Churn Analysis

In [84]:
```
import pandas as pd
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
```

In [85]:
```
df = pd.read_csv('telecom_churn.csv')
df
```

Out[85]:

	Churn	AccountWeeks	ContractRenewal	DataPlan	DataUsage	CustServCalls	DayMins	DayCal
0	0	128	1	1	2.70	1	265.1	11
1	0	107	1	1	3.70	1	161.6	12
2	0	137	1	0	0.00	0	243.4	11
3	0	84	0	0	0.00	2	299.4	7
4	0	75	0	0	0.00	3	166.7	11
...	...	...	...	...	...	...	...	
3328	0	192	1	1	2.67	2	156.2	7
3329	0	68	1	0	0.34	3	231.1	5
3330	0	28	1	0	0.00	2	180.8	10
3331	0	184	0	0	0.00	2	213.8	10
3332	0	74	1	1	3.70	0	234.4	11

3333 rows × 11 columns

In [86]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3333 entries, 0 to 3332
Data columns (total 11 columns):
 #   Column           Non-Null Count  Dtype  
---  ------           --------------  -----  
 0   Churn            3333 non-null   int64  
 1   AccountWeeks     3333 non-null   int64  
 2   ContractRenewal  3333 non-null   int64  
 3   DataPlan         3333 non-null   int64  
 4   DataUsage        3333 non-null   float64
 5   CustServCalls    3333 non-null   int64  
 6   DayMins          3333 non-null   float64
 7   DayCalls         3333 non-null   int64  
 8   MonthlyCharge    3333 non-null   float64
 9   OverageFee       3333 non-null   float64
 10  RoamMins         3333 non-null   float64
dtypes: float64(5), int64(6)
memory usage: 286.6 KB
```

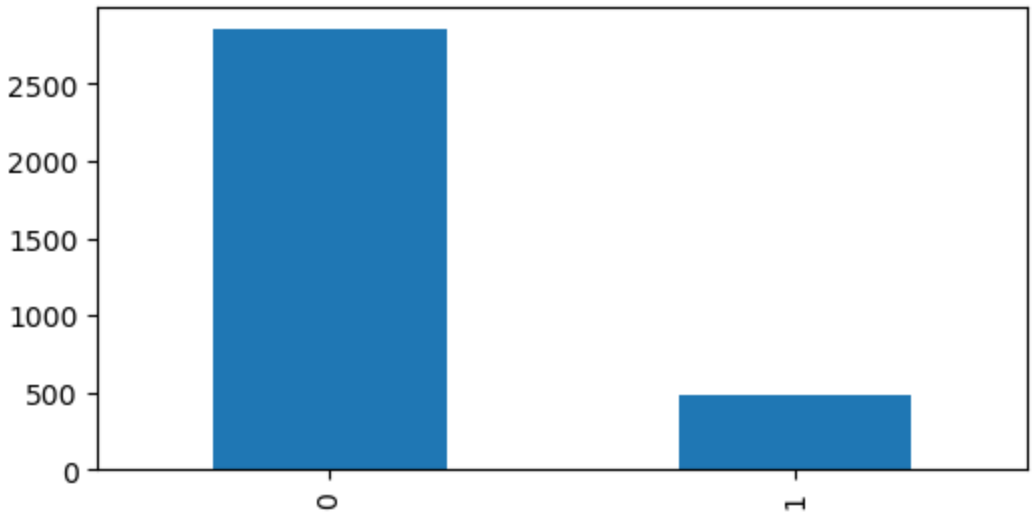
In [87]:
```
df.duplicated().sum()
```

Out[87]:
```
0
```

In [88]:
```
df.isnull().sum()
```

Out[88]:
```
Churn             0
AccountWeeks      0
ContractRenewal   0
DataPlan          0
DataUsage         0
CustServCalls     0
DayMins           0
DayCalls          0
MonthlyCharge     0
OverageFee        0
RoamMins          0
dtype: int64
```

In [89]:
```
plt.figure(figsize=(6,3))
df['Churn'].value_counts().plot(kind='bar')
plt.show()
```



In [90]:
```
df.head()
```

Out[90]:

	Churn	AccountWeeks	ContractRenewal	DataPlan	DataUsage	CustServCalls	DayMins	DayCalls
0	0	128	1	1	2.7	1	265.1	110
1	0	107	1	1	3.7	1	161.6	123
2	0	137	1	0	0.0	0	243.4	114
3	0	84	0	0	0.0	2	299.4	71
4	0	75	0	0	0.0	3	166.7	113

In [91]:
```
# function to find the counts of a category

def value_count(col):
```

```
    return df[col].value_counts()

value_count('Churn')
```

Out[91]:
```
0    2850
1     483
Name: Churn, dtype: int64
```

In [92]:
```
value_count('ContractRenewal')
```

Out[92]:
```
1    3010
0     323
Name: ContractRenewal, dtype: int64
```

In [93]:
```
value_count('DataPlan')
```

Out[93]:
```
0    2411
1     922
Name: DataPlan, dtype: int64
```

In [94]:
```
 # replace 1,0 in DataPlan with yes, and no

def rep(col_name):
    if col_name==1:
        return 'yes'
    else:
        return 'no'

df['DataPlan'] = df['DataPlan'].apply(rep)
```

In [95]:
```
df
```

Out[95]:

	Churn	AccountWeeks	ContractRenewal	DataPlan	DataUsage	CustServCalls	DayMins	DayCal
0	0	128	1	yes	2.70	1	265.1	11
1	0	107	1	yes	3.70	1	161.6	12
2	0	137	1	no	0.00	0	243.4	11
3	0	84	0	no	0.00	2	299.4	7
4	0	75	0	no	0.00	3	166.7	11
...	...	...	...	...	...	...	...	
3328	0	192	1	yes	2.67	2	156.2	7
3329	0	68	1	no	0.34	3	231.1	5
3330	0	28	1	no	0.00	2	180.8	10
3331	0	184	0	no	0.00	2	213.8	10
3332	0	74	1	yes	3.70	0	234.4	11

3333 rows × 11 columns

In [96]:
```
# now replacing the 'ContractRenewal' column
```

```
df['ContractRenewal'] = df['ContractRenewal'].apply(rep)
```

In [97]:
```
df
```

Out[97]:

	Churn	AccountWeeks	ContractRenewal	DataPlan	DataUsage	CustServCalls	DayMins	DayCal
0	0	128	yes	yes	2.70	1	265.1	11
1	0	107	yes	yes	3.70	1	161.6	12
2	0	137	yes	no	0.00	0	243.4	11
3	0	84	no	no	0.00	2	299.4	7
4	0	75	no	no	0.00	3	166.7	11
...	...	...	...	...	...	...	...	
3328	0	192	yes	yes	2.67	2	156.2	7
3329	0	68	yes	no	0.34	3	231.1	5
3330	0	28	yes	no	0.00	2	180.8	10
3331	0	184	no	no	0.00	2	213.8	10
3332	0	74	yes	yes	3.70	0	234.4	11

3333 rows × 11 columns

In [98]:
```
# Now replacing the 'Churn column'

df['Churn'] =df['Churn'].apply(rep)
```

In [99]:
```
df.head()
```

Out[99]:

	Churn	AccountWeeks	ContractRenewal	DataPlan	DataUsage	CustServCalls	DayMins	DayCalls
0	no	128	yes	yes	2.7	1	265.1	110
1	no	107	yes	yes	3.7	1	161.6	123
2	no	137	yes	no	0.0	0	243.4	114
3	no	84	no	no	0.0	2	299.4	71
4	no	75	no	no	0.0	3	166.7	113

In [100…
```
value_count('CustServCalls')
```

Out[100]:
```
1    1181
2     759
0     697
3     429
4     166
5      66
6      22
7       9
9       2
8       2
Name: CustServCalls, dtype: int64
```

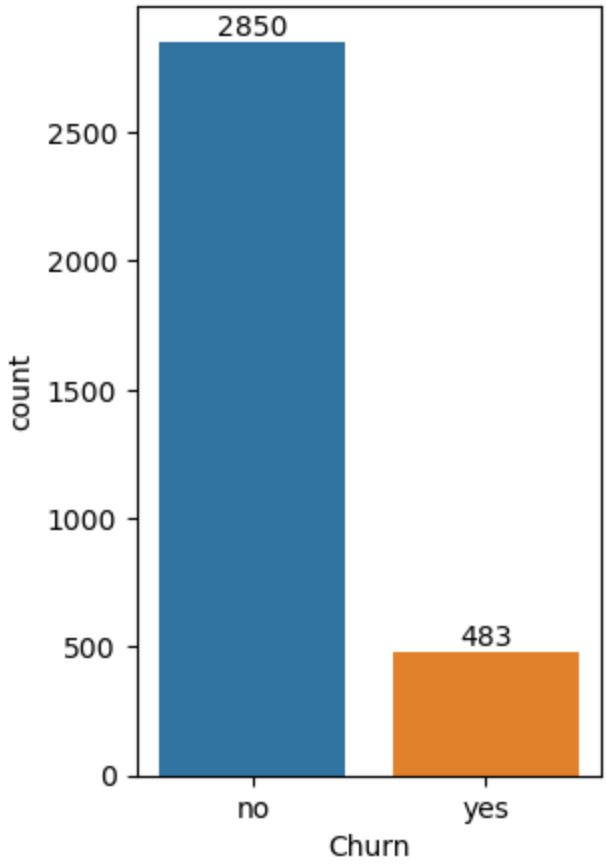
In [101…
```
# Here We start Analysis
```

In [102…
```
# 1- HOW MANY CUSTOMERS HAVE BEEN CHURN OUT
value_count('Churn')
```

Out[102]:
```
no     2850
yes     483
Name: Churn, dtype: int64
```

In [103…
```
plt.figure(figsize=(3,5))

