# Loop through columns and create countplots
for i, col in enumerate(columns):
    sns.countplot(data=df, x=col, ax=axes[i], hue=df["Churn"], legend=False, palette="viridis")
    axes[i].set_title(col)
```

```
    axes[i].set_xlabel("")
    axes[i].set_ylabel("Count")
    axes[i].tick_params(axis='x', rotation=45)  # Rotate x-axis labels if needed

# Adjust layout to avoid overlap
plt.tight_layout()
plt.show()
```



In [33]:
```
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
```

Out[33]:
```
<function matplotlib.pyplot.show(close=None, block=None)>
```


Churned Customers by Payment Method
1294
1071
1304
308
1286
258
1290
232
Churn
No
Yes
count
0
200
400
600
800
1000
1200
Electronic check
Mailed check
Bank transfer (automatic)
Credit card (automatic)
PaymentMethod

In [ ]: