```
pip install pandas
```

```
Requirement already satisfied: pandas in
/usr/local/lib/python3.10/dist-packages (2.2.2)
Requirement already satisfied: numpy>=1.22.4 in
/usr/local/lib/python3.10/dist-packages (from pandas) (1.26.4)
Requirement already satisfied: python-dateutil>=2.8.2 in
/usr/local/lib/python3.10/dist-packages (from pandas) (2.8.2)
Requirement already satisfied: pytz>=2020.1 in
/usr/local/lib/python3.10/dist-packages (from pandas) (2024.2)
Requirement already satisfied: tzdata>=2022.7 in
/usr/local/lib/python3.10/dist-packages (from pandas) (2024.2)
Requirement already satisfied: six>=1.5 in
/usr/local/lib/python3.10/dist-packages (from python-dateutil>=2.8.2-
>pandas) (1.16.0)
```

```
pip install numpy
```

```
Requirement already satisfied: numpy in
/usr/local/lib/python3.10/dist-packages (1.26.4)
```

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

```
df = pd.read_csv('Customer Churn.csv')
```

```
from google.colab import drive
drive.mount('/content/drive')
```

```
df .head()
```

```
{"type":"dataframe"}
```

```
df .tail()
```

```
{"type":"dataframe"}
```

```
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
```

#replacing blanks with 0 as enure is 0 and no total charges are recorded

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

df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 7043 entries, 0 to 7042
Data columns (total 21 columns):
 #   Column            Non-Null Count  Dtype
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 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
```

```
df.isnull()
```


```
{"type":"dataframe"}
```


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

```
0
```

```
df.describe()
```


```
{"summary":"{\n  \"name\": \"df\",\n  \"rows\": 8,\n  \"fields\": [\n{\n      \"column\": \"SeniorCitizen\",\n      \"properties\": {\n\"dtype\": \"number\",\n        \"std\": 2489.9992387084,\n\"min\": 0.0,\n        \"max\": 7043.0,\n\"num_unique_values\": 5,\n        \"samples\": [\n0.1621468124378816,\n          1.0,\n          0.36861160561002687\n],\n        \"semantic_type\": \"\",\n        \"description\": \"\"\n}\n    },\n    {\n      \"column\": \"tenure\",\n      \"properties\": {\n        \"dtype\": \"number\",\n        \"std\": 2478.9752758409018,\n        \"min\": 0.0,\n        \"max\": 7043.0,\n\"num_unique_values\": 8,\n        \"samples\": [\n32.37114865824223,\n          29.0,\n          7043.0\n        ],\n\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\n    },\n    {\n      \"column\": \"MonthlyCharges\",\n\"properties\": {\n        \"dtype\": \"number\",\n        \"std\": 2468.7047672837775,\n        \"min\": 18.25,\n        \"max\": 7043.0,\n        \"num_unique_values\": 8,\n        \"samples\": [\n64.76169246059918,\n          70.35,\n          7043.0\n        ],\n\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\n    },\n    {\n      \"column\": \"TotalCharges\",\n\"properties\": {\n        \"dtype\": \"number\",\n        \"std\": 3122.5732655623974,\n        \"min\": 0.0,\n        \"max\": 8684.8,\n\"num_unique_values\": 8,\n        \"samples\": [\n2279.7343035638223,\n          1394.55,\n          7043.0\n        ],\n        \"semantic_type\": \"\",\n        \"description\": \"\"\n}\n    }\n  ]\n}","type":"dataframe"}
```


