```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import seaborn as sns
#Here we are giving print statement to show successful import of all these libraries.
print("done")
```

```
done
```

```
#reading our csv file in a variable using pandas library.
df= pd.read_csv("C:/Users/hp/Desktop/Skills/EDA/Customer_Churn.csv")
#here we have converted all backward slashes into forward slashes for successfully importing our dataset.
print("dataset imported successfully")
#print statement is provided for ensuring successfull import of our data.
```

```
dataset imported successfully
```

```
#Now, to understand the different columns in our dataset and the type of values in each column, we are using the head() function of the pandas lib
df.head(25)
```

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	MultipleLines	InternetService	OnlineSecurity	...	DevicePr
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	9305-CDSKC	Female	0	No	No	8	Yes	Yes	Fiber optic	No	...	
6	1452-KIOVK	Male	0	No	Yes	22	Yes	Yes	Fiber optic	No	...	
7	6713-OKOMC	Female	0	No	No	10	No	No phone service	DSL	Yes	...	
8	7892-POOKP	Female	0	Yes	No	28	Yes	Yes	Fiber optic	No	...	
9	6388-TABGU	Male	0	No	Yes	62	Yes	No	DSL	Yes	...	
10	9763-GRSKD	Male	0	Yes	Yes	13	Yes	No	DSL	Yes	...	
11	7469-LKBCI	Male	0	No	No	16	Yes	No	No	No internet service	...	No interr
12	8091-TTVAX	Male	0	Yes	No	58	Yes	Yes	Fiber optic	No	...	
13	0280-XJGEX	Male	0	No	No	49	Yes	Yes	Fiber optic	No	...	
14	5129-JLPIS	Male	0	No	No	25	Yes	No	Fiber optic	Yes	...	
15	3655-SNQYZ	Female	0	Yes	Yes	69	Yes	Yes	Fiber optic	Yes	...	
16	8191-XWSZG	Female	0	No	No	52	Yes	No	No	No internet service	...	No interr
17	9959-WOFKT	Male	0	No	Yes	71	Yes	Yes	Fiber optic	Yes	...	
18	4190-MFLUW	Female	0	Yes	Yes	10	Yes	No	DSL	No	...	
19	4183-MYFRB	Female	0	No	No	21	Yes	No	Fiber optic	No	...	
20	8779-QRDMV	Male	1	No	No	1	No	No phone service	DSL	No	...	
21	1680-VDCWW	Male	0	Yes	No	12	Yes	No	No	No internet service	...	No interr
22	1066-JKSGK	Male	0	No	No	1	Yes	No	No	No internet service	...	No interr
23	3638-WEABW	Female	0	Yes	No	58	Yes	Yes	DSL	No	...	
24	6322-HRPFA	Male	0	Yes	Yes	49	Yes	No	DSL	Yes	...	

25 rows × 21 columns

```
#to understand the columns in our dataset we are performing data inspection, for which we are using info function from pandas library.
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
```

```
# Here, we have the "TotalCharges" column's datatype as an object. Using Excel, we discovered that it contains some blank values, so we will repla
df["TotalCharges"]= df["TotalCharges"].replace(" ","0")
df["TotalCharges"]= df["TotalCharges"].astype("float")
```

```
df.info()
#to ensure that the changes we have done are visible in our dataset.
```

```
<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
```

```
#determining the number of null values in each column.
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
```

```
#determining the overall null values in complete dataset.
df.isnull().sum().sum()
```

```
0
```

```
#performing descriptive analysis of our dataset.
df.describe()
```

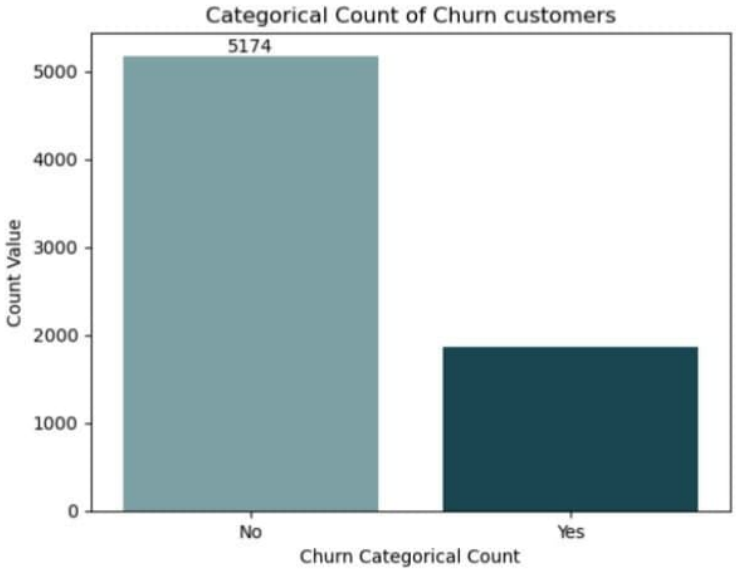
	SeniorCitizen	tenure	MonthlyCharges	TotalCharges
count	7043.000000	7043.000000	7043.000000	7043.000000
mean	0.162147	32.371149	64.761692	2279.734304
std	0.368612	24.559481	30.090047	2266.794470
min	0.000000	0.000000	18.250000	0.000000
25%	0.000000	9.000000	35.500000	398.550000
50%	0.000000	29.000000	70.350000	1394.550000
75%	0.000000	55.000000	89.850000	3786.600000
max	1.000000	72.000000	118.750000	8684.800000

```
#next step of our data inspection is to find out the null values in our primary key that is customerID
df["customerID"].duplicated().sum()
```

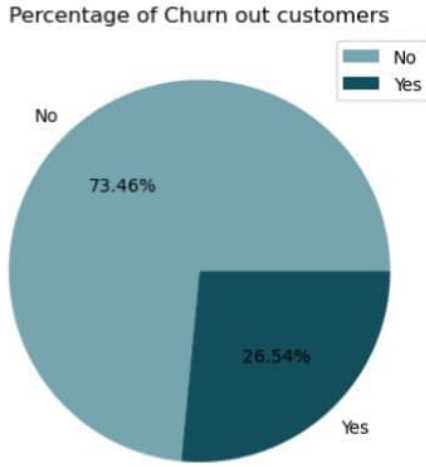
```
0
```

```
#Data Analysis and Finding Insights of our project.
#1.Using countplot from seaborn library to find number of customers churned out and retained by the company.
plot1 = sns.countplot(x="Churn", data=df,palette=["#76a5af","#134f5c"])
plt.xlabel("Churn Categorical Count")
plt.ylabel("Count Value")
plt.title("Categorical Count of Churn customers")
plot1.bar_label(plot1.containers[0])
plt.show()
#here for some amazing colours i have used colour palette from color-hex.com link for it "https://www.color-hex.com/color-palette/1051732".
```

```
C:\Users\hp\AppData\Local\Temp\ipykernel_3076\999703529.py:3: FutureWarning:

Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `x` variable to `hue` and set `legend=False

  plot1 = sns.countplot(x="Churn", data=df,palette=["#76a5af","#134f5c"])
```

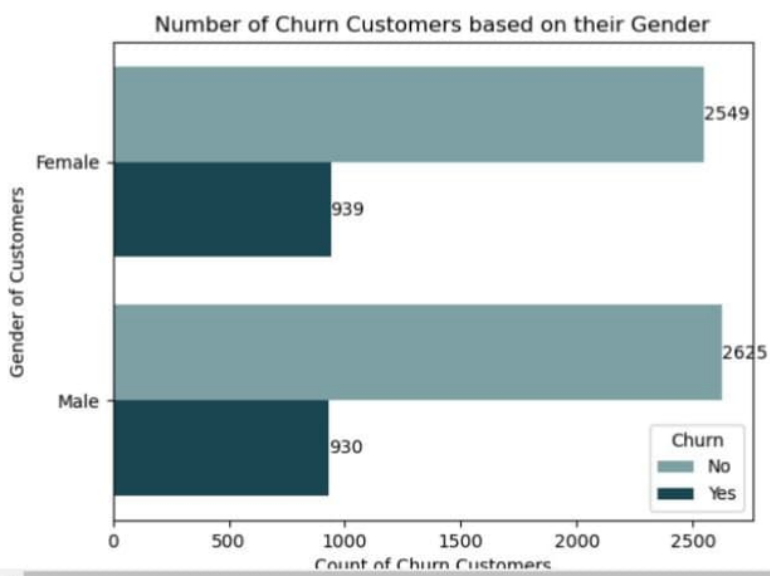



```
#plot2 Drawing pie chart to determine the percentage of churn customers.
gb= df.groupby("Churn").agg({"Churn":"count"})
colours= ["#76a5af","#134f5c"]
plt.pie(gb["Churn"], labels= gb.index, autopct="%1.2f%%", colors=colours)
plt.title("Percentage of Churn out customers")
plt.legend()
plt.show()
```




```
#As we have determined the percentage of customers churned out. Now let us focus to determine the reason behind it.
```

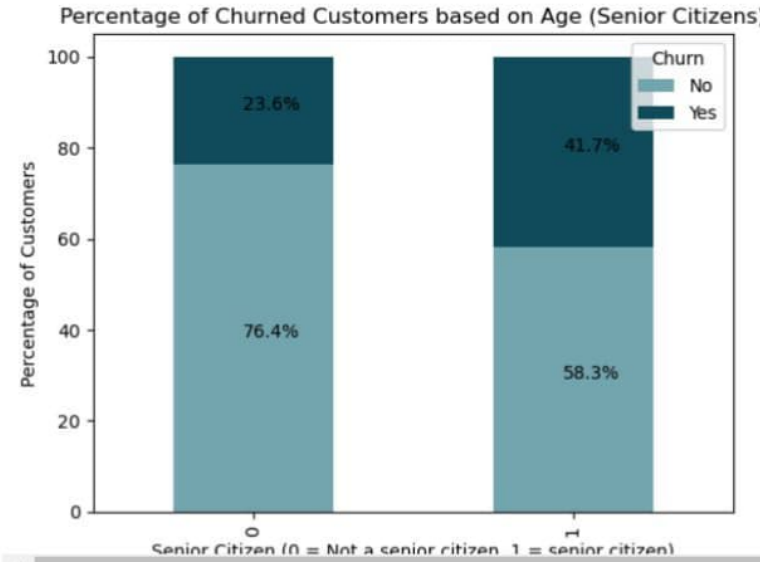
```
#3.Determining churned-out customers based on gender.
plot3= sns.countplot(y="gender",data= df, hue="Churn",palette=["#76a5af","#134f5c"])
plot3.bar_label(plot3.containers[0])
plot3.bar_label(plot3.containers[1])
plt.ylabel("Gender of Customers")
plt.xlabel("Count of Churn Customers")
plt.title("Number of Churn Customers based on their Gender")
plt.show()
```




```
# This shows that the number of churn customers does not depend on their gender.
# Now moving to our next column "SeniorCitizen" we can also check if the age of the customer affect the number of churn customers.
```

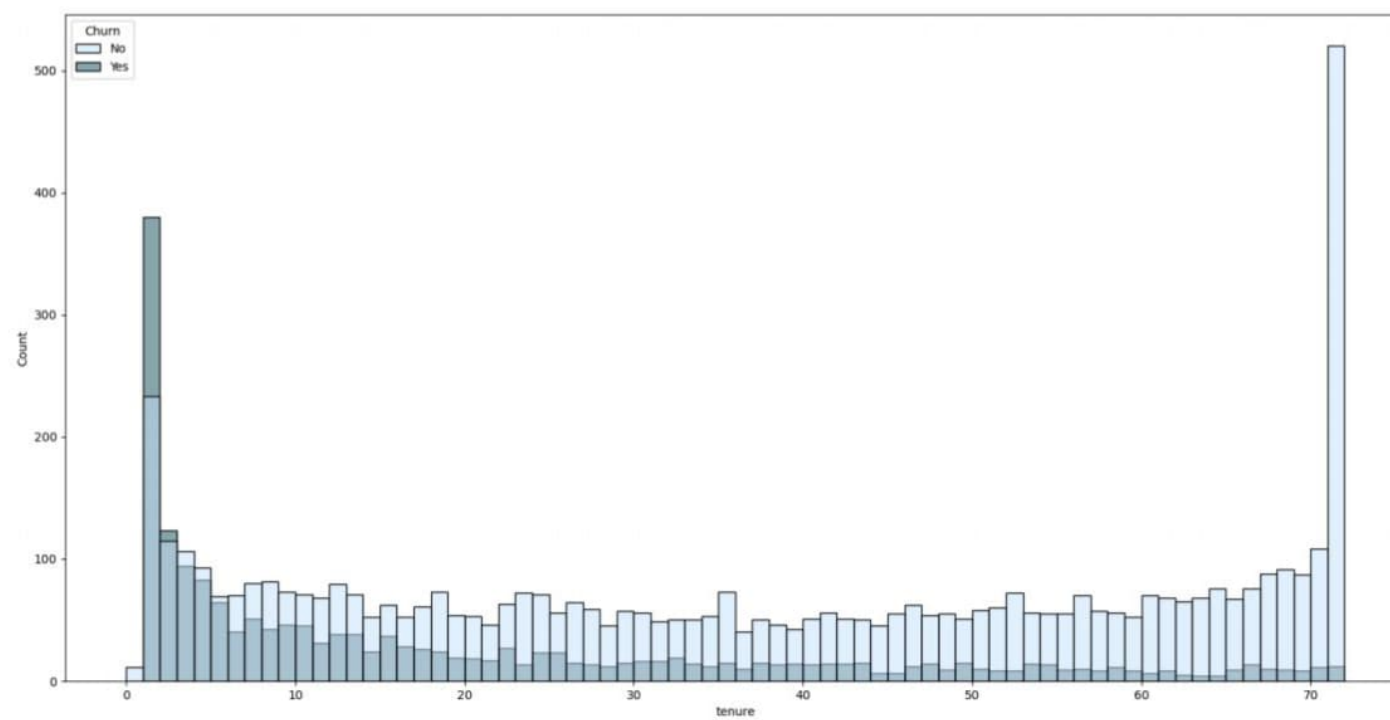
```
#4.Determining churned-out customers based on age(SeniorCitizen).
# Create crosstab for stacked bar chart (normalized to get percentages)
cross_tab = pd.crosstab(df['SeniorCitizen'], df['Churn'], normalize='index') * 100

# Plot stacked bar chart
plot4 = cross_tab.plot(kind='bar', stacked=True, color=['#76a5af', '#134f5c'])

# Add labels on the bars
for container in ax.containers:
    plot4.bar_label(container, label_type='center', fmt='%.1f%%')

# Set labels and title
plt.xlabel("Senior Citizen (0 = Not a senior citizen, 1 = senior citizen)")
plt.ylabel("Percentage of Customers")
plt.title("Percentage of Churned Customers based on Age (Senior Citizens)")
plt.legend(title="Churn", loc="upper right")
```

```
# Show the plot
plt.show()
```



It concludes that comparitively greater number of senior citizens churned out.

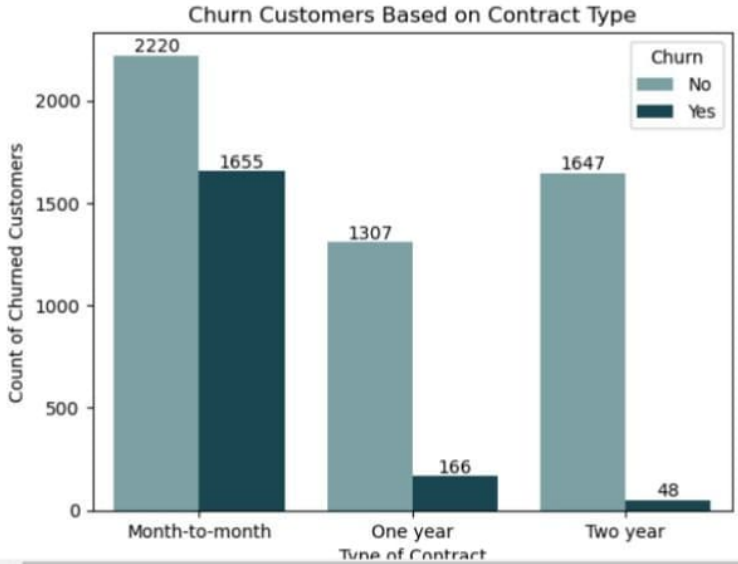
```
#5.Using histplot() for tenure column.
plt.figure(figsize= (20,10))
plot5= sns.histplot(x="tenure",data=df, hue="Churn",palette=["#cce6ff","#134f5c"],bins=72)
plt.show()
```



Through this graph we can conclude that long tenure customers have stayed and people with short tenure churned out.

```
#6.using pie chart to determine the types of contracts available and percentage of customer of each type of contract.
gb1= df.groupby("Contract").agg({"Contract":"count"})
colours= ["#76a5af","#134f5c","#97b3b4"]
plt.pie(gb1["Contract"], labels= gb1.index, autopct="%1.2f%%", colors=colours)
plt.title("Customer percentage for different type of contracts")
plt.legend(loc="right")
plt.show()
```


```
#7.Finding out number of churn customers based on contract type.
plot7= sns.countplot(x="Contract", data=df, hue="Churn",palette= ["#76a5af","#134f5c"])
plot7.bar_label(plot7.containers[0])
plot7.bar_label(plot7.containers[1])
plt.title("Churn Customers Based on Contract Type")
plt.xlabel("Type of Contract")
plt.ylabel("Count of Churned Customers")
plt.show()
```



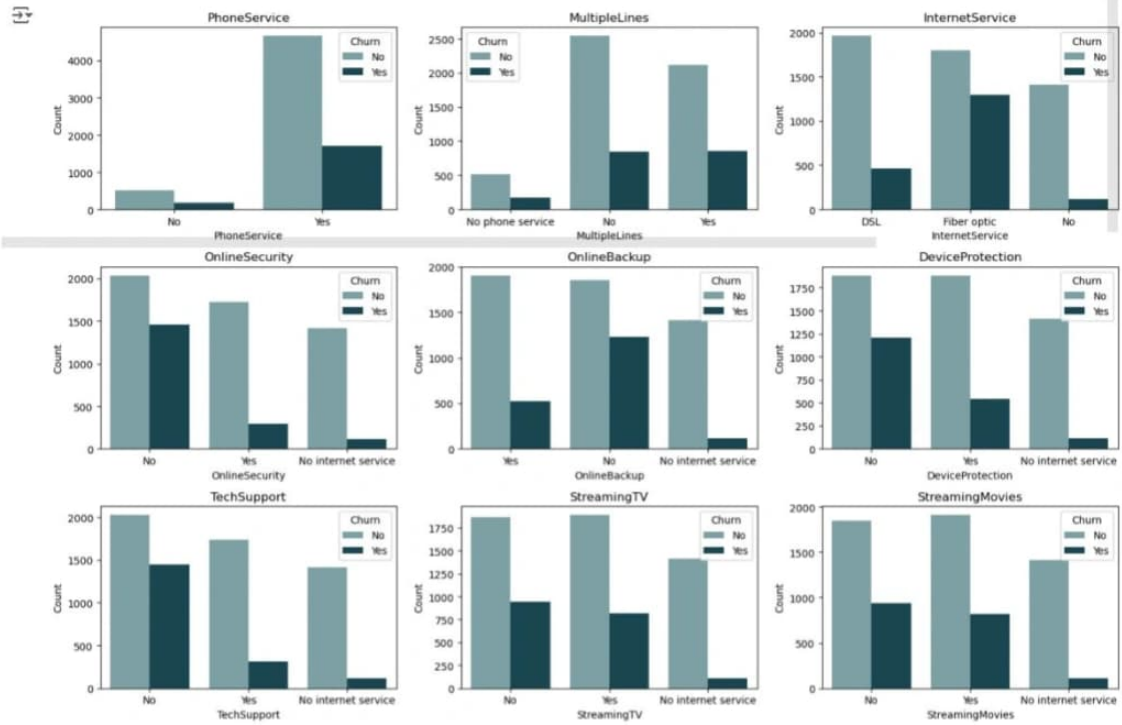
Through this we can conclude that we should focus on selling longer duration plan to our customer.

```
df.columns.values
```

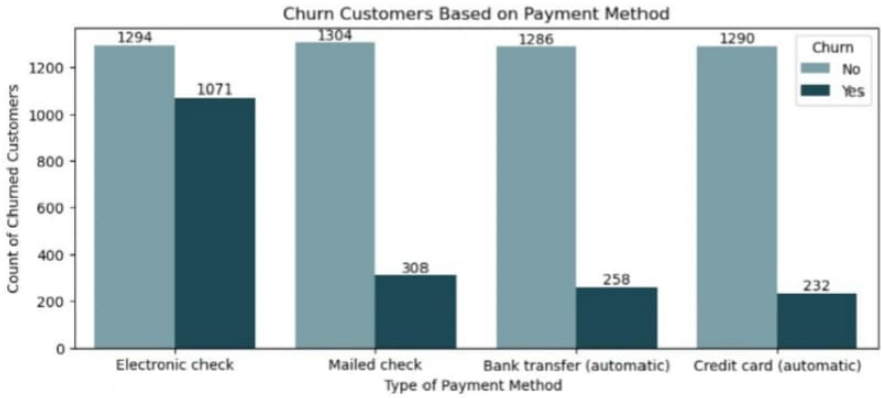
```
array(['customerID', 'gender', 'SeniorCitizen', 'Partner', 'Dependents',
       'tenure', 'PhoneService', 'MultipleLines', 'InternetService',
       'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
       'TechSupport', 'StreamingTV', 'StreamingMovies', 'Contract',
       'PaperlessBilling',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

```
#8.Creating subplot for columns 'PhoneService', 'MultipleLines', 'InternetService','OnlineSecurity', 'OnlineBackup', 'DeviceProtection','TechSupp
# Columns to create count plots for
columns = ['PhoneService', 'MultipleLines', 'InternetService',
           'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
           'TechSupport', 'StreamingTV', 'StreamingMovies']

# Create subplots
fig, axes = plt.subplots(nrows=3, ncols=3, figsize=(15, 10))  # Adjust size as needed
axes = axes.flatten()  # Flatten the axes array for easy iteration

# Create count plots
for i, column in enumerate(columns):
    sns.countplot(x=column, data=df, ax=axes[i], hue= df["Churn"],palette= ["#76a5af","#134f5c"])
```

```
    axes[i].set_title(column)
    axes[i].set_ylabel('Count')
    axes[i].set_xlabel(column)

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




```
#9. plotting to understand PaymentMethod column
plt.figure(figsize= (12,9))
plot7= sns.countplot(x="PaymentMethod", data=df, hue="Churn",palette= ["#76a5af","#134f5c"])
plot7.bar_label(plot7.containers[0])
plot7.bar_label(plot7.containers[1])
plt.title("Churn Customers Based on Payment Method")
plt.xlabel("Type of Payment Method ")
```



Through this we can reduce churn customer by encouraging customer to use Mailed check, Bank Transfer(automatic), Credit card(automatic) as their Payment Method.