Telco Customer churn EDA

July 15, 2022

0.0.1 Telco Customer churn EDA by P.Pallavi.

https://www.kaggle.com/bandiatindra/telecom-churn-prediction/data

[13]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
```

[14]:
```
# to read the dataset in the Jupiter Notebook
df1 = pd.read_csv("Telecom.csv")
```

[15]:
```
# to make the copy of dataset
df = df1.copy()
```

[16]:
```
# to drop the column customerid as it of no use in EDA
df.drop(columns = ['customerid'], inplace = True)
```

[17]:
```
# Adding to the column SerialNumber to the dataset
df["SerialNumber"] = np.arange(1,len(df)+1)
```

[18]:
```
# setting the SerialNumber as index to the dataset
df.set_index("SerialNumber", inplace = True)
```

[19]:
```
# to find the dimensions of data set
df.shape
```

[19]:
```
(7043, 20)
```

[20]:
```
# to find the type of columns present in the dataset and observed␣
↪dtype(SeniorCitizen) as int64 and dtype(TotalCharges)
# as object
df.dtypes
```

[20]:
```
gender              object
SeniorCitizen        int64
Partner             object
Dependents          object
```

```
tenure              int64
PhoneService       object
MultipleLines      object
InternetService    object
OnlineSecurity     object
OnlineBackup       object
DeviceProtection   object
TechSupport        object
StreamingTV        object
StreamingMovies    object
Contract           object
PaperlessBilling   object
PaymentMethod      object
MonthlyCharges    float64
TotalCharges       object
Churn              object
dtype: object
```

[21]:
```
pd.set_option("display.max_rows", None)
```

[22]:
```
# Converting the dtype(SeniorCitizen) to object  and dtype(Totalcharges) to␣
 ↪numeric for analysis
df["SeniorCitizen"] = df["SeniorCitizen"].astype(object, errors = "raise")
df["TotalCharges"] = pd.to_numeric(df["TotalCharges"], errors = "coerce")
```

[23]:
```
#to find the count of data in every column and found data missing in Total␣
 ↪Charges column
df.count()
```

[23]:
```
gender            7043
SeniorCitizen     7043
Partner           7043
Dependents        7043
tenure            7043
PhoneService      7043
MultipleLines     7043
InternetService   7043
OnlineSecurity    7043
OnlineBackup      7043
DeviceProtection  7043
TechSupport       7043
StreamingTV       7043
StreamingMovies   7043
Contract          7043
PaperlessBilling  7043
PaymentMethod     7043
MonthlyCharges    7043
```

```
TotalCharges        7006
Churn               7043
dtype: int64
```

[24]:
```
#to fill the missing data in Totalcharges with tenure*Monthlycharges
df['TotalCharges'].fillna(df["tenure"]*df["MonthlyCharges"], inplace = True)
```

[25]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Int64Index: 7043 entries, 1 to 7043
Data columns (total 20 columns):
 #   Column            Non-Null Count  Dtype
---  ------            --------------  -----
 0   gender            7043 non-null   object
 1   SeniorCitizen     7043 non-null   object
 2   Partner           7043 non-null   object
 3   Dependents        7043 non-null   object
 4   tenure            7043 non-null   int64
 5   PhoneService      7043 non-null   object
 6   MultipleLines     7043 non-null   object
 7   InternetService   7043 non-null   object
 8   OnlineSecurity    7043 non-null   object
 9   OnlineBackup      7043 non-null   object
 10  DeviceProtection  7043 non-null   object
 11  TechSupport       7043 non-null   object
 12  StreamingTV       7043 non-null   object
 13  StreamingMovies   7043 non-null   object
 14  Contract          7043 non-null   object
 15  PaperlessBilling  7043 non-null   object
 16  PaymentMethod     7043 non-null   object
 17  MonthlyCharges    7043 non-null   float64
 18  TotalCharges      7043 non-null   float64
 19  Churn             7043 non-null   object
dtypes: float64(2), int64(1), object(17)
memory usage: 687.8+ KB
```

[26]:
```
df.describe()
```

[26]:

	tenure	MonthlyCharges	TotalCharges
count	7043.000000	7043.000000	7043.000000
mean	32.371149	64.761692	2279.701257
std	24.559481	30.090047	2266.810129
min	0.000000	18.250000	0.000000
25%	9.000000	35.500000	397.775000
50%	29.000000	70.350000	1394.550000
75%	55.000000	89.850000	3786.600000

```
max       72.000000      118.750000    8684.800000
```

[27]:
```
df[df['tenure'] == 0].shape
```

[27]:
```
(11, 20)
```

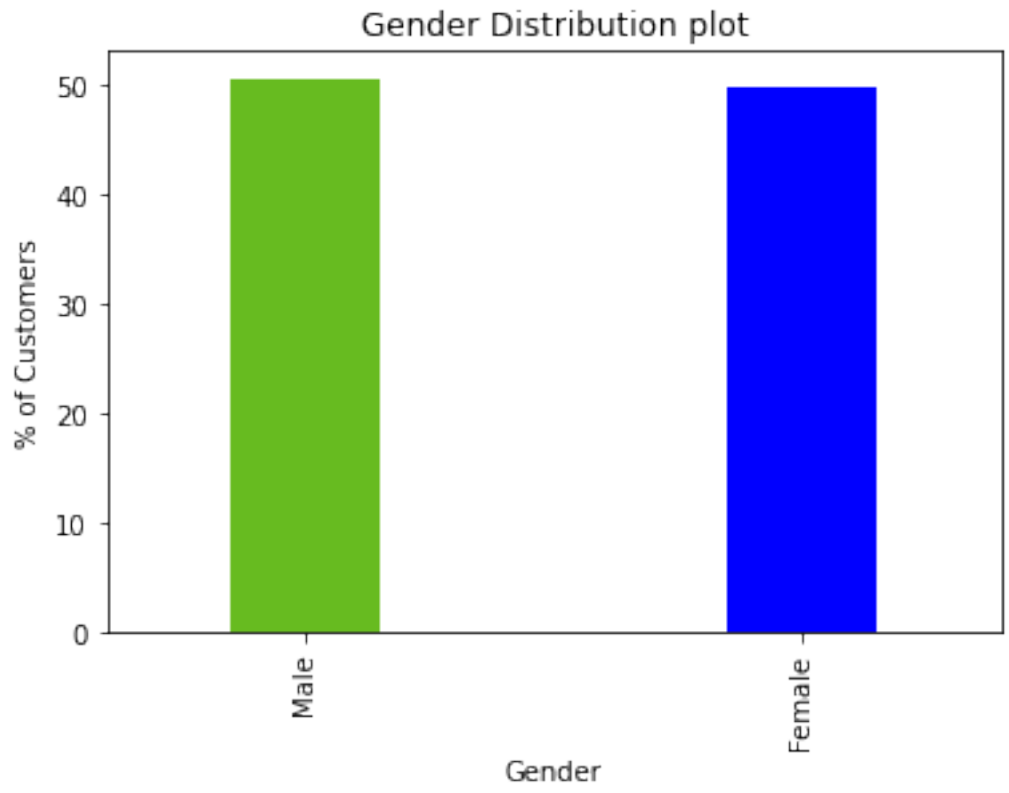
[28]:
```
#df['gender'].replace("Female",0, inplace = True)
#df['gender'].replace("Male",1, inplace = True)
df['Churn'].replace("No",0, inplace = True) #to replace Churn value with '0' if
 ↪No and with '1' if Yes
df['Churn'].replace("Yes",1, inplace = True)
```

0.0.2 Data Visualization using Matplotlib and Seaborn

[29]:
```
# 1. From the plot it is learnt that, nearly 50% of customers are male and
 ↪remaining Female.
print("""Percentages of Male and Female """)
a = df["gender"].value_counts()*100/len(df)
print(a)
ax = (df["gender"].value_counts()*100/len(df)).plot(kind = "bar",
 ↪color=['#67BB20',"b"], width = 0.3)
ax.set_xlabel("Gender")
ax.set_ylabel("% of Customers")
ax.set_title("Gender Distribution plot")
```

```
Percentages of Male and Female
Male      50.47565
Female    49.52435
Name: gender, dtype: float64
```

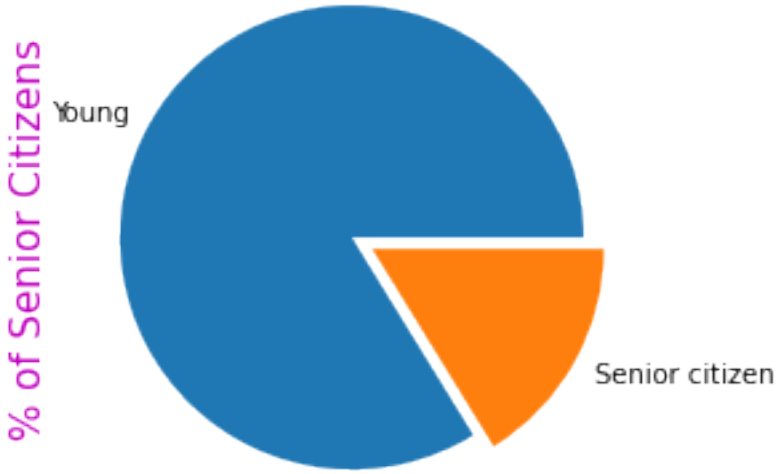
[29]:
```
Text(0.5, 1.0, 'Gender Distribution plot')
```



[30]:
```
# 2. Most of customers in the dataset belong to young group and the count of␣
 ↪senior citizens are very less than Young group.
#bx = (df.groupby(["SeniorCitizen"])["gender"].count()).plot.pie(explode=[0,0.
 ↪1], labels=['Others',"Senior citizen"])
print("""Count of  Senior Citizens(denoted by 1) and young group(denoted by␣
 ↪0)""")
b = df["SeniorCitizen"].value_counts()
print(b)
print (" The percentage of youth = {:.2f}% and percentage of Senior Citizens =␣
 ↪{:.2f}%".format(b[0]*100/(b[0]+b[1]),b[1]*100/(b[0]+b[1])))
bx = (df["SeniorCitizen"].value_counts()).plot.pie(explode=[0,0.1],␣
 ↪labels=['Young',"Senior citizen"])
bx.set_ylabel("% of Senior Citizens", fontsize = 15, c = 'm')
```

```
Count of  Senior Citizens(denoted by 1) and young group(denoted by 0)
0    5901
1    1142
Name: SeniorCitizen, dtype: int64
 The percentage of youth = 83.79% and percentage of Senior Citizens = 16.21%
```

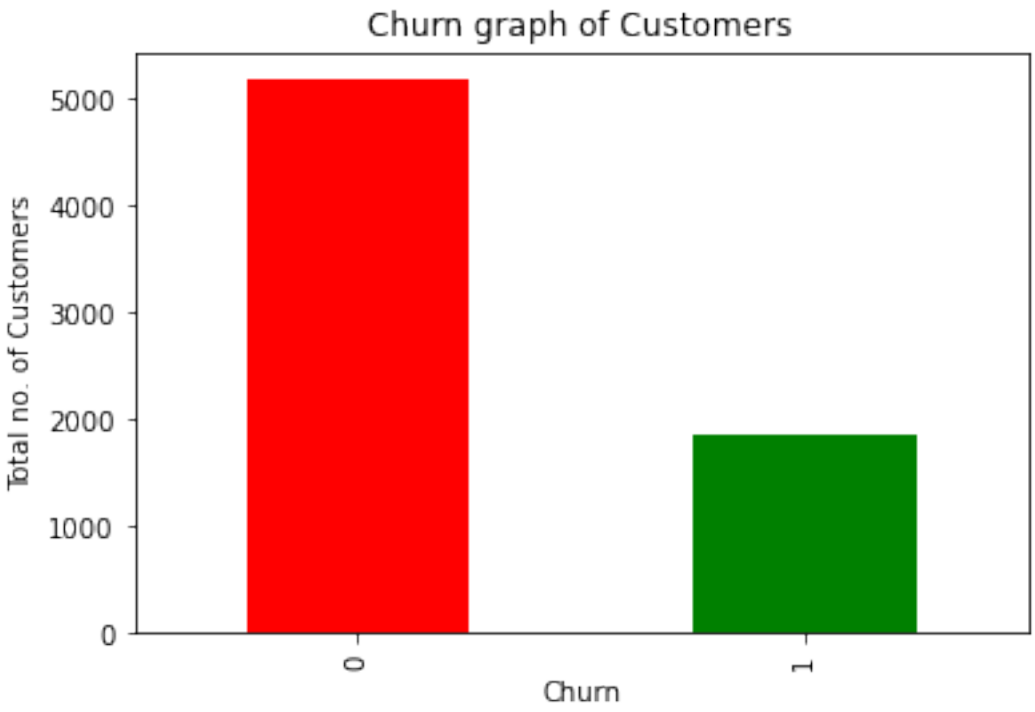
[30]:
```
Text(0, 0.5, '% of Senior Citizens')
```



[31]:
```
print("""Count of Churn of Customers from Telco""")
c = df["Churn"].value_counts()
print(c)
cx = (df["Churn"].value_counts()).plot(kind ='bar',color= ['r','g'])
cx.set_xlabel("Churn")
cx.set_ylabel("Total no. of Customers")
cx.set_title("Churn graph of Customers")
```

```
Count of Churn of Customers from Telco
0    5174
1    1869
Name: Churn, dtype: int64
```

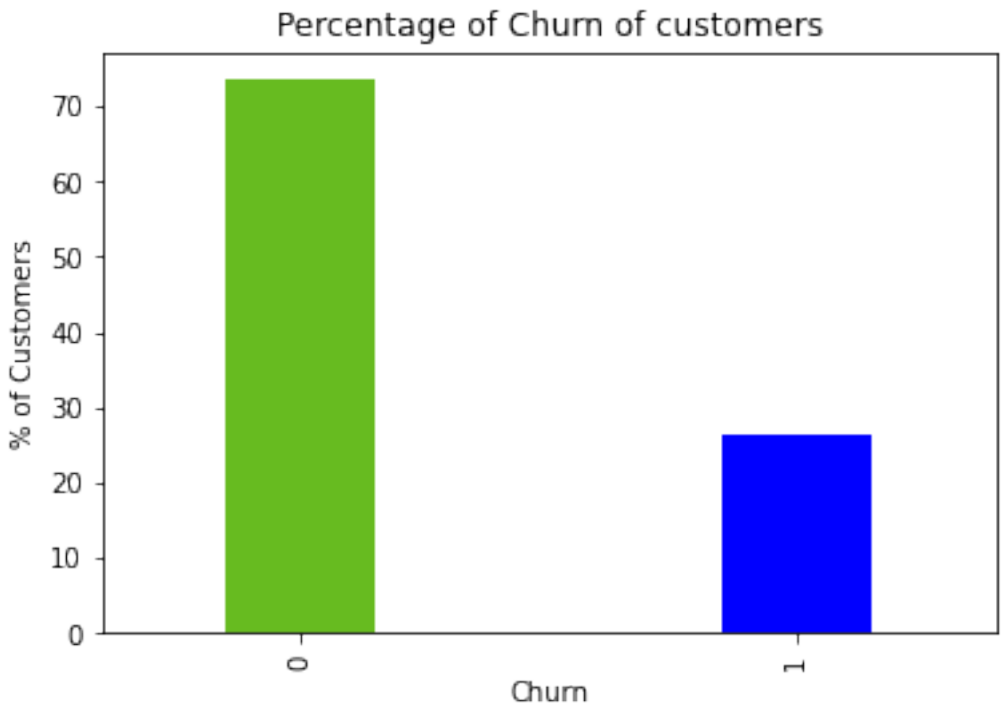
[31]: Text(0.5, 1.0, 'Churn graph of Customers')