```
df.duplicated().sum()
```

```
0
```

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

```
0
```

```
def conv(value):
  if value==1:
```

```
    return "yes"
  else:
    return "no"
df["SeniorCitizen"] = df["SeniorCitizen"].apply(conv)
```

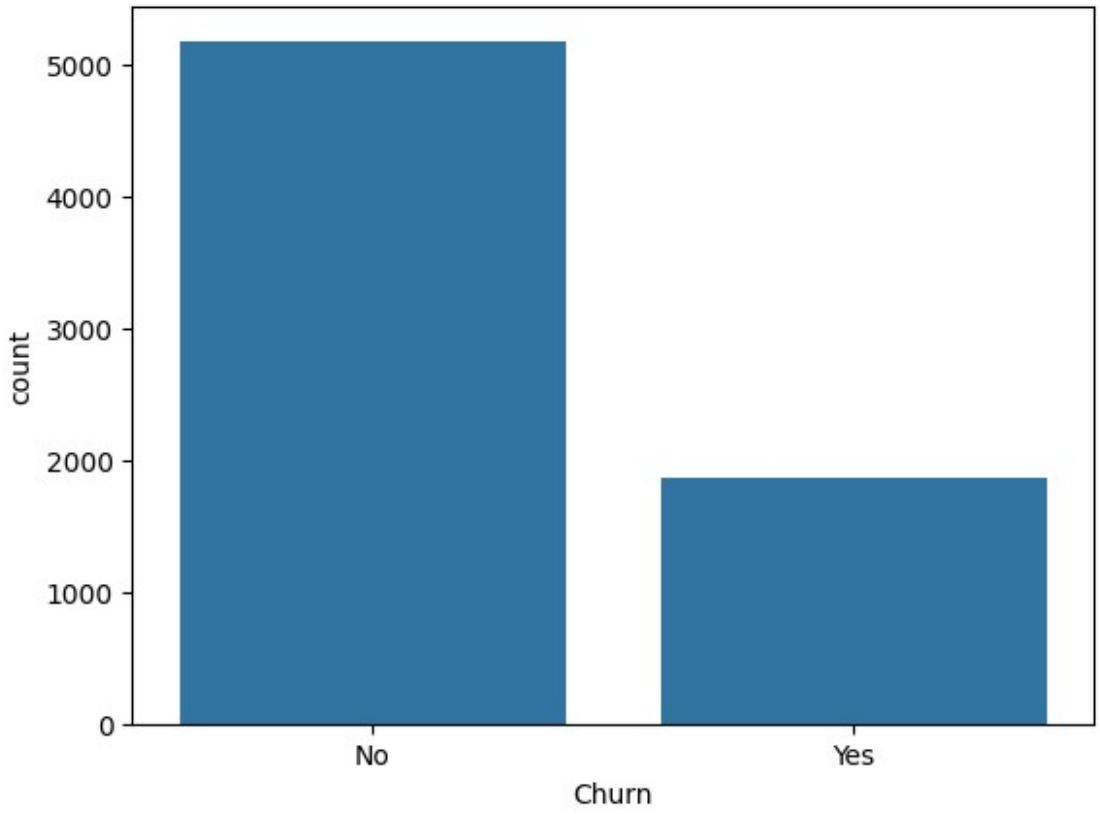
converted 0 and 1 value of SeniorCitizen to yes and no for easier to understand

```
df.head(30)
```

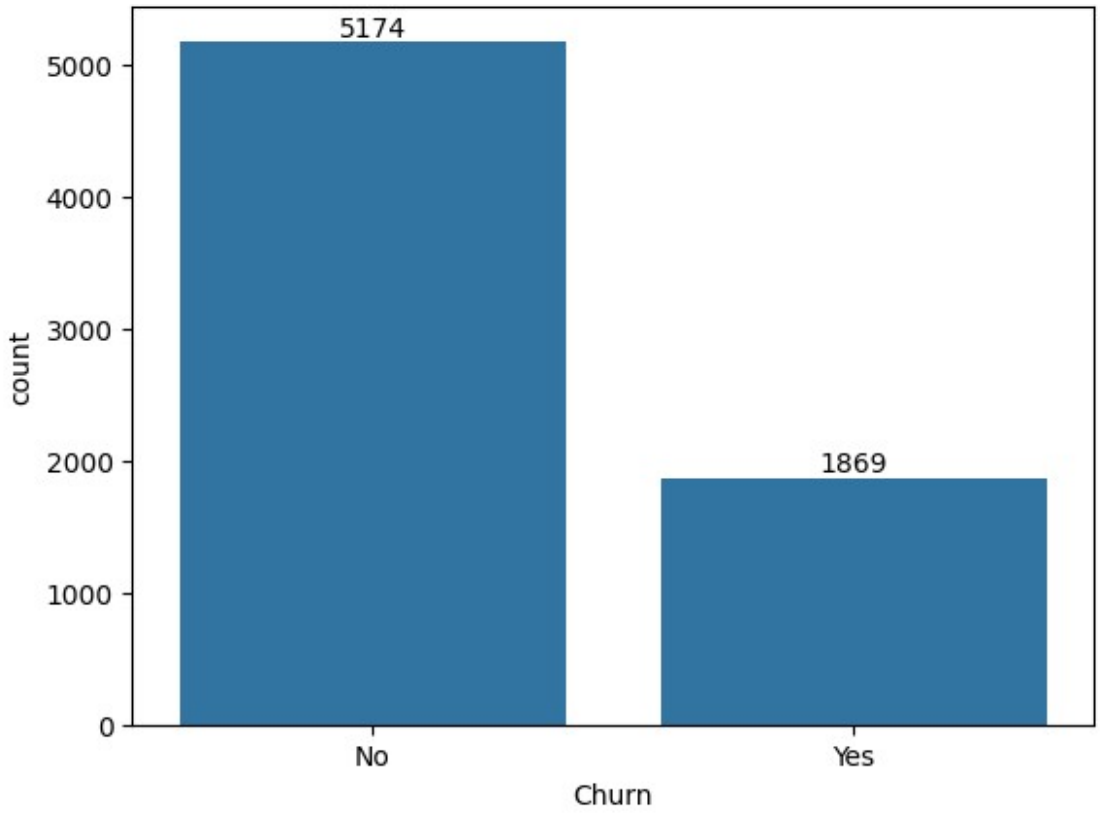

```
{"summary":"{\n  \"name\": \"df\",\n  \"rows\": 8,\n  \"fields\": [\n
{\n      \"column\": \"PhoneService\",\n      \"properties\": {\n
\"dtype\": \"category\",\n        \"num_unique_values\": 2,\n
\"samples\": [\n          \"No\",\n          \"Yes\"\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    },\n    {\n      \"column\": \"MultipleLines\",\n
\"properties\": {\n        \"dtype\": \"category\",\n
\"num_unique_values\": 2,\n        \"samples\": [\n          \"Yes\",\
n          \"No\"\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
\"InternetService\",\n      \"properties\": {\n        \"dtype\":
\"category\",\n        \"num_unique_values\": 3,\n        \"samples\":
[\n          \"DSL\",\n          \"Fiber optic\"\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    },\n    {\n      \"column\": \"OnlineSecurity\",\n
\"properties\": {\n        \"dtype\": \"category\",\n
\"num_unique_values\": 2,\n        \"samples\": [\n          \"Yes\",\
n          \"No\"\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
\"OnlineBackup\",\n      \"properties\": {\n        \"dtype\":
\"category\",\n        \"num_unique_values\": 2,\n        \"samples\":
[\n          \"No\",\n          \"Yes\"\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    },\n    {\n      \"column\": \"DeviceProtection\",\n
\"properties\": {\n        \"dtype\": \"category\",\n
\"num_unique_values\": 2,\n        \"samples\": [\n          \"Yes\",\
n          \"No\"\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
\"TechSupport\",\n      \"properties\": {\n        \"dtype\":
\"category\",\n        \"num_unique_values\": 2,\n        \"samples\":
[\n          \"No\",\n          \"Yes\"\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    },\n    {\n      \"column\": \"StreamingTV\",\n
\"properties\": {\n        \"dtype\": \"category\",\n
\"num_unique_values\": 2,\n        \"samples\": [\n          \"Yes\",\
n          \"No\"\n        ],\n        \"semantic_type\": \"\",\n
\"description\": \"\"\n      }\n    },\n    {\n      \"column\":
```

```
\"StreamingMovies\",\n      \"properties\": {\n        \"dtype\":
\"category\",\n        \"num_unique_values\": 2,\n        \"samples\":
[\n          \"No\",\n          \"Yes\"\n        ],\n
\"semantic_type\": \"\",\n        \"description\": \"\"\n      }\
n    }\n  ]\n}","type":"dataframe","variable_name":"df"}

sns.countplot(x='Churn',data=df)
plt.show()
```

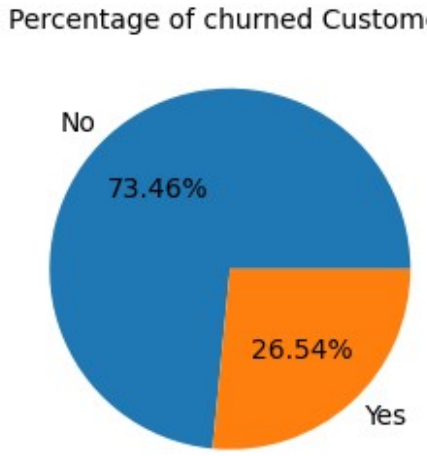