ax = sns.countplot(x='Churn',data = df)
ax.bar_label(ax.containers[0])
plt.show()
```



In [104…
```
# to see these values in percentages we do this

# we can't directly apply the pie function because this is a string variables, So, fir
```

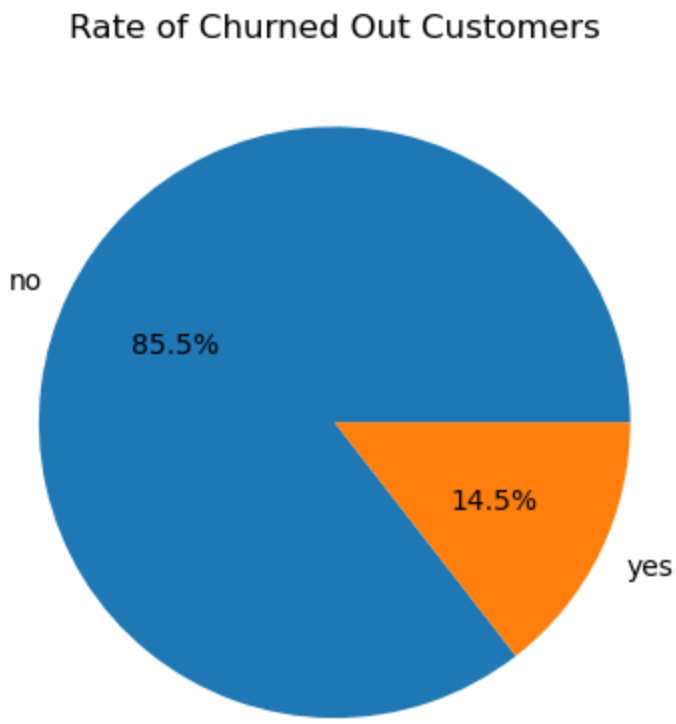
```
group = df.groupby("Churn").agg({'Churn':"count"})
group
```

Out[104]:

Churn	Churn
no	2850
yes	483

In [105…

```
# now we check the percentage
plt.pie(group['Churn'],labels=group.index,autopct="%.1f%%")
plt.title('Rate of Churned Out Customers')
plt.show()
```



1- From here we conclude that 14.5 % of Customers has Churned Out

In [106…

```
# NOW WE CAN EXPLORE THE REASON OF BEING CHURNED OUT
```

In [107…

```
df
```

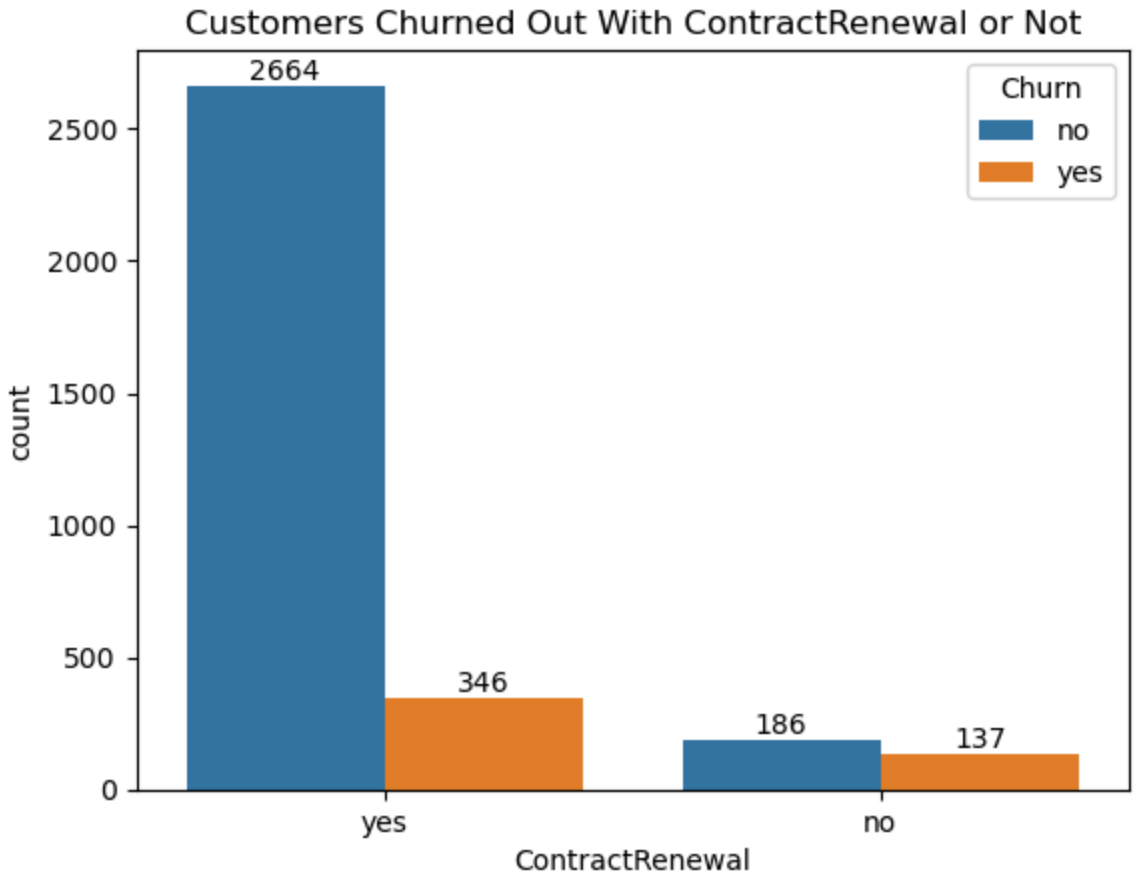
Out[107]:

	Churn	AccountWeeks	ContractRenewal	DataPlan	DataUsage	CustServCalls	DayMins	DayCal
0	no	128	yes	yes	2.70	1	265.1	11
1	no	107	yes	yes	3.70	1	161.6	12
2	no	137	yes	no	0.00	0	243.4	11
3	no	84	no	no	0.00	2	299.4	7
4	no	75	no	no	0.00	3	166.7	11
...	...	...	...	...	...	...	...	
3328	no	192	yes	yes	2.67	2	156.2	7
3329	no	68	yes	no	0.34	3	231.1	5
3330	no	28	yes	no	0.00	2	180.8	10
3331	no	184	no	no	0.00	2	213.8	10
3332	no	74	yes	yes	3.70	0	234.4	11

3333 rows × 11 columns

In [109…