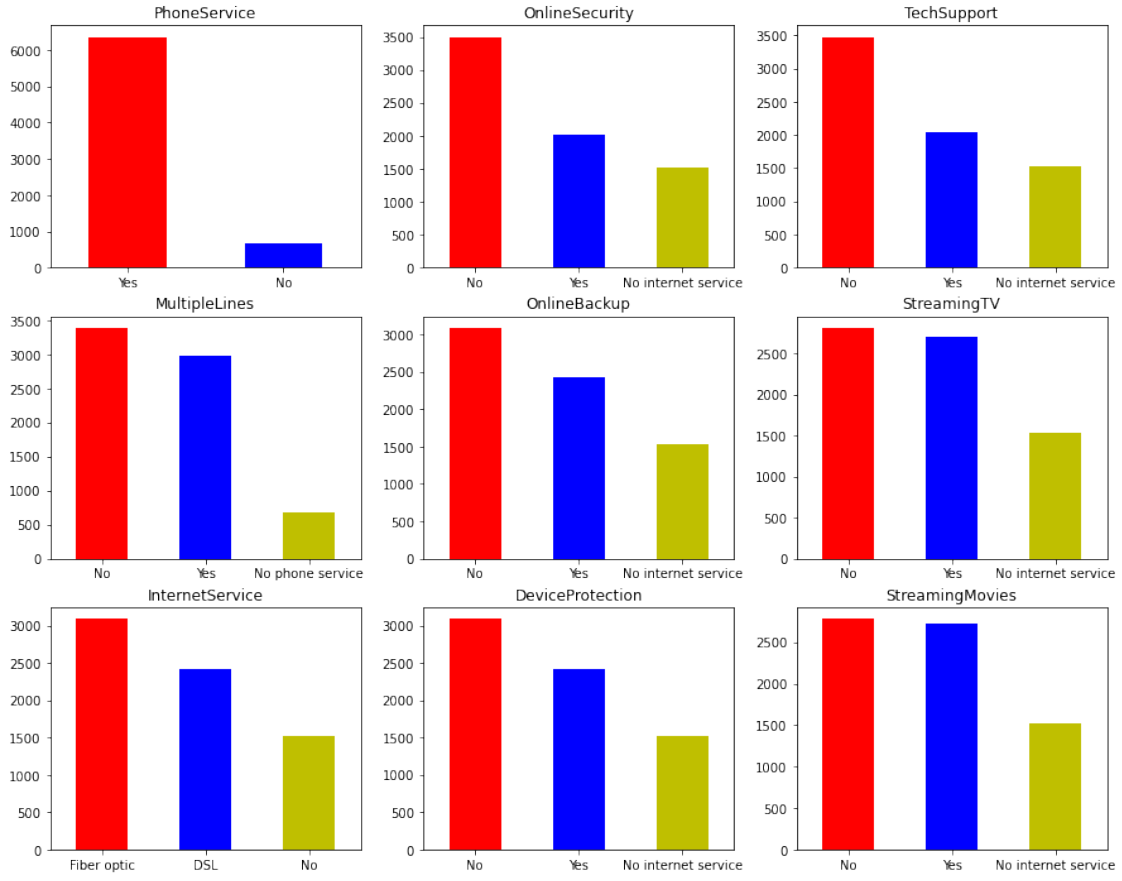
[32]:
```
#3. Nearly 26.5% of Customers are churning from Telco because of different␣
 ↪factors.
print("""Percentage of Churn of Customers from Telco""")
d = df["Churn"].value_counts()*100/len(df)
print(d)
dx = (df["Churn"].value_counts()*100/len(df)).plot(kind = "bar",␣
 ↪color=['#67BB20',"b"], width = 0.3)
dx.set_xlabel("Churn")
dx.set_ylabel("% of Customers")
dx.set_title("Percentage of Churn of customers")
```

```
Percentage of Churn of Customers from Telco
0    73.463013
1    26.536987
Name: Churn, dtype: float64
```

[32]: `Text(0.5, 1.0, 'Percentage of Churn of customers')`



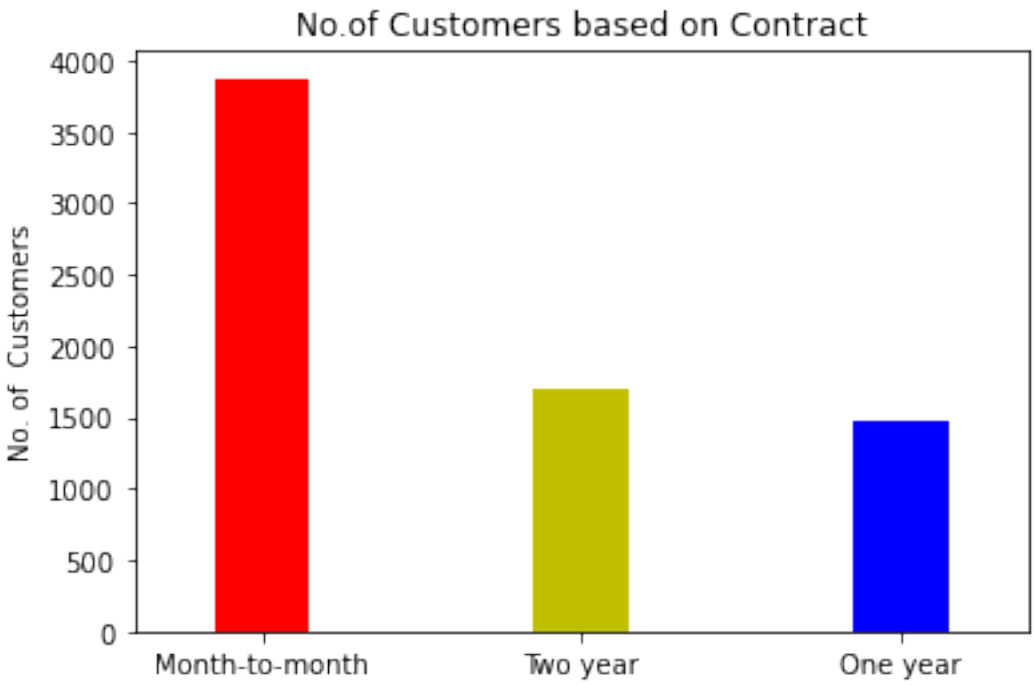
[33]:
```
# 4. Shows various services provided by the Telco and observed that most of the␣
 ↪customers opted for Fibreoptic services. The
# telco provides less online security and Techsupport. Nearly 50% of the␣
 ↪customers opted for Streaming TV and Streaming movies.
Facility = {1:'PhoneService',2:'MultipleLines',3:'InternetService',4:
 ↪'OnlineSecurity',
          5:'OnlineBackup',6:'DeviceProtection',7:'TechSupport',8:
 ↪'StreamingTV',9:'StreamingMovies'}

fig, axes = plt.subplots(3, 3,figsize = (15,12))
for i, item in Facility.items():
    if i <=3:
        Fx = df[item].value_counts().plot(kind = 'bar',rot=0,ax=axes[i-1,0],␣
 ↪color = ['r','b','y'])
        Fx.set_title(item)
    elif i<=6:
        Fx = df[item].value_counts().plot(kind = 'bar',ax=axes[i-4,1],rot=0,␣
 ↪color = ['r','b','y'])
        Fx.set_title(item)
    elif i<=9:
        Fx = df[item].value_counts().plot(kind = 'bar',ax=axes[i-7,2],rot=0,␣
 ↪color = ['r','b','y'])
        Fx.set_title(item)
```



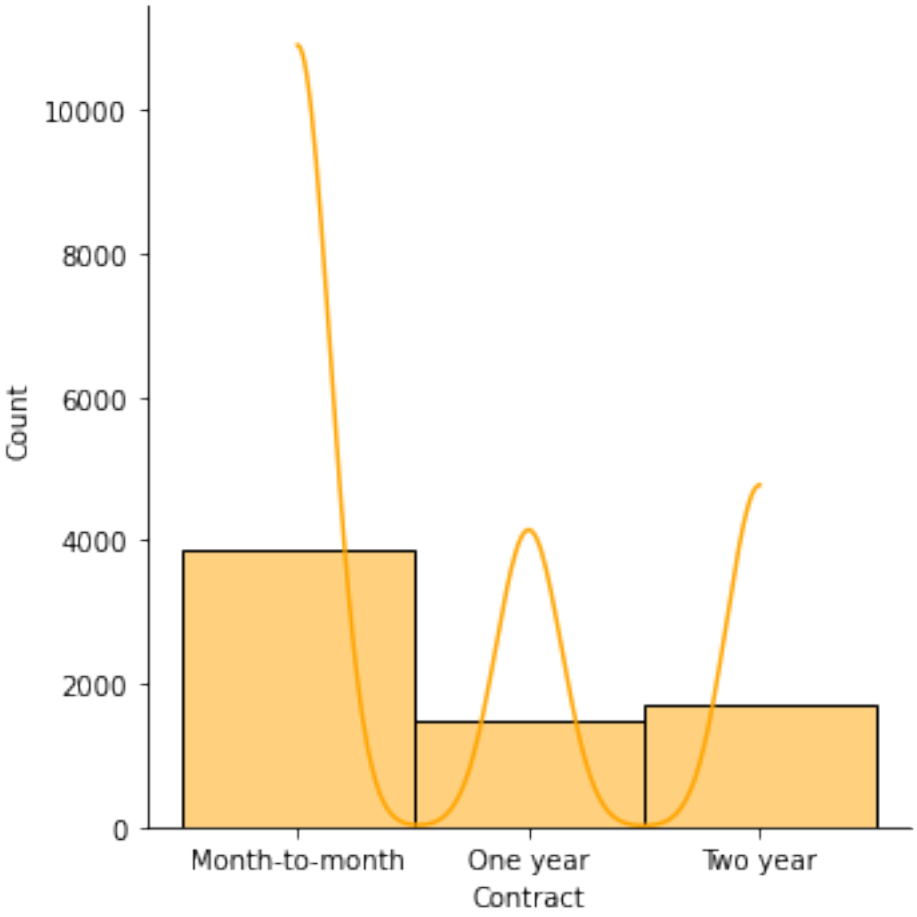
[34]:
```
# 5. The Customers in the dataset preferred lower contract periods i.e␣
 ↪Month-to-Month than two or three year Contract period.
print("The no.of Customers based on Contract")
g = df['Contract'].value_counts()
print(g)
gx = df['Contract'].value_counts().plot(kind = 'bar',color = ["r","y","b"],␣
 ↪width = 0.3, rot=0)
gx.set_ylabel('No. of  Customers')
gx.set_title("No.of Customers based on Contract")
```

```
The no.of Customers based on Contract
Month-to-month    3875
Two year          1695
One year          1473
Name: Contract, dtype: int64
```

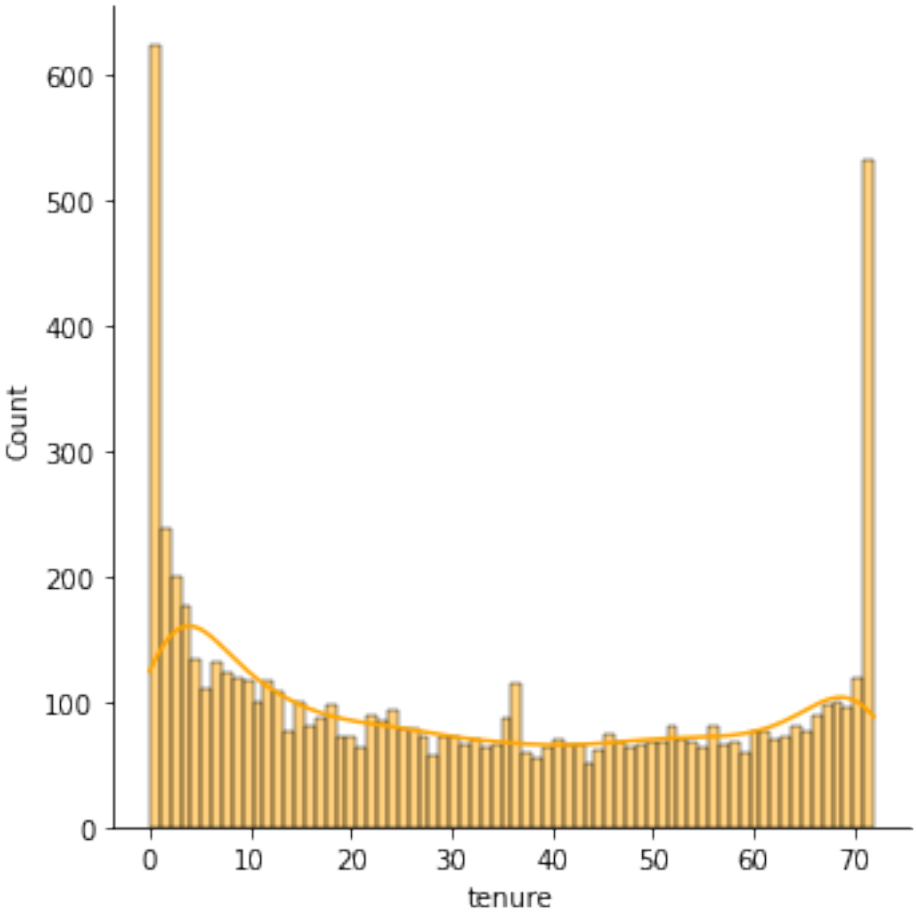
[34]:
```
Text(0.5, 1.0, 'No.of Customers based on Contract')
```



[35]:
```
gx = sns.displot(df["Contract"], kde=True, bins=10 ,color = "orange")
```



[36]:
```
#6.The Customers in the dataset opted  mostly for one month tenure or 72 months␣
 ↪tenure
hx = sns.displot(df['tenure'], kde=True, bins=70 ,color = "orange")
```



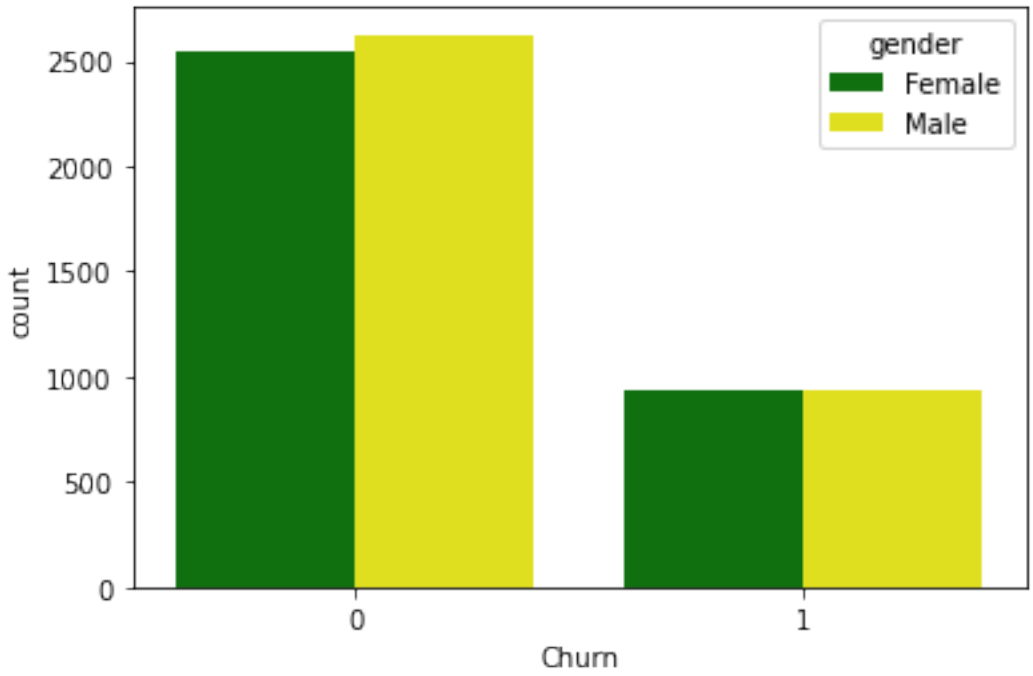
[37]:
```
# 7.The count of churn in Male and Female is nearly same.
print("The count of churn in Male and Female")
i = df.groupby(['gender','Churn']).size()
print(i)
sns.countplot(df['Churn'], hue = df['gender'], dodge = True, palette =␣
↪['green', 'yellow'])
```

```
The count of churn in Male and Female
gender  Churn
Female  0        2549
        1         939
Male    0        2625
        1         930
dtype: int64
```

```
C:\Users\User\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning: Pass the following variable as a keyword arg: x. From version
0.12, the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
```

```
misinterpretation.
  warnings.warn(
```

[37]: <AxesSubplot:xlabel='Churn', ylabel='count'>

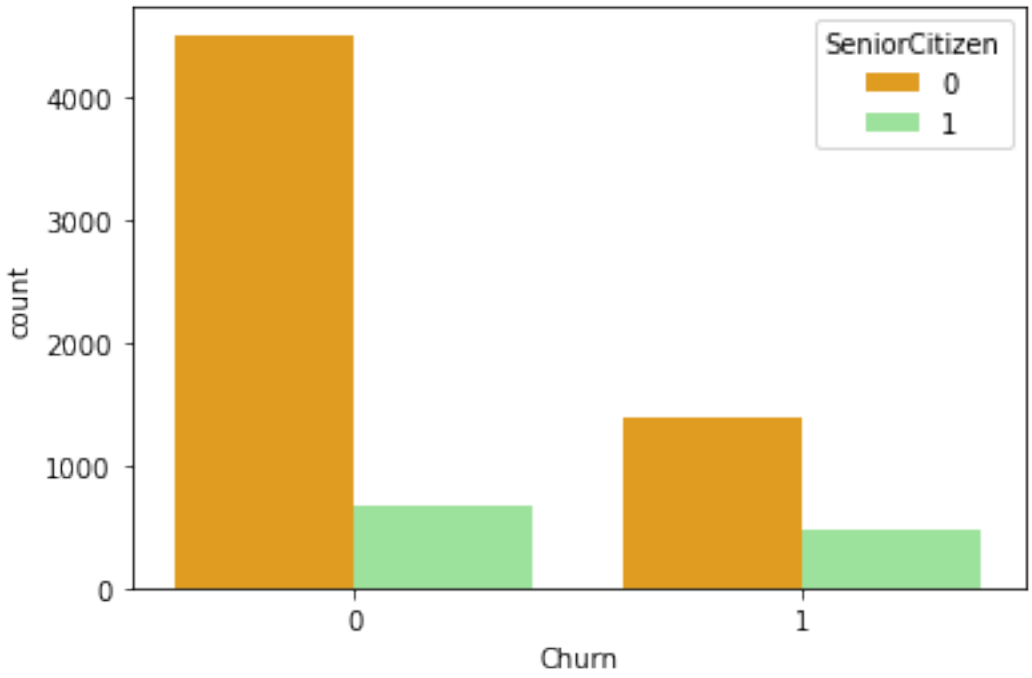


[38]:
```
# 8.  The rate of Churn in SeniorCitizens are high than young group customers
print("The count of Churn of Seniorcitizens")
Sen_churn = (df.groupby(['SeniorCitizen','Churn']).size())
print(Sen_churn)
print("The rate of churn in youth :  {:.2f}%" .format(Sen_churn[0][1]*100/b[0]))
print("The rate of churn in SeniorCitizens : {:.2f}%" .
 ↪format(Sen_churn[1][1]*100/b[1]))
sns.countplot(df['Churn'], hue = df['SeniorCitizen'], dodge = True, palette =␣
 ↪['orange', 'lightgreen'])
```

```
The count of Churn of Seniorcitizens
SeniorCitizen  Churn
0              0        4508
               1        1393
1              0         666
               1         476
dtype: int64
The rate of churn in youth :  23.61%
The rate of churn in SeniorCitizens : 41.68%

C:\Users\User\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
```

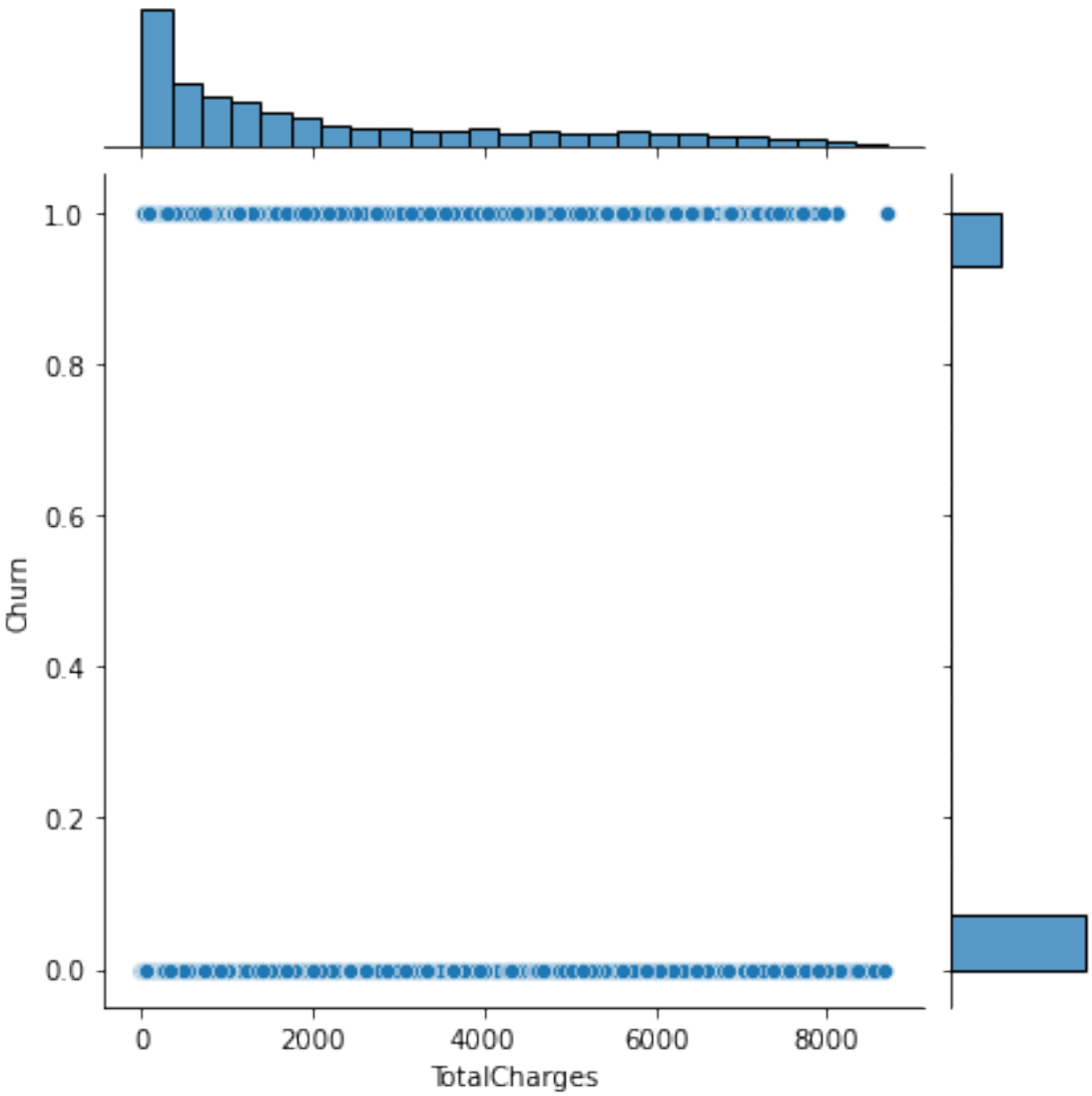
```
FutureWarning: Pass the following variable as a keyword arg: x. From version
0.12, the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.
  warnings.warn(
```

[38]:
```
<AxesSubplot:xlabel='Churn', ylabel='count'>
```



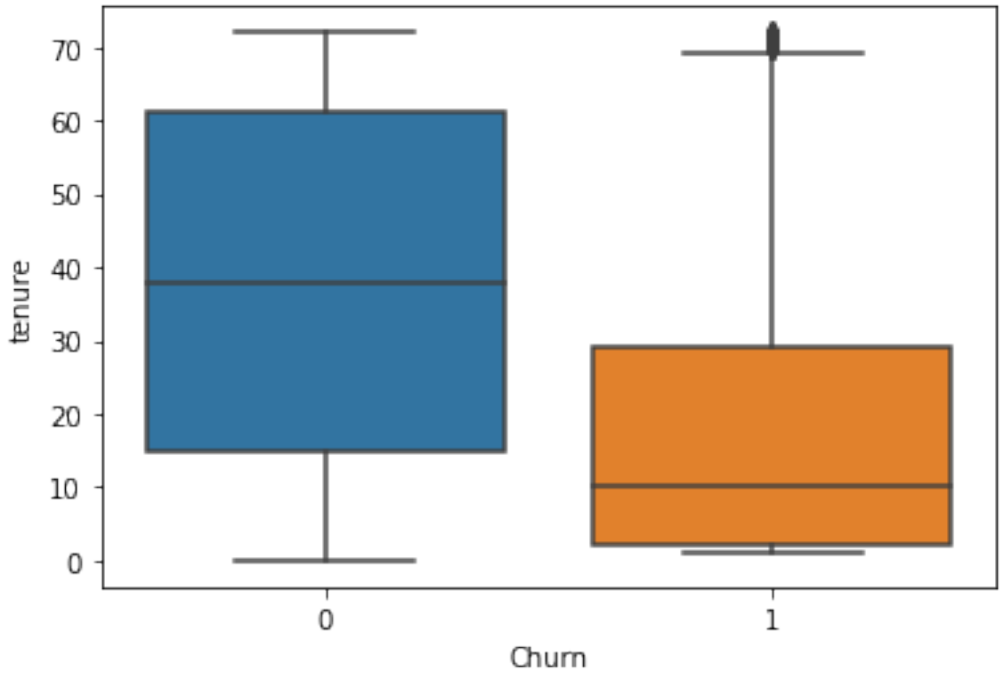
[39]:
```
#9.
sns.jointplot(y = df['Churn'], x = df['TotalCharges'])
```

[39]:
```
<seaborn.axisgrid.JointGrid at 0xa92fdc0>
```



[40]:
```
#10.The customers with lower tenure preferring to churn than the customers with␣
 ↪high tenure.
sns.boxplot(x = df["Churn"], y = df["tenure"])
```

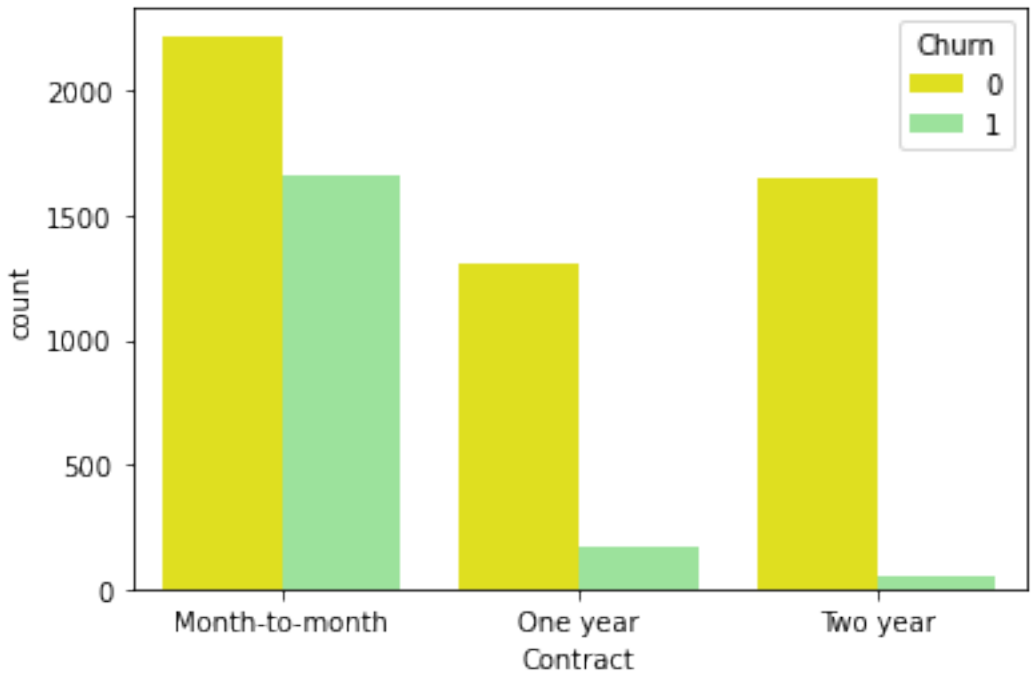
[40]:
```
<AxesSubplot:xlabel='Churn', ylabel='tenure'>
```



[41]:
```
# 11.The churn count is high where customers opted for Month-to-Month contract␣
↪than one year and two year contract.
sns.countplot(df['Contract'], hue = df['Churn'], dodge = True, palette =␣
↪['yellow', 'lightgreen'])
```

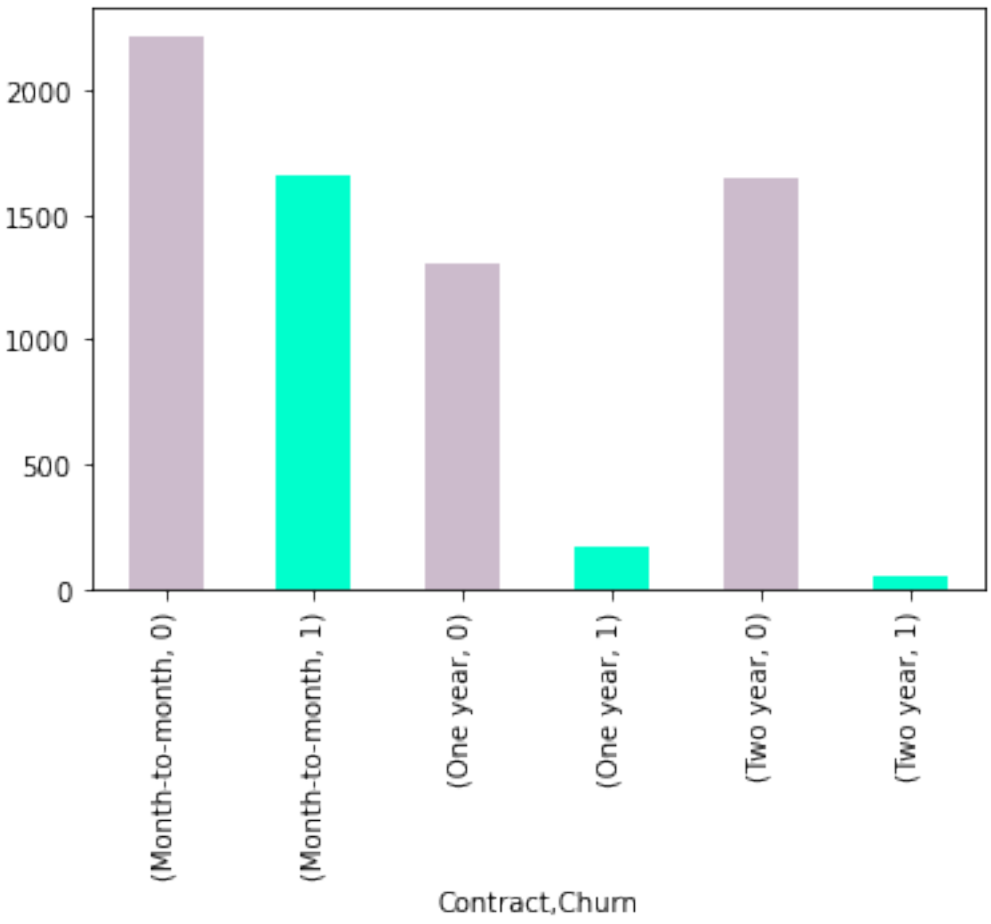
```
C:\Users\User\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning: Pass the following variable as a keyword arg: x. From version
0.12, the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.
  warnings.warn(
```

[41]:
```
<AxesSubplot:xlabel='Contract', ylabel='count'>
```



[42]:
```
contract_churn = df.groupby(['Contract','Churn']).size()
print(contract_churn)
cc = (df.groupby(['Contract','Churn']).size()).plot.bar(color =␣
↪['#CCBBCC',"#00FFCC"])
```

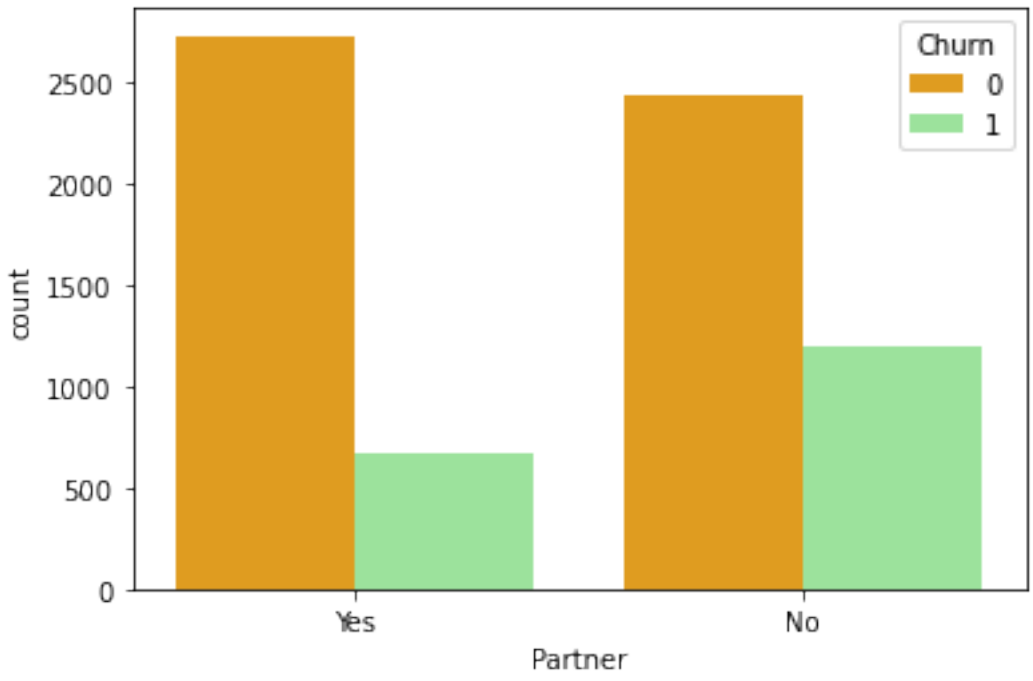
```
Contract        Churn
Month-to-month  0        2220
                1        1655
One year        0        1307
                1         166
Two year        0        1647
                1          48
dtype: int64
```



[43]:
```
#12.
sns.countplot(df['Partner'], hue = df['Churn'], dodge = True, palette =␣
↪['orange', 'lightgreen'])
```

```
C:\Users\User\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning: Pass the following variable as a keyword arg: x. From version
0.12, the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.
  warnings.warn(
```

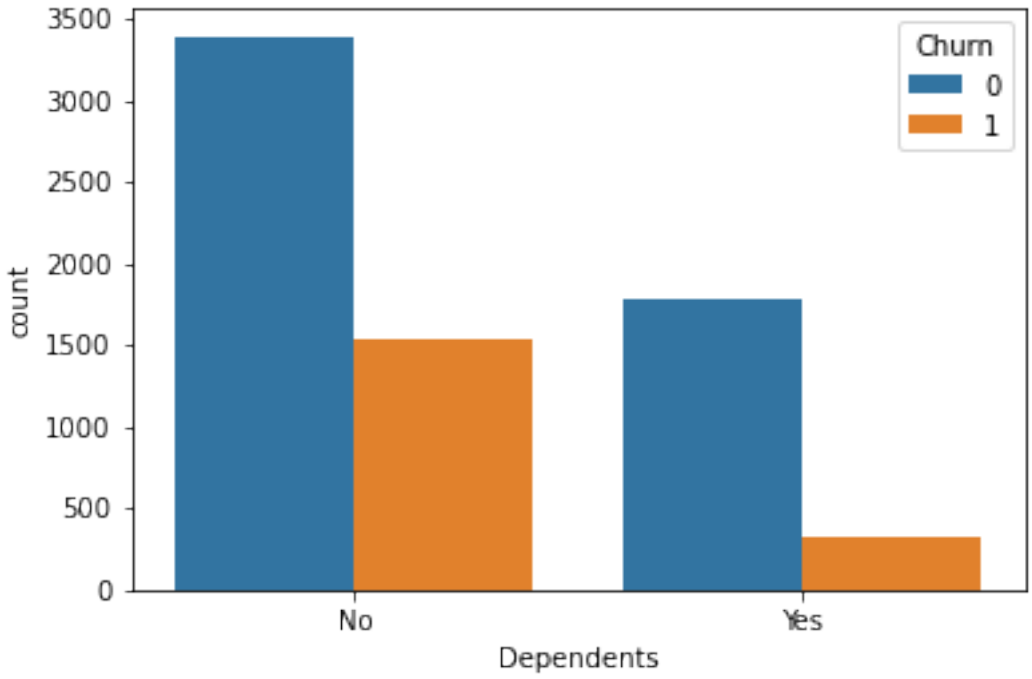
[43]: <AxesSubplot:xlabel='Partner', ylabel='count'>



[44]:
```
#13.
sns.countplot(df['Dependents'], hue = df['Churn'])
```

```
C:\Users\User\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning: Pass the following variable as a keyword arg: x. From version
0.12, the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.
  warnings.warn(
```

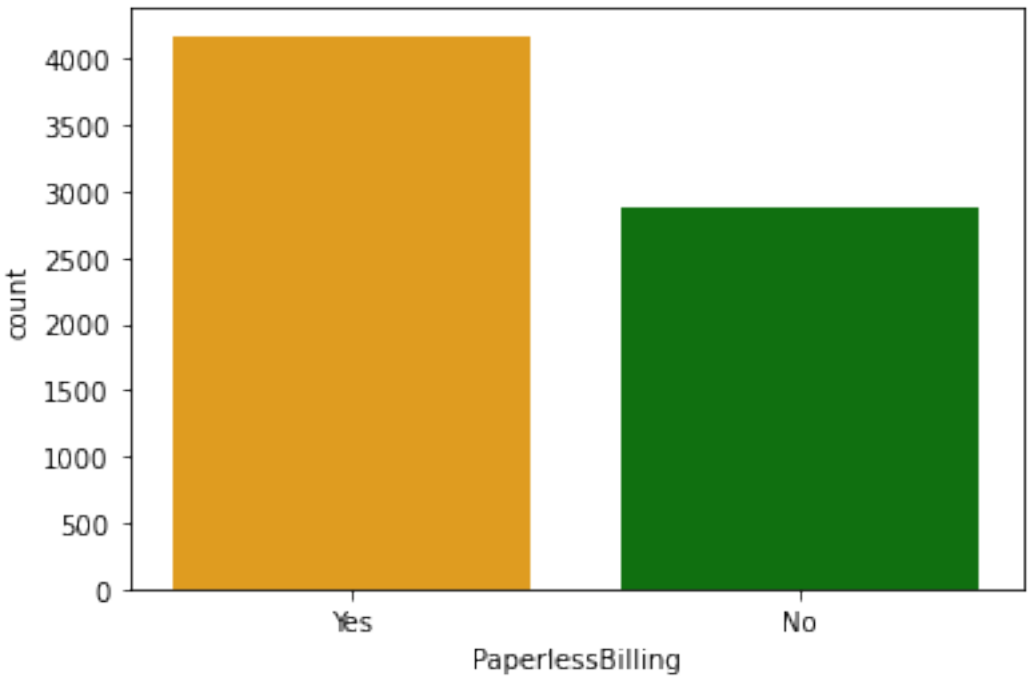
[44]:
```
<AxesSubplot:xlabel='Dependents', ylabel='count'>
```



[45]:
```
#14. The customers prefer paperless billing than paperbilling.
sns.countplot(df["PaperlessBilling"],dodge = True, palette = ['orange',␣
↪'green',"b","#CC00FF"], orient = "h")
```

```
C:\Users\User\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning: Pass the following variable as a keyword arg: x. From version
0.12, the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.
  warnings.warn(
```

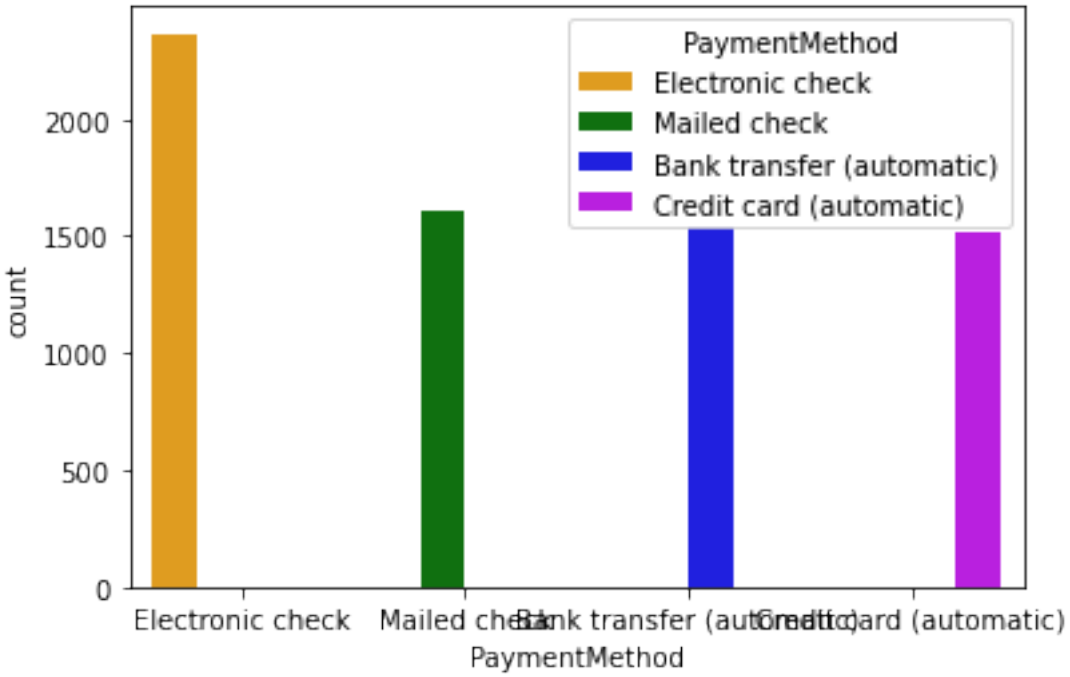
[45]: <AxesSubplot:xlabel='PaperlessBilling', ylabel='count'>



[46]:
```
#15. The customers prefer Electronic check method than other payment methods.
sns.countplot(df["PaymentMethod"], hue = df["PaymentMethod"], dodge = True,␣
↪palette = ['orange', 'green',"b","#CC00FF"], orient = "h")
```

```
C:\Users\User\anaconda3\lib\site-packages\seaborn\_decorators.py:36:
FutureWarning: Pass the following variable as a keyword arg: x. From version
0.12, the only valid positional argument will be `data`, and passing other
arguments without an explicit keyword will result in an error or
misinterpretation.
  warnings.warn(
```

[46]:
```
<AxesSubplot:xlabel='PaymentMethod', ylabel='count'>
```



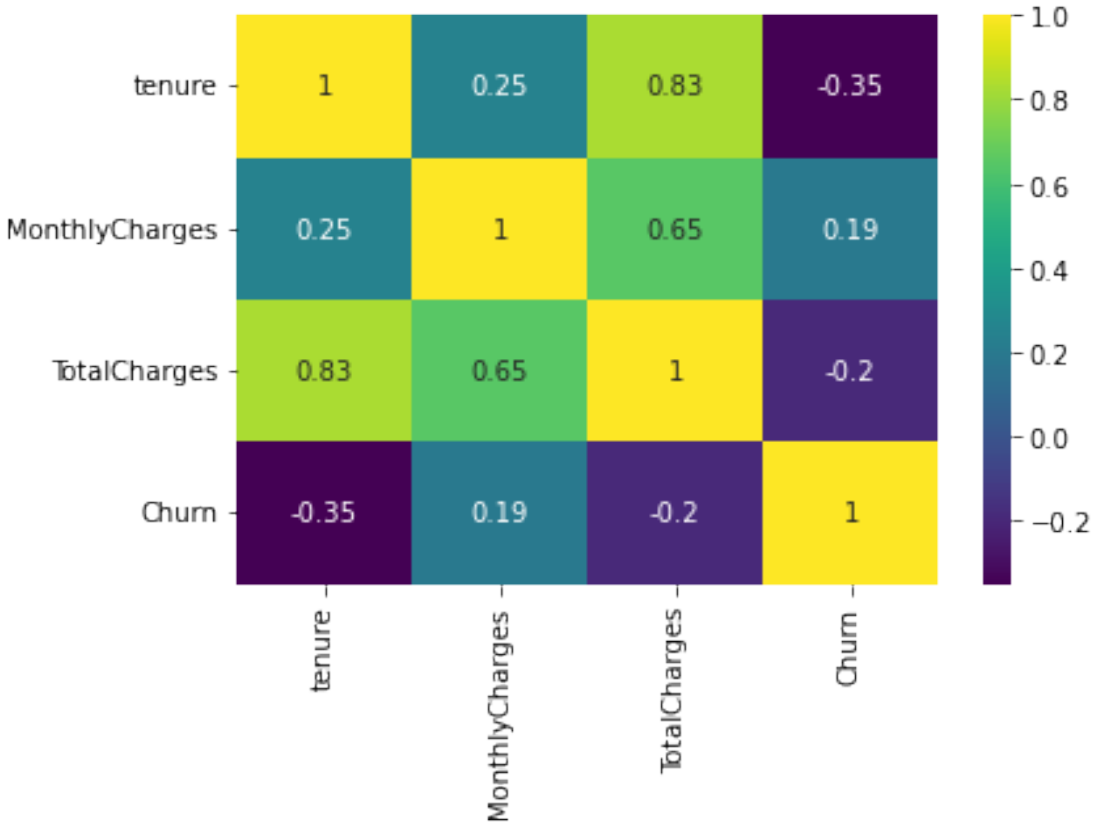
[47]:
```
df.corr() #
```

[47]:

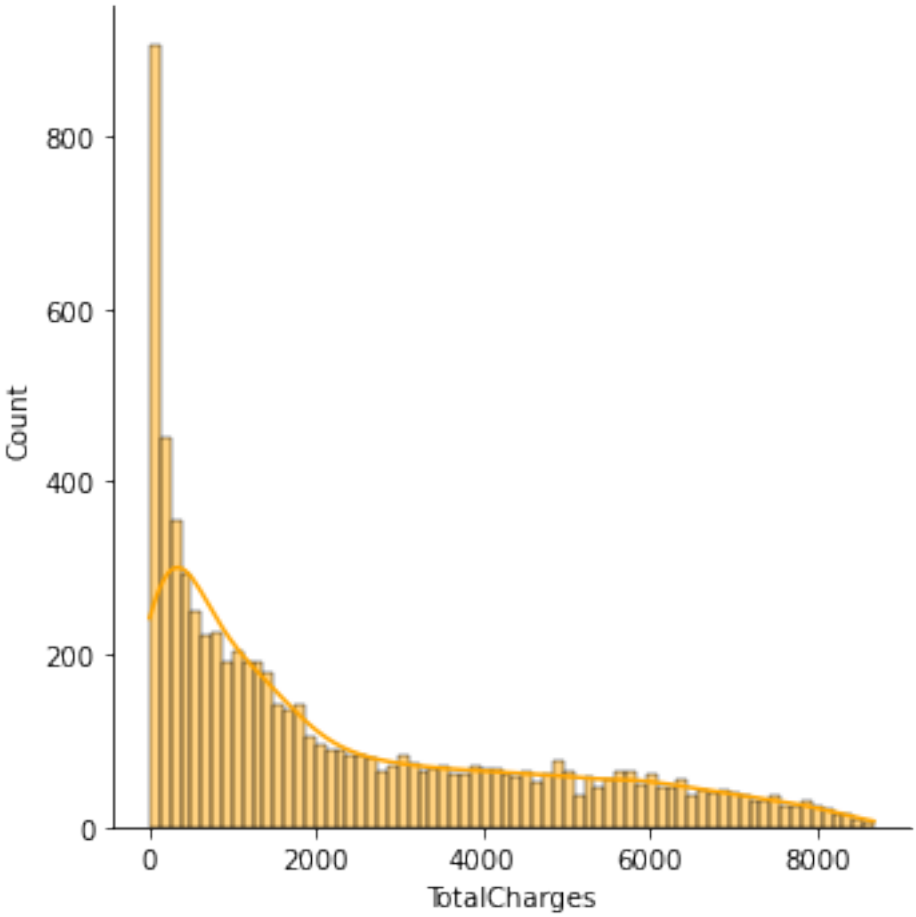
	tenure	MonthlyCharges	TotalCharges	Churn
tenure	1.000000	0.247900	0.826176	-0.352229
MonthlyCharges	0.247900	1.000000	0.651170	0.193356
TotalCharges	0.826176	0.651170	1.000000	-0.198313
Churn	-0.352229	0.193356	-0.198313	1.000000

[48]:
```
#16. The churn and tenure are inversely related. The customers with lower␣
 ↪tenure prefer to churn than customers with long tenure
sns.heatmap(df.corr(), annot = True, cmap = 'viridis')
```

[48]:
```
<AxesSubplot:>
```



[49]:
```
hx = sns.displot(df['TotalCharges'], kde=True, bins=70 ,color = "orange")
```


800
600
400
200
0
Count
0
2000
4000
6000
8000
TotalCharges

[ ]:

[ ]: