In [1]:

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

In [3]:

```
df = pd.read_csv(r"C:\Users\tapas\OneDrive\Desktop\Customer Churn.csv")
df.head()
```

Out[3]:

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

5 rows × 21 columns

In [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
```

In [5]:
```
# replacing blank values with 0 and changing the data type
df["TotalCharges"] = df["TotalCharges"].replace(" ","0")
df["TotalCharges"] = df["TotalCharges"].astype("float")
```

In [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
```

In [9]:

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

Out[9]:

```
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 [10]:
```
df.describe()
```

Out[10]:

	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

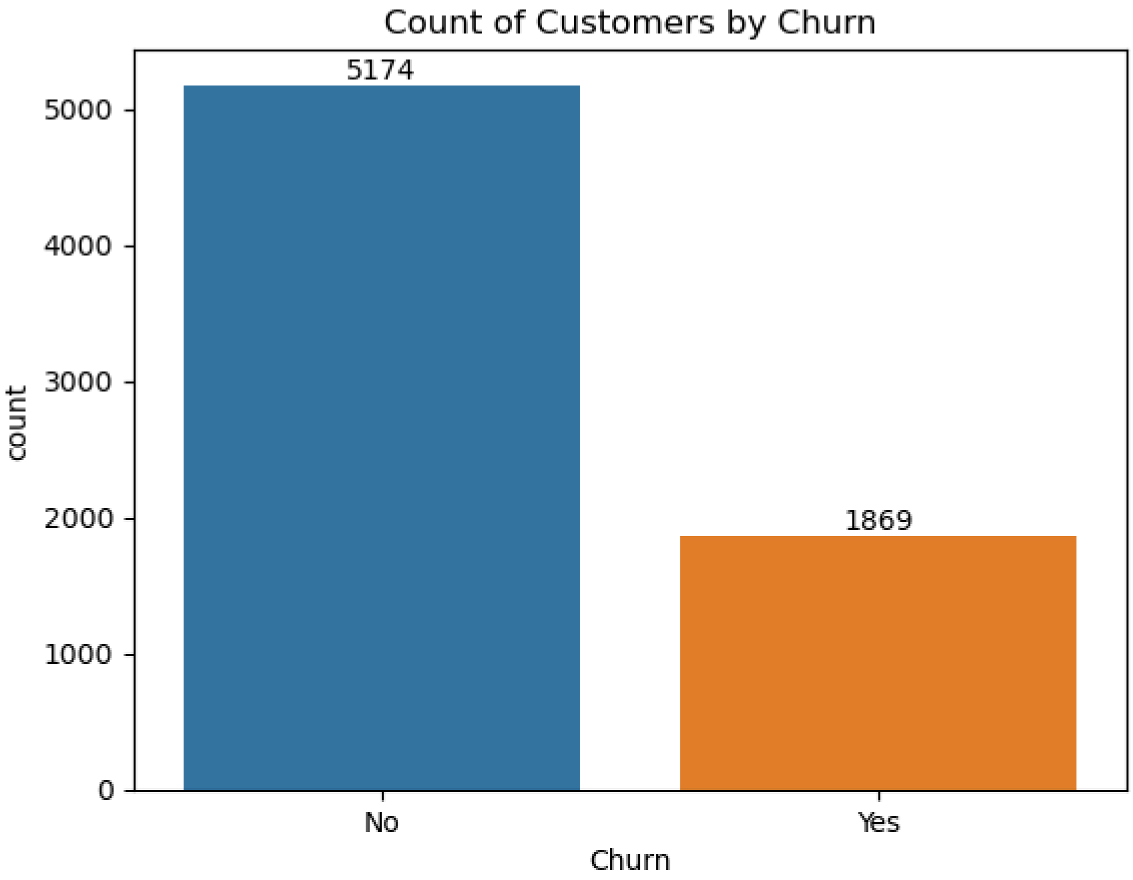
In [12]:
```
df["customerID"].duplicated().sum()
```

Out[12]:
```
0
```

In [14]:
```
def conv(value):
    if value == 1:
        return "Yes"
    else:
        return "No"

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

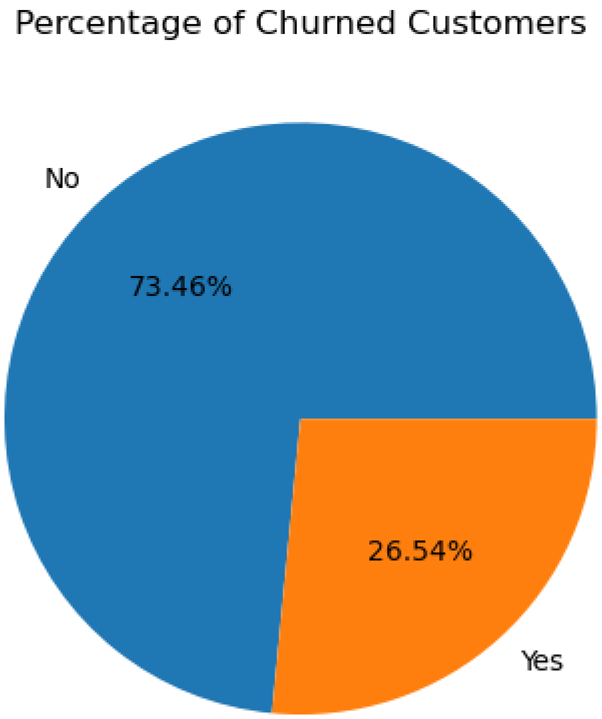
In [23]:

```
ax = sns.countplot(x = "Churn" , data=df)

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

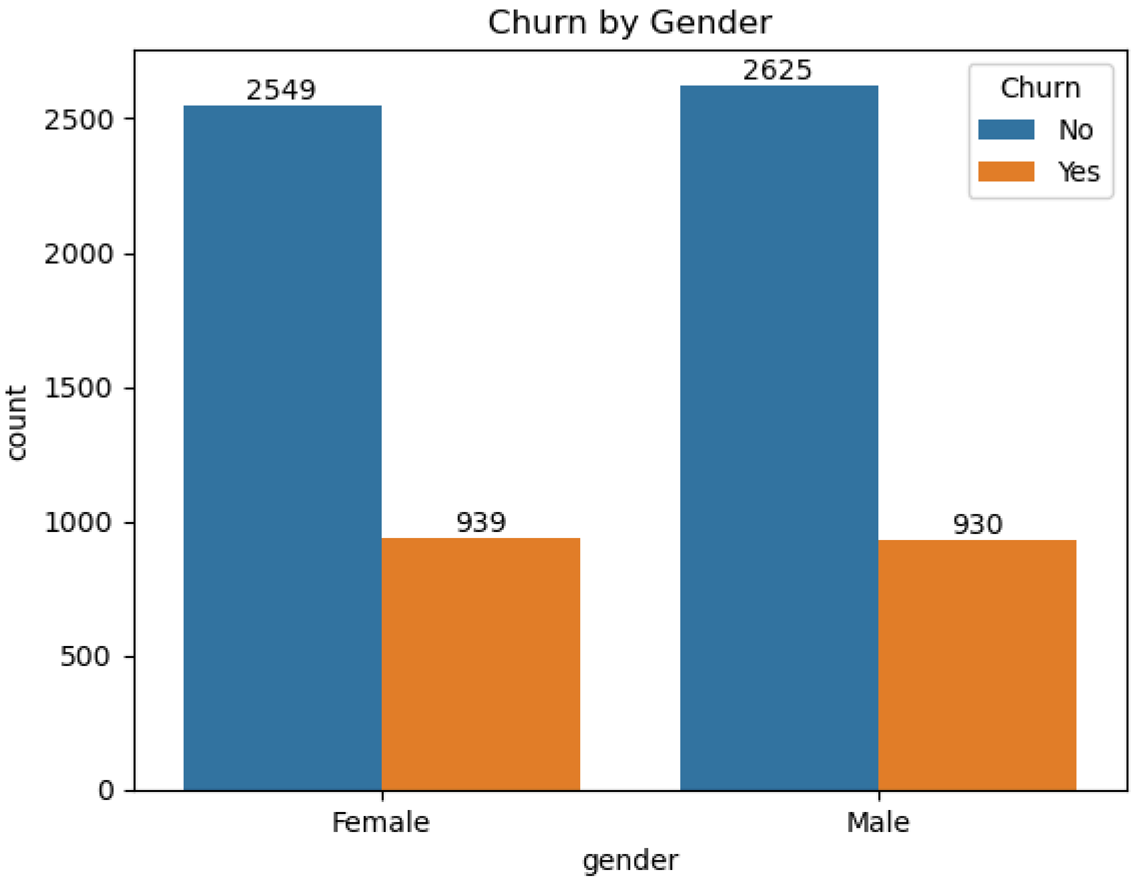


In [25]:

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

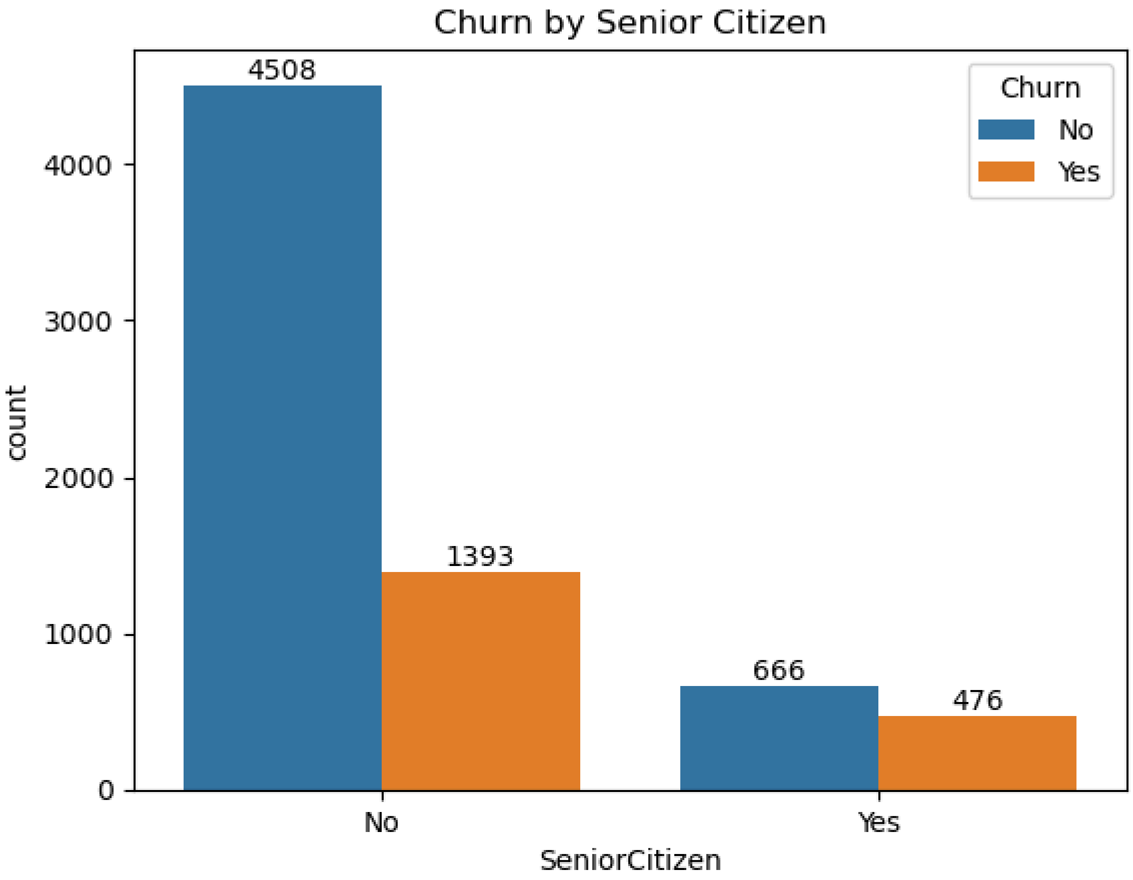


```
In [33]: ax = sns.countplot(x = "gender" , data = df, hue = "Churn")
         ax.bar_label(ax.containers[1])
         ax.bar_label(ax.containers[0])
         plt.title("Churn by Gender")
         plt.show()
```



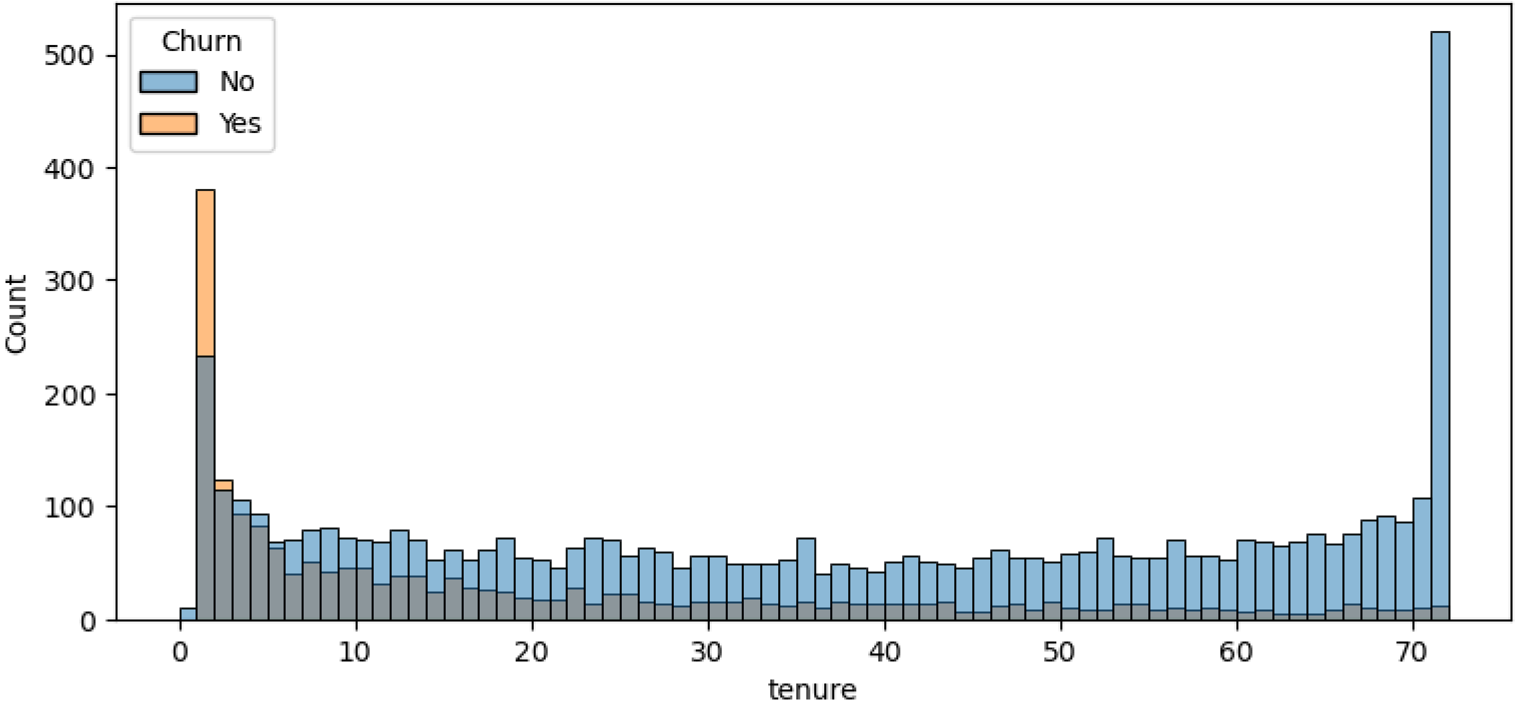
In [35]:

```
ax = sns.countplot(x = "SeniorCitizen" , data = df, hue = "Churn")
ax.bar_label(ax.containers[1])
ax.bar_label(ax.containers[0])
plt.title("Churn by Senior Citizen")
plt.show()
```



In [8]:

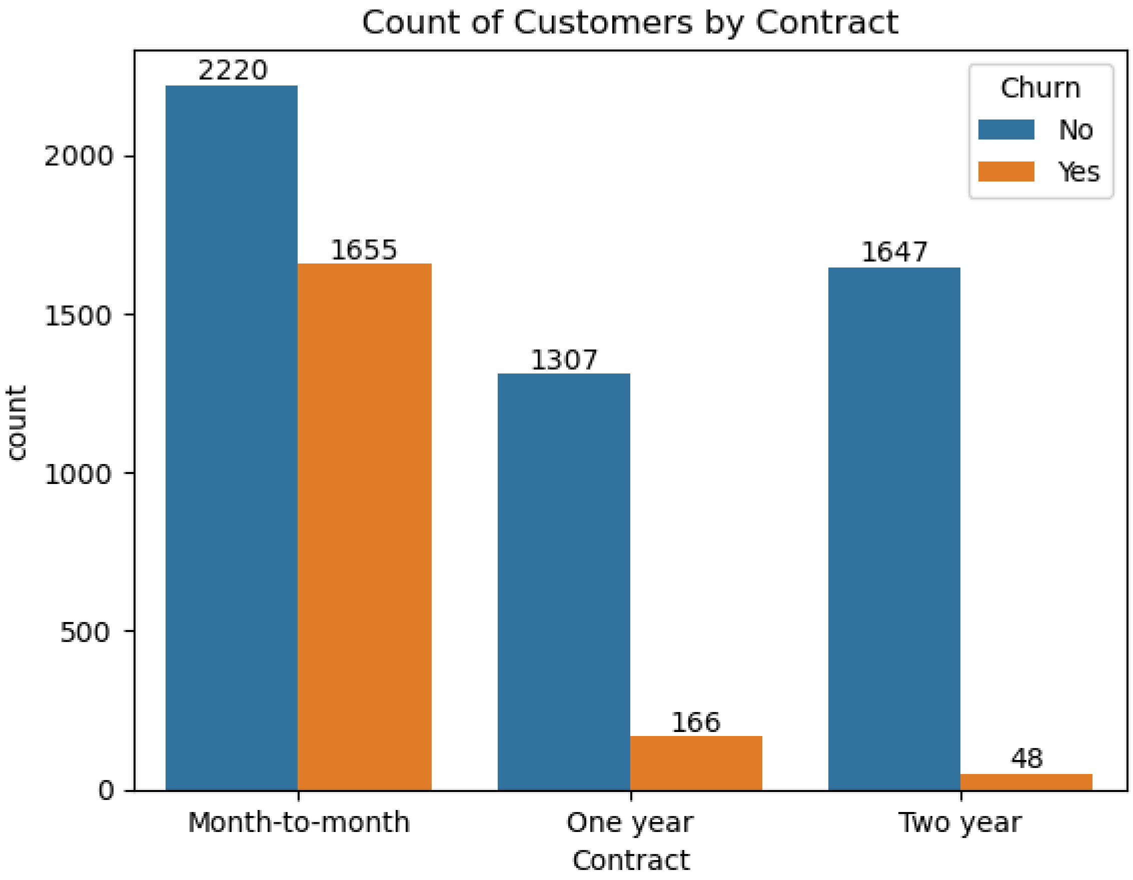
```
plt.figure(figsize = (9,4))
sns.histplot(x = "tenure", data = df, bins = 72, hue = "Churn")
plt.show()
```



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

In [13]:

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



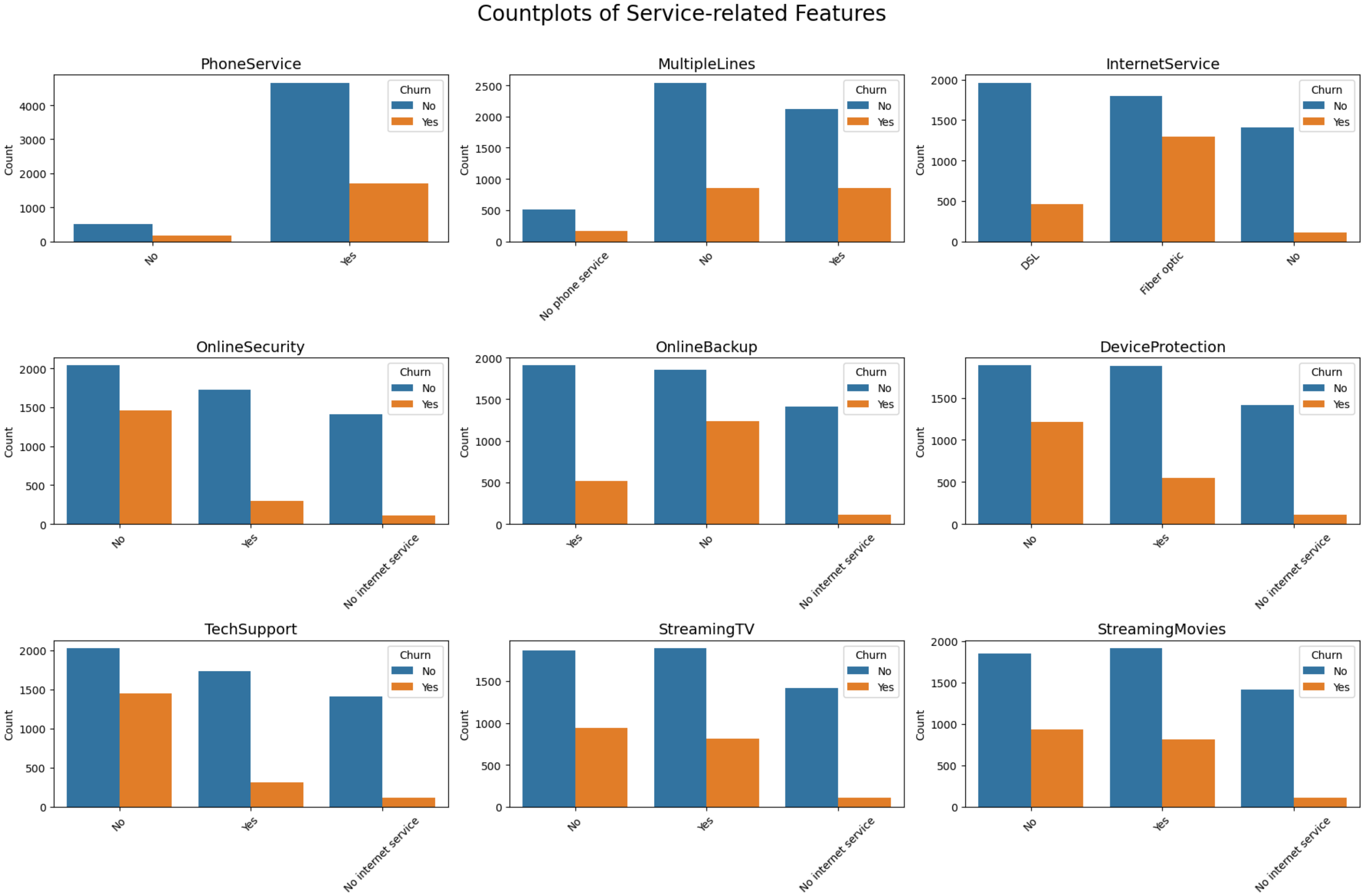
People who have month to month contract are likely to churn than from those who have 1 or 2 years of contract.

In [14]:
```
df.columns.values
```

Out[14]:
```
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 [16]:

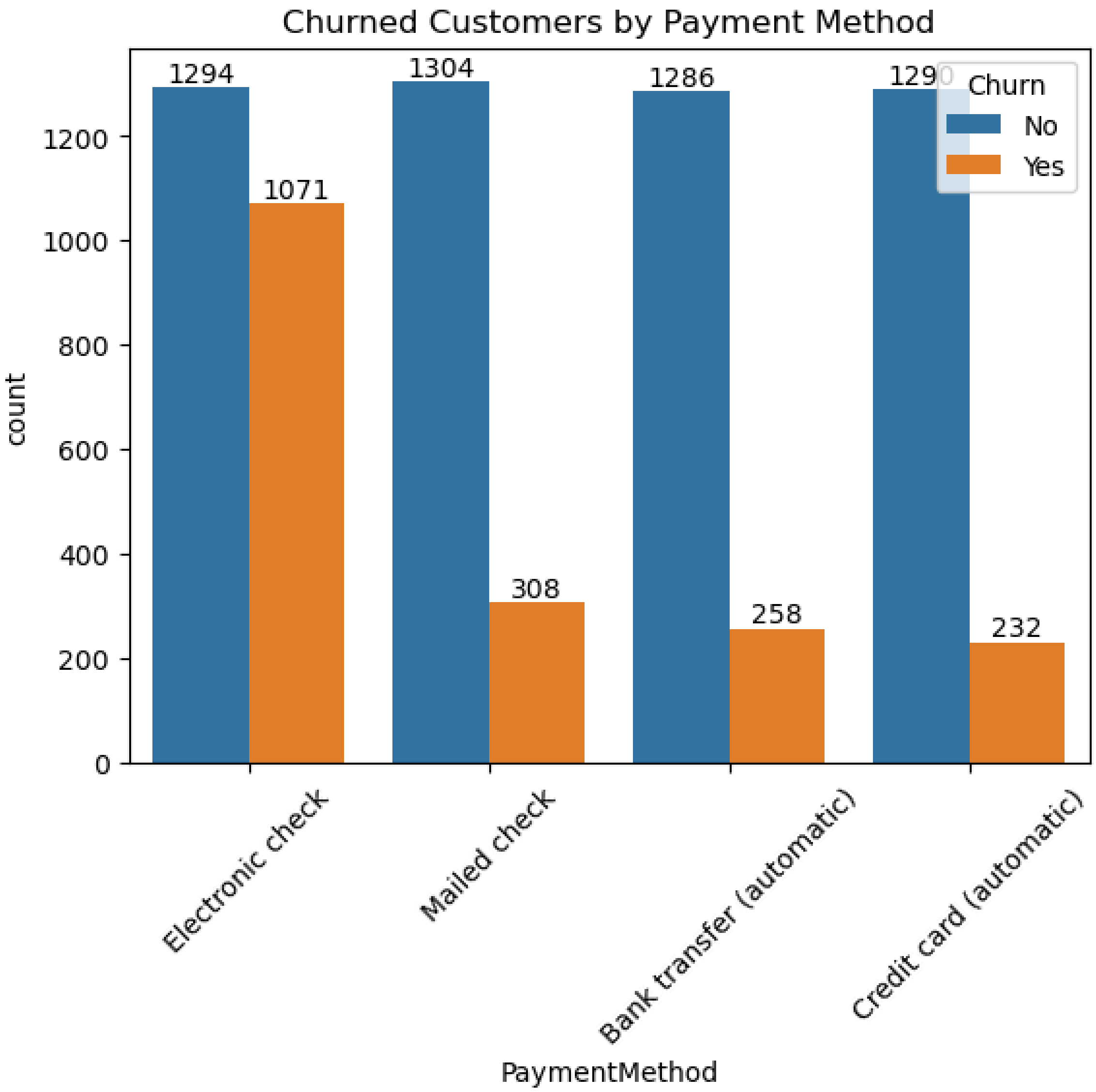
```
# Sample DataFrame (replace this with your actual dataset)
# df = pd.read_csv("your_dataset.csv")

# List of columns to plot
cols = [
    'PhoneService', 'MultipleLines', 'InternetService',
    'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
    'TechSupport', 'StreamingTV', 'StreamingMovies'
]

# Set up the figure size and grid
num_cols = len(cols)
n_rows = 3
n_cols = 3

fig, axes = plt.subplots(n_rows, n_cols, figsize=(18, 12))
fig.suptitle('Countplots of Service-related Features', fontsize=20)

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

# Plot countplots
for i, col in enumerate(cols):
    sns.countplot(data=df, x=col, ax=axes[i], hue = "Churn")
    axes[i].set_title(f'{col}', fontsize=14)
    axes[i].set_xlabel('')
    axes[i].set_ylabel('Count')
    axes[i].tick_params(axis='x', rotation=45)

# Remove any empty subplots
for j in range(i + 1, len(axes)):
    fig.delaxes(axes[j])

plt.tight_layout(rect=[0, 0, 1, 0.97])  # Adjust layout to fit the suptitle
plt.show()
```



Services like PhoneService, MultipleLines, and InternetService show relatively balanced distributions, but churn is notably higher among customers with Fiber optic internet. Features like OnlineSecurity, OnlineBackup, and TechSupport show significantly more churn among those who did not subscribe to these services. Overall, customers lacking added services tend to churn more.

In [18]:

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



Customer are likely to churn when they are using electronic check as a payment method.