```
ax=sns.countplot(x='Churn',data=df)
ax.bar_label(ax.containers[0])
plt.show()
```




```
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 Customer",fontsize = 10)
plt.show()
```



from this we find that 26.54% of our customer have churned out :not let's explore reason behind it

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

```
/usr/local/lib/python3.10/dist-packages/seaborn/_base.py:949:
FutureWarning: When grouping with a length-1 list-like, you will need
to pass a length-1 tuple to get_group in a future version of pandas.
Pass `(name,)` instead of `name` to silence this warning.
  data_subset = grouped_data.get_group(pd_key)
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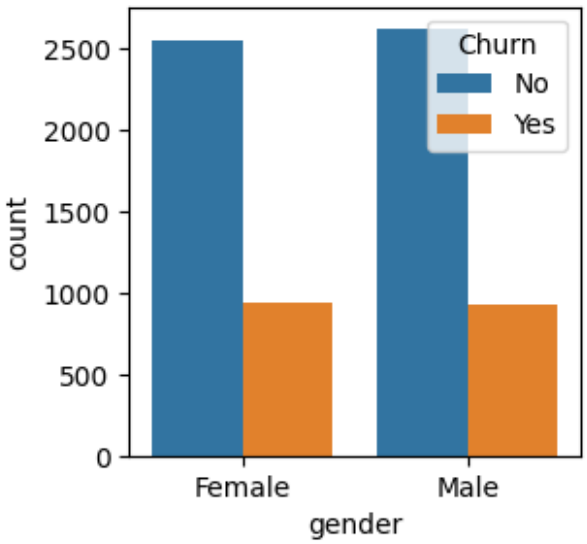


```
plt.figure(figsize=(3,3))
sns.countplot(x="SeniorCitizen",data=df , hue= "Churn")
plt.title("Churn by SeniorCitizen")
plt.show()
```

```
/usr/local/lib/python3.10/dist-packages/seaborn/_base.py:949:
FutureWarning: When grouping with a length-1 list-like, you will need
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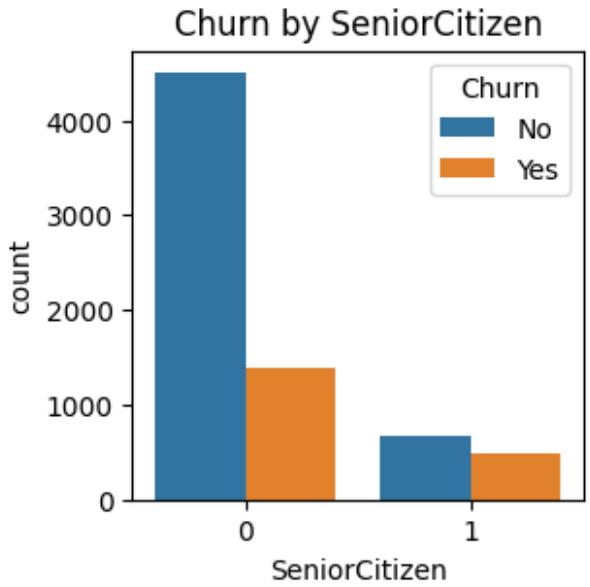
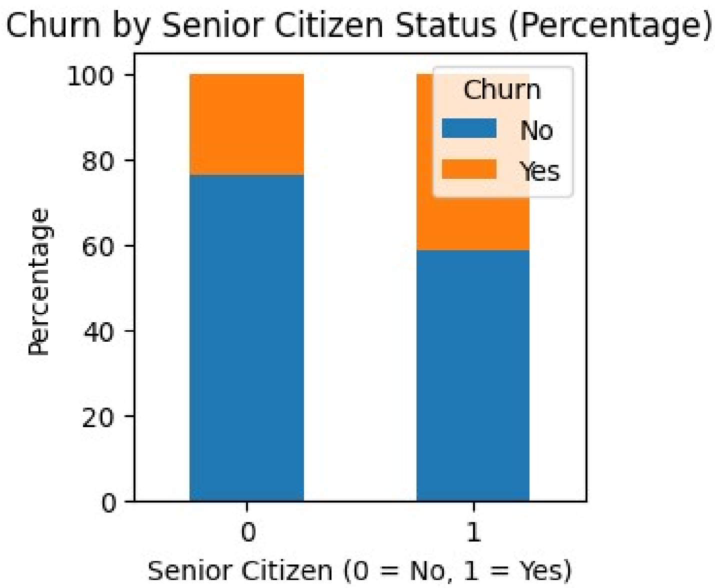



```
counts = df.groupby(['SeniorCitizen',
'Churn']).size().unstack(fill_value=0)
percentages = counts.div(counts.sum(axis=1), axis=0) * 100

# Plot stacked bar chart
percentages.plot(kind='bar', stacked=True, figsize=(3, 3))

# Add title and labels
plt.title("Churn by Senior Citizen Status (Percentage)")
plt.xlabel("Senior Citizen (0 = No, 1 = Yes)")
plt.ylabel("Percentage")
plt.xticks(rotation=0)
plt.legend(title='Churn', labels=percentages.columns)
plt.show()
```




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

```
/usr/local/lib/python3.10/dist-packages/seaborn/_base.py:949:
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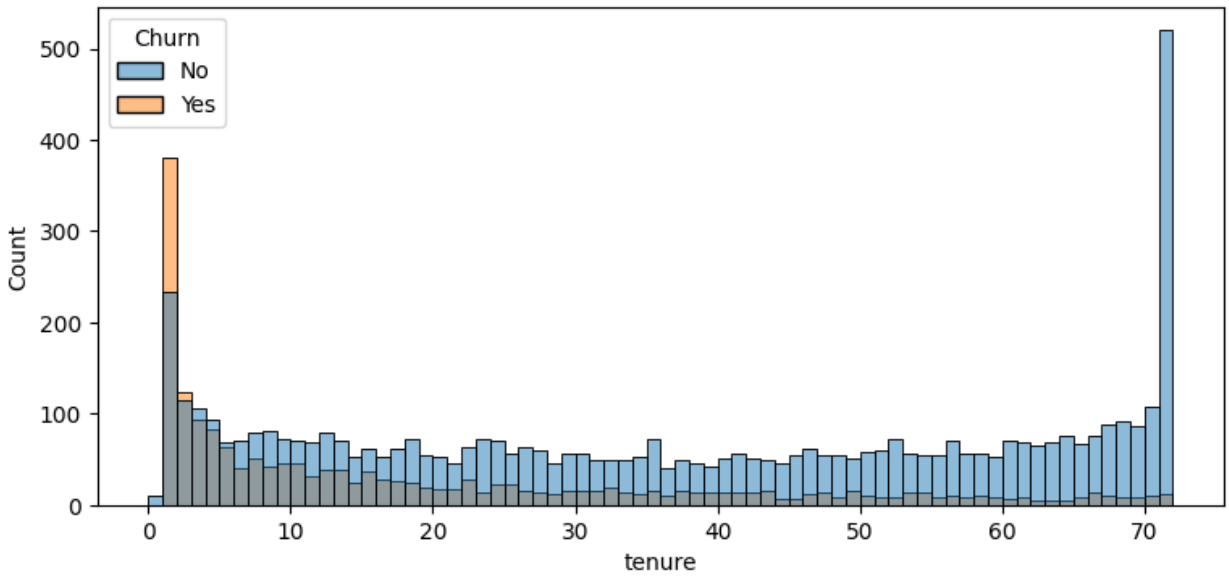

people who have used our services for a long time have stayed and people who have used our service for one or two month have churned

```
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()
```

```
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FutureWarning: When grouping with a length-1 list-like, you will need
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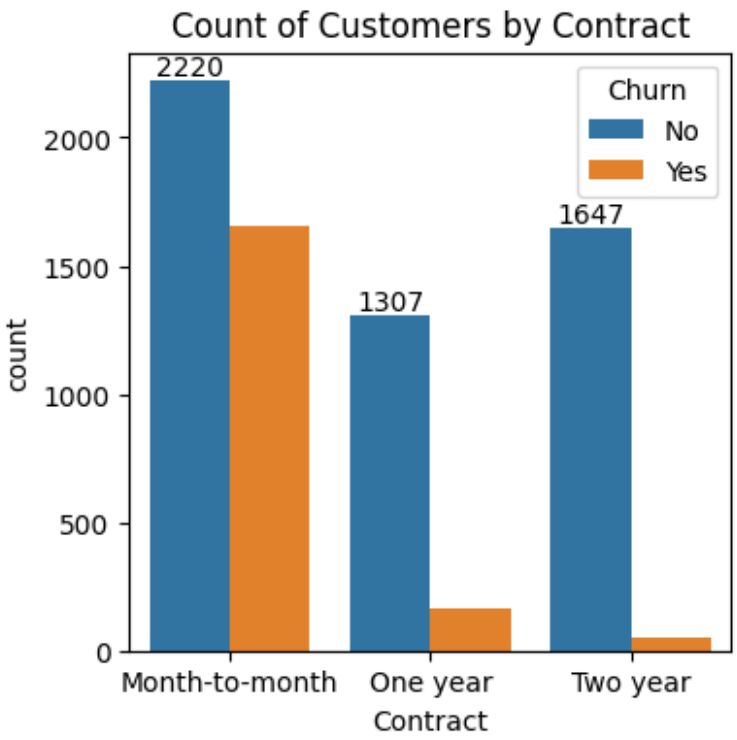


people who have month to month are likely to churn then who have 1 or 2 years of contracted

```
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)


columns_to_plot = [
    'PhoneService', 'MultipleLines', 'InternetService',
    'OnlineSecurity', 'OnlineBackup', 'DeviceProtection',
    'TechSupport', 'StreamingTV', 'StreamingMovies'
]

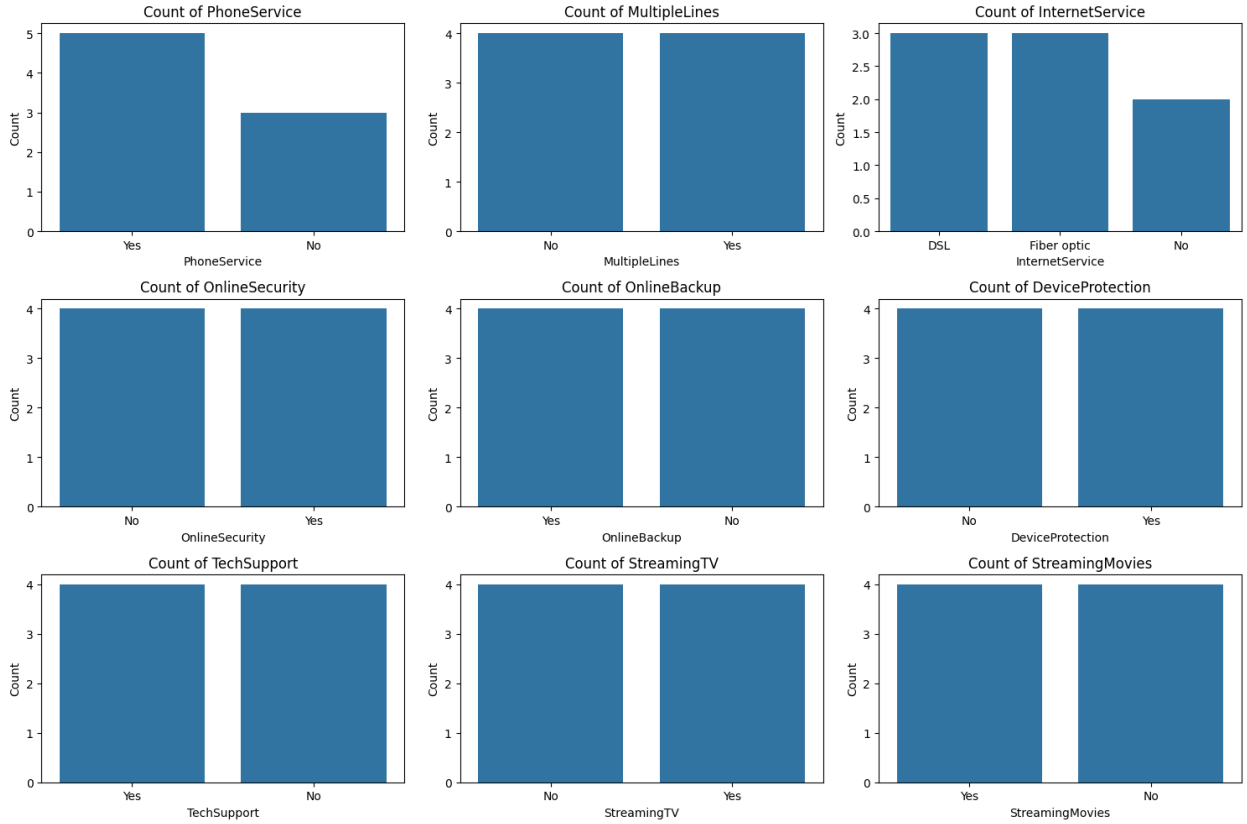
# Create subplots
n = len(columns_to_plot)
fig, axes = plt.subplots(nrows=(n + 2) // 3, ncols=3, figsize=(15,
10))

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

```
# Create count plots for each column
for i, col in enumerate(columns_to_plot):
    sns.countplot(x=col, data=df, ax=axes[i])
    axes[i].set_title(f'Count of {col}')
    axes[i].set_ylabel('Count')

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

plt.tight_layout()
plt.show()
```




```
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)
```

```
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 PaymentMethod")
plt.xticks(rotation = 45)
plt.show()
```

```
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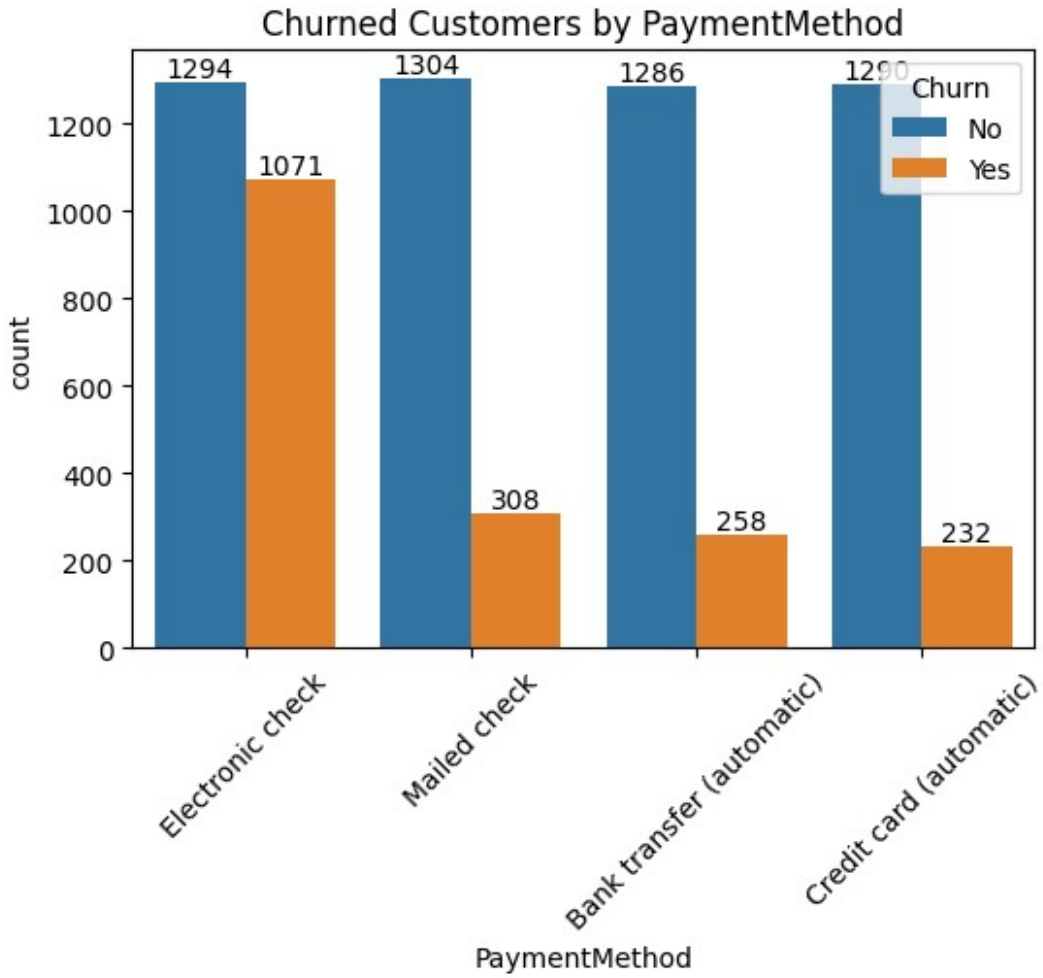

Customer is likely o churn when he is using electronic check as a payment method