```
ax = sns.countplot(x='ContractRenewal',data=df,hue='Churn')
plt.title('Customers Churned Out With ContractRenewal or Not')
ax.bar_label(ax.containers[0])
ax.bar_label(ax.containers[1])
plt.show()
```



A significantly larger number of customers who renewed their contracts (yes) did not churn (2664 did not churn, compared to 346 who churned).

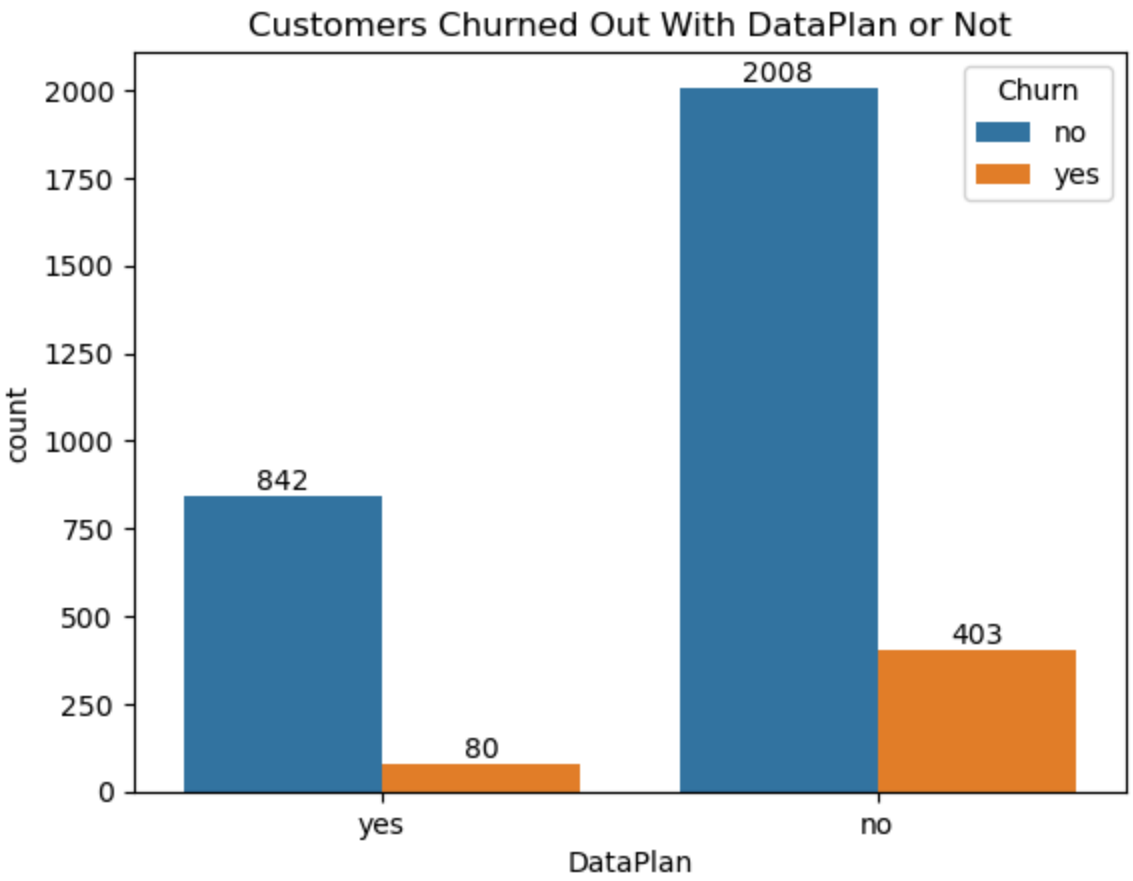
Among customers who did not renew their contracts (no), there is a more balanced split, with 186 not churning and 137 churning.

This suggests that contract renewal has a strong association with customer retention, as a majority of customers who renew their contracts do not churn.

However, a significant portion of those who do not renew are more likely to churn.

In [110…

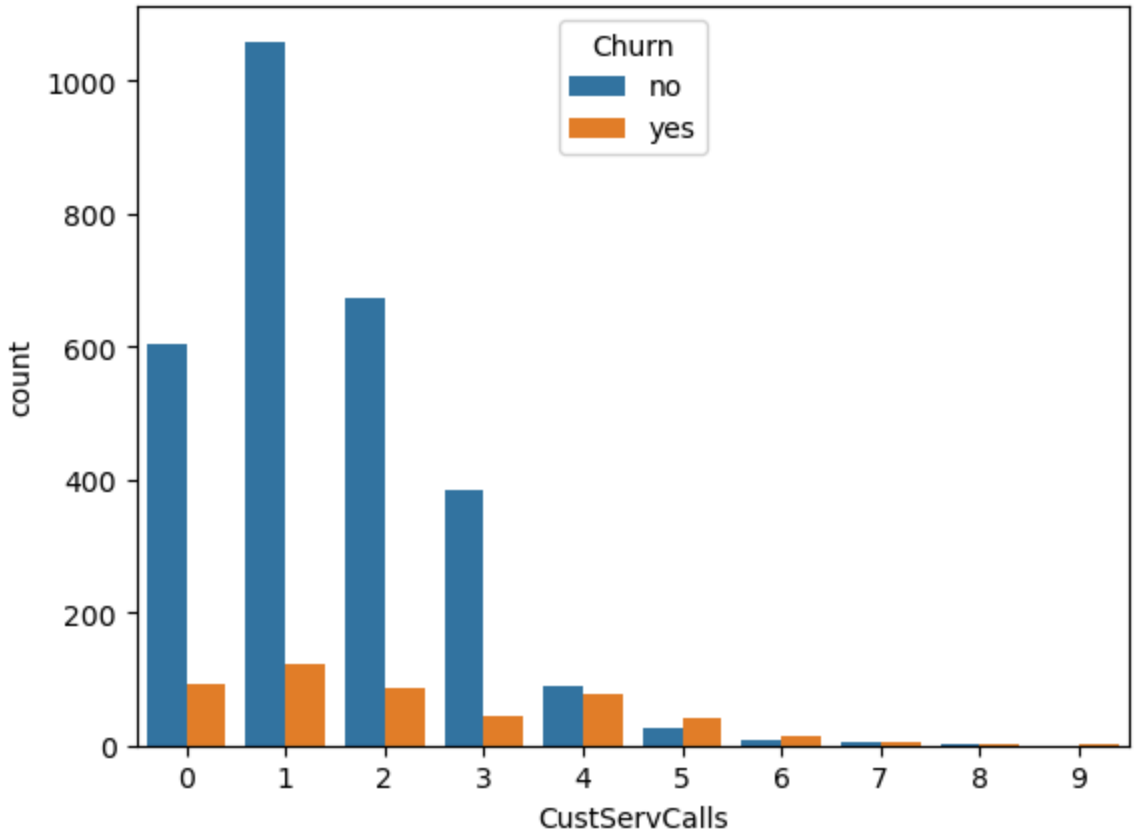
```
ax = sns.countplot(x='DataPlan',data=df,hue='Churn')
plt.title('Customers Churned Out With DataPlan or Not')
ax.bar_label(ax.containers[0])
ax.bar_label(ax.containers[1])
plt.show()
```



large number of customer they had no data plan had churn, where as customer they have data plan has less customer has churned out as compared to no dataplan

In [114…
```
sns.countplot(x='CustServCalls',data=df,hue='Churn')
```

Out[114]:
```
<AxesSubplot:xlabel='CustServCalls', ylabel='count'>
```



Here we can see that customers they are calling more than three time are churnning out

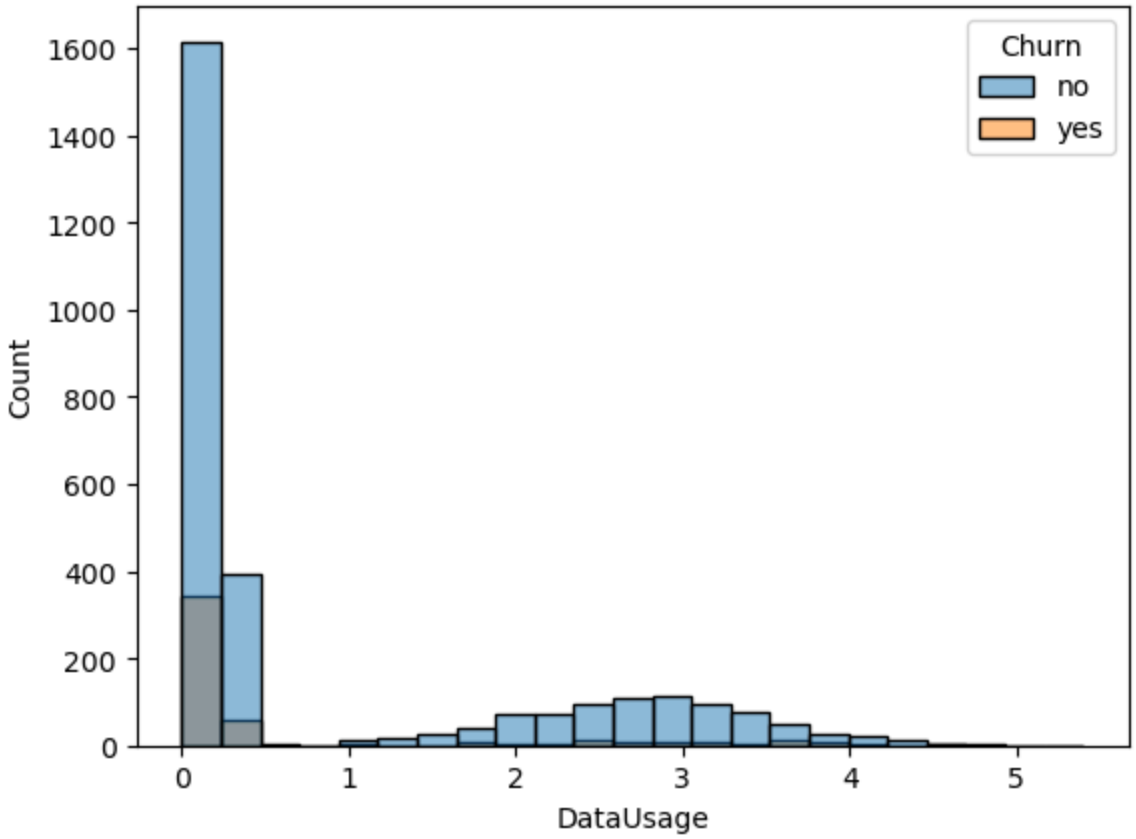
In [116…
```
df.head()
```

Out[116]:

	Churn	AccountWeeks	ContractRenewal	DataPlan	DataUsage	CustServCalls	DayMins	DayCalls
0	no	128	yes	yes	2.7	1	265.1	110
1	no	107	yes	yes	3.7	1	161.6	123
2	no	137	yes	no	0.0	0	243.4	114
3	no	84	no	no	0.0	2	299.4	71
4	no	75	no	no	0.0	3	166.7	113

In [136…
```
sns.histplot(x='DataUsage',data=df,hue='Churn')
```

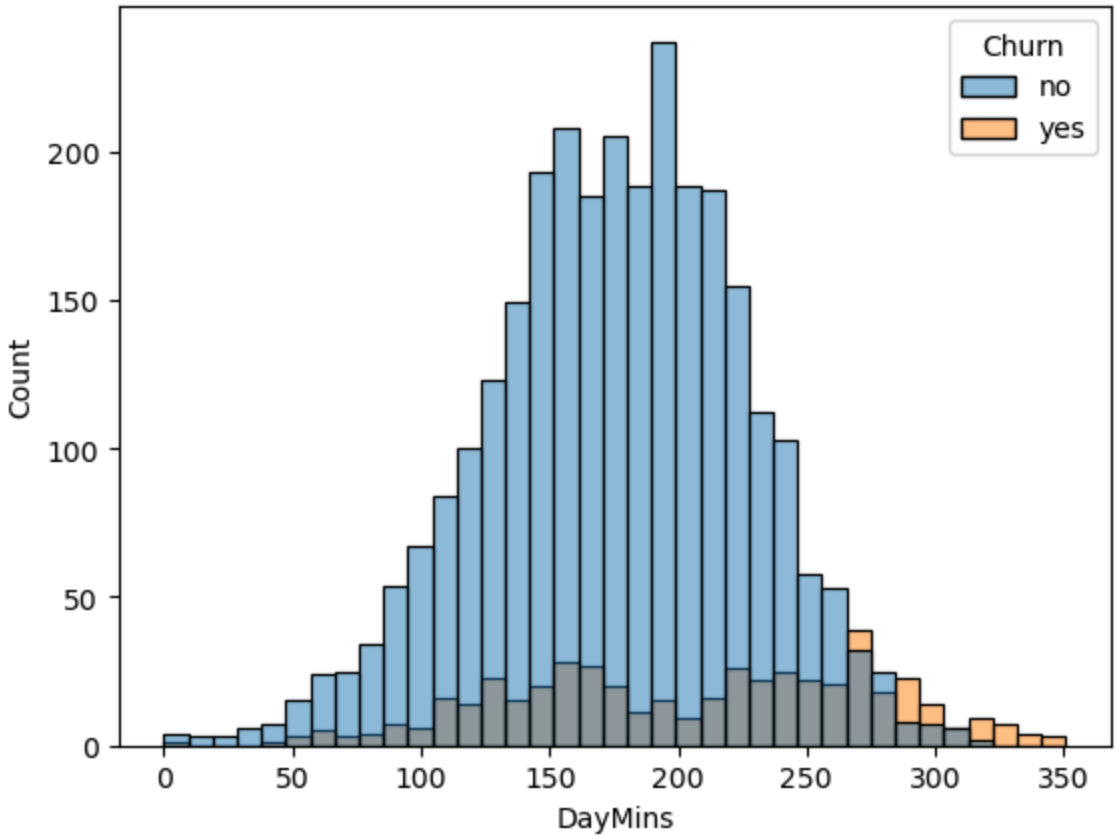
Out[136]:
```
<AxesSubplot:xlabel='DataUsage', ylabel='Count'>
```



Those people churn out they actually utilize 0 data, as compared to those who utilize data

In [139…
```
sns.histplot(x='DayMins',data=df,hue='Churn')
```

Out[139]:
```
<AxesSubplot:xlabel='DayMins', ylabel='Count'>
```



Those people who spend more than 250 minutes on a call being churn out

In [ ]:

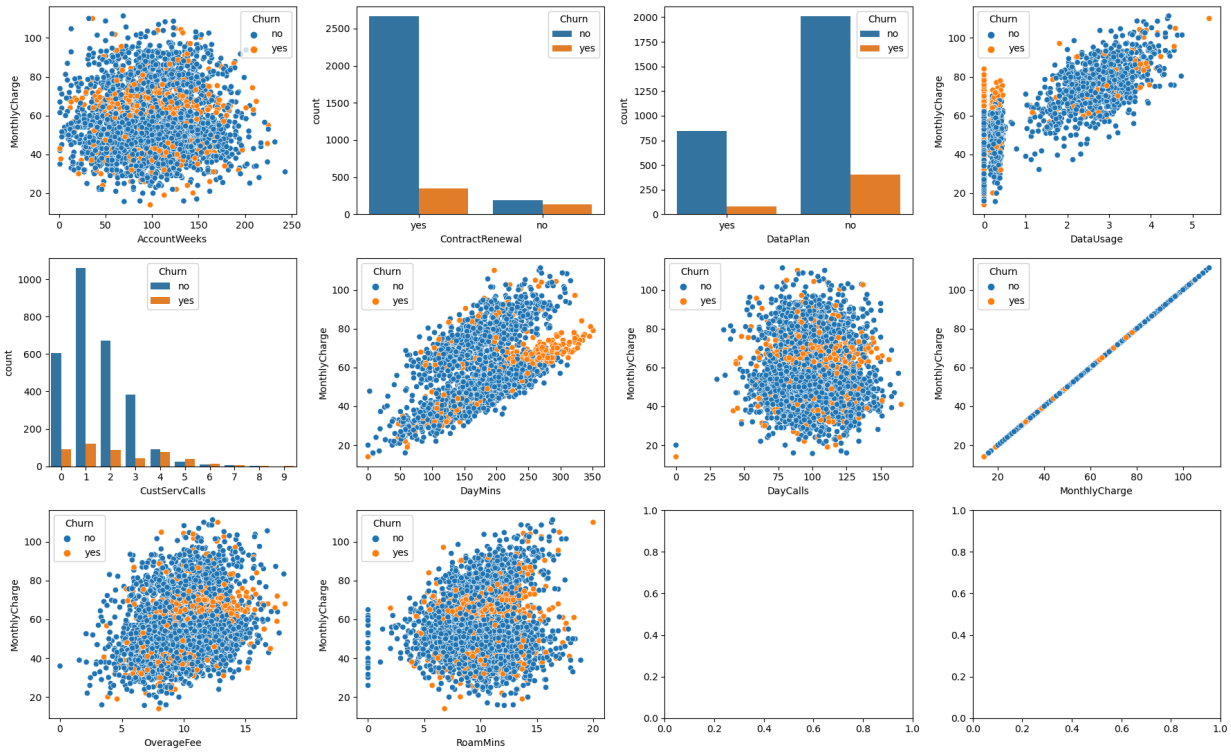
In [145…

```
fig, axes = plt.subplots(3, 4, figsize=(18, 12))

# List of columns to plot
columns = ['AccountWeeks', 'ContractRenewal', 'DataPlan', 'DataUsage', 'CustServCalls'
           'DayMins', 'DayCalls', 'MonthlyCharge', 'OverageFee', 'RoamMins']

# Loop through columns and create a subplot for each one
for i, column in enumerate(columns):
    row = i // 4
    col = i % 4
    if df[column].dtype == 'object' or df[column].nunique() <= 10:
        # If the column is categorical or has few unique values, use countplot
        sns.countplot(x=column, data=df, hue='Churn', ax=axes[row, col])
    else:
        # For numerical columns, use scatterplot
        sns.scatterplot(x=column, y='MonthlyCharge', data=df, hue='Churn', ax=axes[row

# Set plot title and adjust layout
fig.suptitle('Churn Analysis for Different Features', fontsize=16)
plt.tight_layout(rect=[0, 0, 1, 0.95])  # Adjust layout to fit title
plt.show()
```


Churn Analysis for Different Features
Churn
no
yes
MonthlyCharge
AccountWeeks
count
ContractRenewal
DataPlan
DataUsage
CustServCalls
DayMins
DayCalls
MonthlyCharge
OverageFee
RoamMins

In [ ]: