churn-analysis-1-2

September 27, 2024

1 Telecom Service Analysis

2 Importing libraries for EDA (Expolratory Data Analysis)

[3]:
```
import seaborn as sns
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

df = pd.read_csv('/Users/ratnadeepgurav/Desktop/AIDS/Study for carrer material/
 ↪Project/Churn_analysis_EDA/churn_analysis.csv')
df.head(30)
```

[3]:

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	\
0	7590-VHVEG	Female	0	Yes	No	1	No	
1	5575-GNVDE	Male	0	No	No	34	Yes	
2	3668-QPYBK	Male	0	No	No	2	Yes	
3	7795-CFOCW	Male	0	No	No	45	No	
4	9237-HQITU	Female	0	No	No	2	Yes	
5	9305-CDSKC	Female	0	No	No	8	Yes	
6	1452-KIOVK	Male	0	No	Yes	22	Yes	
7	6713-OKOMC	Female	0	No	No	10	No	
8	7892-POOKP	Female	0	Yes	No	28	Yes	
9	6388-TABGU	Male	0	No	Yes	62	Yes	
10	9763-GRSKD	Male	0	Yes	Yes	13	Yes	
11	7469-LKBCI	Male	0	No	No	16	Yes	
12	8091-TTVAX	Male	0	Yes	No	58	Yes	
13	0280-XJGEX	Male	0	No	No	49	Yes	
14	5129-JLPIS	Male	0	No	No	25	Yes	
15	3655-SNQYZ	Female	0	Yes	Yes	69	Yes	
16	8191-XWSZG	Female	0	No	No	52	Yes	
17	9959-WOFKT	Male	0	No	Yes	71	Yes	
18	4190-MFLUW	Female	0	Yes	Yes	10	Yes	
19	4183-MYFRB	Female	0	No	No	21	Yes	
20	8779-QRDMV	Male	1	No	No	1	No	
21	1680-VDCWW	Male	0	Yes	No	12	Yes	
22	1066-JKSGK	Male	0	No	No	1	Yes	

```
23  3638-WEABW  Female              0     Yes         No      58          Yes
24  6322-HRPFA    Male              0     Yes        Yes      49          Yes
25  6865-JZNKO  Female              0      No         No      30          Yes
26  6467-CHFZW    Male              0     Yes        Yes      47          Yes
27  8665-UTDHZ    Male              0     Yes        Yes       1           No
28  5248-YGIJN    Male              0     Yes         No      72          Yes
29  8773-HHUOZ  Female              0      No        Yes      17          Yes

       MultipleLines InternetService       OnlineSecurity  … \
0   No phone service             DSL                   No  …
1                 No             DSL                  Yes  …
2                 No             DSL                  Yes  …
3   No phone service             DSL                  Yes  …
4                 No     Fiber optic                   No  …
5                Yes     Fiber optic                   No  …
6                Yes     Fiber optic                   No  …
7   No phone service             DSL                  Yes  …
8                Yes     Fiber optic                   No  …
9                 No             DSL                  Yes  …
10                No             DSL                  Yes  …
11                No              No  No internet service  …
12               Yes     Fiber optic                   No  …
13               Yes     Fiber optic                   No  …
14                No     Fiber optic                  Yes  …
15               Yes     Fiber optic                  Yes  …
16                No              No  No internet service  …
17               Yes     Fiber optic                  Yes  …
18                No             DSL                   No  …
19                No     Fiber optic                   No  …
20  No phone service             DSL                   No  …
21                No              No  No internet service  …
22                No              No  No internet service  …
23               Yes             DSL                   No  …
24                No             DSL                  Yes  …
25                No             DSL                  Yes  …
26               Yes     Fiber optic                   No  …
27  No phone service             DSL                   No  …
28               Yes             DSL                  Yes  …
29                No             DSL                   No  …

       DeviceProtection          TechSupport          StreamingTV  \
0                    No                   No                   No
1                   Yes                   No                   No
2                    No                   No                   No
3                   Yes                  Yes                   No
4                    No                   No                   No
5                   Yes                   No                  Yes
```

```
6                    No                    No                   Yes
7                    No                    No                    No
8                   Yes                   Yes                   Yes
9                    No                    No                    No
10                   No                    No                    No
11  No internet service  No internet service  No internet service
12                  Yes                    No                   Yes
13                  Yes                    No                   Yes
14                  Yes                   Yes                   Yes
15                  Yes                   Yes                   Yes
16  No internet service  No internet service  No internet service
17                  Yes                    No                   Yes
18                  Yes                   Yes                    No
19                  Yes                    No                    No
20                  Yes                    No                    No
21  No internet service  No internet service  No internet service
22  No internet service  No internet service  No internet service
23                   No                   Yes                    No
24                   No                   Yes                    No
25                   No                    No                    No
26                   No                    No                   Yes
27                   No                    No                    No
28                  Yes                   Yes                   Yes
29                   No                    No                   Yes

        StreamingMovies        Contract PaperlessBilling  \
0                    No  Month-to-month              Yes
1                    No        One year               No
2                    No  Month-to-month              Yes
3                    No        One year               No
4                    No  Month-to-month              Yes
5                   Yes  Month-to-month              Yes
6                    No  Month-to-month              Yes
7                    No  Month-to-month               No
8                   Yes  Month-to-month              Yes
9                    No        One year               No
10                   No  Month-to-month              Yes
11  No internet service        Two year               No
12                  Yes        One year               No
13                  Yes  Month-to-month              Yes
14                  Yes  Month-to-month              Yes
15                  Yes        Two year               No
16  No internet service        One year               No
17                  Yes        Two year               No
18                   No  Month-to-month               No
19                  Yes  Month-to-month              Yes
20                  Yes  Month-to-month              Yes
```

21	No internet service	One year	No
22	No internet service	Month-to-month	No
23	No	Two year	Yes
24	No	Month-to-month	No
25	No	Month-to-month	Yes
26	Yes	Month-to-month	Yes
27	No	Month-to-month	No
28	Yes	Two year	Yes
29	Yes	Month-to-month	Yes

	PaymentMethod	MonthlyCharges	TotalCharges	Churn
0	Electronic check	29.85	29.85	No
1	Mailed check	56.95	1889.5	No
2	Mailed check	53.85	108.15	Yes
3	Bank transfer (automatic)	42.30	1840.75	No
4	Electronic check	70.70	151.65	Yes
5	Electronic check	99.65	820.5	Yes
6	Credit card (automatic)	89.10	1949.4	No
7	Mailed check	29.75	301.9	No
8	Electronic check	104.80	3046.05	Yes
9	Bank transfer (automatic)	56.15	3487.95	No
10	Mailed check	49.95	587.45	No
11	Credit card (automatic)	18.95	326.8	No
12	Credit card (automatic)	100.35	5681.1	No
13	Bank transfer (automatic)	103.70	5036.3	Yes
14	Electronic check	105.50	2686.05	No
15	Credit card (automatic)	113.25	7895.15	No
16	Mailed check	20.65	1022.95	No
17	Bank transfer (automatic)	106.70	7382.25	No
18	Credit card (automatic)	55.20	528.35	Yes
19	Electronic check	90.05	1862.9	No
20	Electronic check	39.65	39.65	Yes
21	Bank transfer (automatic)	19.80	202.25	No
22	Mailed check	20.15	20.15	Yes
23	Credit card (automatic)	59.90	3505.1	No
24	Credit card (automatic)	59.60	2970.3	No
25	Bank transfer (automatic)	55.30	1530.6	No
26	Electronic check	99.35	4749.15	Yes
27	Electronic check	30.20	30.2	Yes
28	Credit card (automatic)	90.25	6369.45	No
29	Mailed check	64.70	1093.1	Yes

[30 rows x 21 columns]

3 Information of churn_analysis.csv file

[20]:
```
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
```

4 Replacing Blanks With 0 as tenure is 0 and no total charges are recorded

[5]:
```
df["TotalCharges"] = df["TotalCharges"].replace(" ","0")
df["TotalCharges"] = df["TotalCharges"].astype("float")
```

[6]:
```
df.isnull().sum().sum()
```

[6]:
```
np.int64(0)
```

[7]:
```
df.describe()
```

[7]:

	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

[8]:
```
df["customerID"].duplicated().sum()
```

[8]:
```
np.int64(0)
```

5 Convert o and 1 for SeniorCitizen to yes/no to easier understand

[9]:
```
def con(value):
    if value == 1:
        return "yes"
    else:
        return "no"
```

[12]:
```
df['SeniorCitizen'] = df["SeniorCitizen"].apply(con)
df.head(22)
```

[12]:

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	\
0	7590-VHVEG	Female	no	Yes	No	1	No	
1	5575-GNVDE	Male	no	No	No	34	Yes	
2	3668-QPYBK	Male	no	No	No	2	Yes	
3	7795-CFOCW	Male	no	No	No	45	No	
4	9237-HQITU	Female	no	No	No	2	Yes	
5	9305-CDSKC	Female	no	No	No	8	Yes	
6	1452-KIOVK	Male	no	No	Yes	22	Yes	
7	6713-OKOMC	Female	no	No	No	10	No	
8	7892-POOKP	Female	no	Yes	No	28	Yes	
9	6388-TABGU	Male	no	No	Yes	62	Yes	
10	9763-GRSKD	Male	no	Yes	Yes	13	Yes	
11	7469-LKBCI	Male	no	No	No	16	Yes	
12	8091-TTVAX	Male	no	Yes	No	58	Yes	
13	0280-XJGEX	Male	no	No	No	49	Yes	
14	5129-JLPIS	Male	no	No	No	25	Yes	
15	3655-SNQYZ	Female	no	Yes	Yes	69	Yes	
16	8191-XWSZG	Female	no	No	No	52	Yes	
17	9959-WOFKT	Male	no	No	Yes	71	Yes	
18	4190-MFLUW	Female	no	Yes	Yes	10	Yes	
19	4183-MYFRB	Female	no	No	No	21	Yes	

```
20  8779-QRDMV    Male           yes      No         No       1           No
21  1680-VDCWW    Male            no     Yes         No      12          Yes

       MultipleLines InternetService       OnlineSecurity  …  \
0   No phone service             DSL                   No  …
1                 No             DSL                  Yes  …
2                 No             DSL                  Yes  …
3   No phone service             DSL                  Yes  …
4                 No     Fiber optic                   No  …
5                Yes     Fiber optic                   No  …
6                Yes     Fiber optic                   No  …
7   No phone service             DSL                  Yes  …
8                Yes     Fiber optic                   No  …
9                 No             DSL                  Yes  …
10                No             DSL                  Yes  …
11                No              No  No internet service  …
12               Yes     Fiber optic                   No  …
13               Yes     Fiber optic                   No  …
14                No     Fiber optic                  Yes  …
15               Yes     Fiber optic                  Yes  …
16                No              No  No internet service  …
17               Yes     Fiber optic                  Yes  …
18                No             DSL                   No  …
19                No     Fiber optic                   No  …
20  No phone service             DSL                   No  …
21                No              No  No internet service  …

       DeviceProtection          TechSupport          StreamingTV  \
0                    No                   No                  No
1                   Yes                   No                  No
2                    No                   No                  No
3                   Yes                  Yes                  No
4                    No                   No                  No
5                   Yes                   No                 Yes
6                    No                   No                 Yes
7                    No                   No                  No
8                   Yes                  Yes                 Yes
9                    No                   No                  No
10                   No                   No                  No
11  No internet service  No internet service  No internet service
12                  Yes                   No                 Yes
13                  Yes                   No                 Yes
14                  Yes                  Yes                 Yes
15                  Yes                  Yes                 Yes
16  No internet service  No internet service  No internet service
17                  Yes                   No                 Yes
18                  Yes                  Yes                  No
```

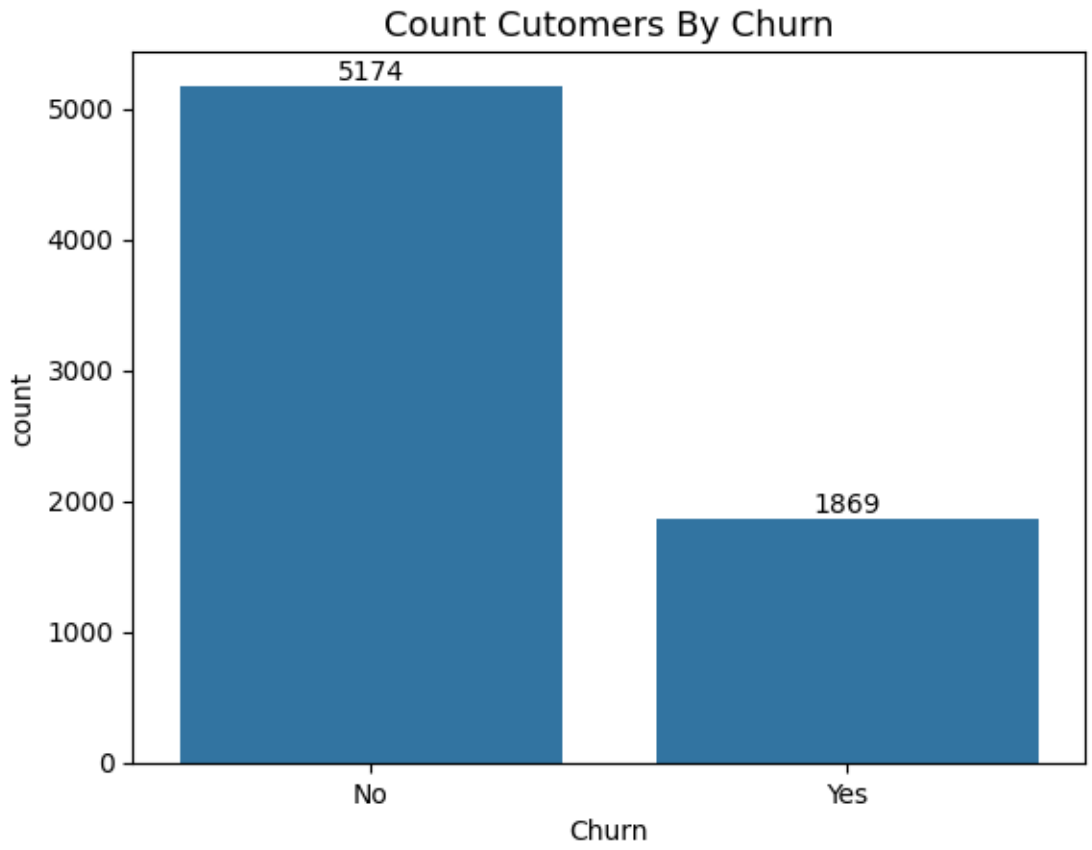
19	Yes	No	No
20	Yes	No	No
21	No internet service	No internet service	No internet service

	StreamingMovies	Contract	PaperlessBilling	\
0	No	Month-to-month	Yes	
1	No	One year	No	
2	No	Month-to-month	Yes	
3	No	One year	No	
4	No	Month-to-month	Yes	
5	Yes	Month-to-month	Yes	
6	No	Month-to-month	Yes	
7	No	Month-to-month	No	
8	Yes	Month-to-month	Yes	
9	No	One year	No	
10	No	Month-to-month	Yes	
11	No internet service	Two year	No	
12	Yes	One year	No	
13	Yes	Month-to-month	Yes	
14	Yes	Month-to-month	Yes	
15	Yes	Two year	No	
16	No internet service	One year	No	
17	Yes	Two year	No	
18	No	Month-to-month	No	
19	Yes	Month-to-month	Yes	
20	Yes	Month-to-month	Yes	
21	No internet service	One year	No	

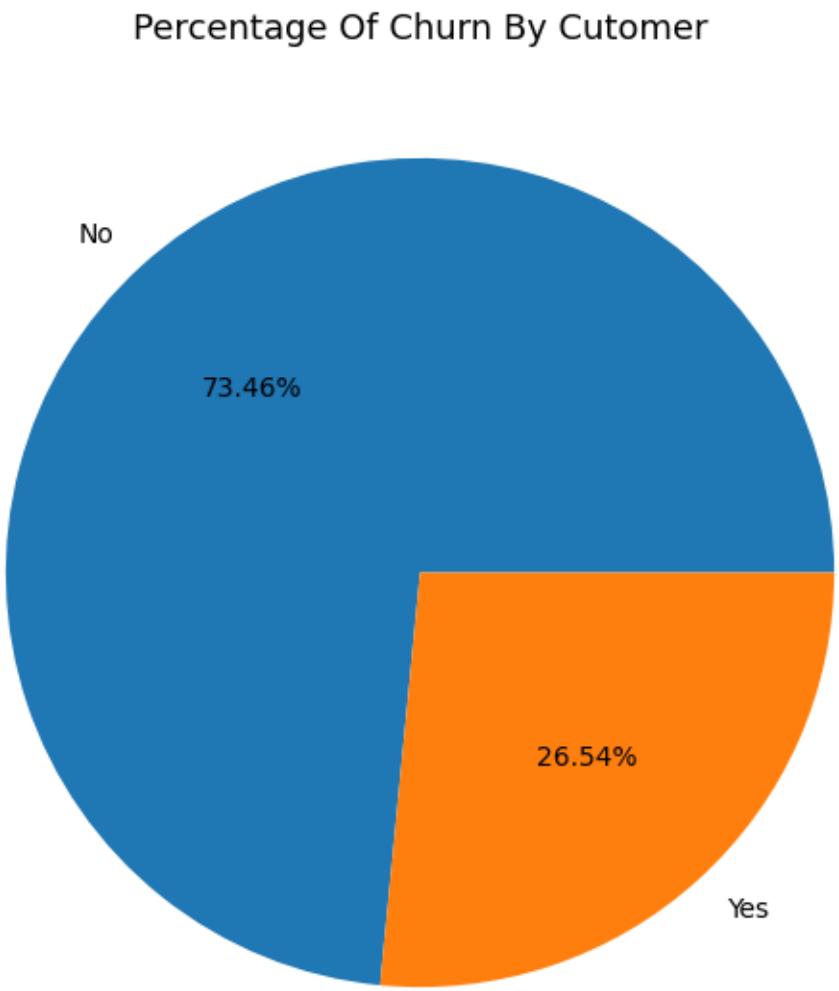
	PaymentMethod	MonthlyCharges	TotalCharges	Churn
0	Electronic check	29.85	29.85	No
1	Mailed check	56.95	1889.50	No
2	Mailed check	53.85	108.15	Yes
3	Bank transfer (automatic)	42.30	1840.75	No
4	Electronic check	70.70	151.65	Yes
5	Electronic check	99.65	820.50	Yes
6	Credit card (automatic)	89.10	1949.40	No
7	Mailed check	29.75	301.90	No
8	Electronic check	104.80	3046.05	Yes
9	Bank transfer (automatic)	56.15	3487.95	No
10	Mailed check	49.95	587.45	No
11	Credit card (automatic)	18.95	326.80	No
12	Credit card (automatic)	100.35	5681.10	No
13	Bank transfer (automatic)	103.70	5036.30	Yes
14	Electronic check	105.50	2686.05	No
15	Credit card (automatic)	113.25	7895.15	No
16	Mailed check	20.65	1022.95	No
17	Bank transfer (automatic)	106.70	7382.25	No

```
18    Credit card (automatic)          55.20        528.35    Yes
19           Electronic check          90.05       1862.90     No
20           Electronic check          39.65         39.65    Yes
21  Bank transfer (automatic)          19.80        202.25     No

[22 rows x 21 columns]
```

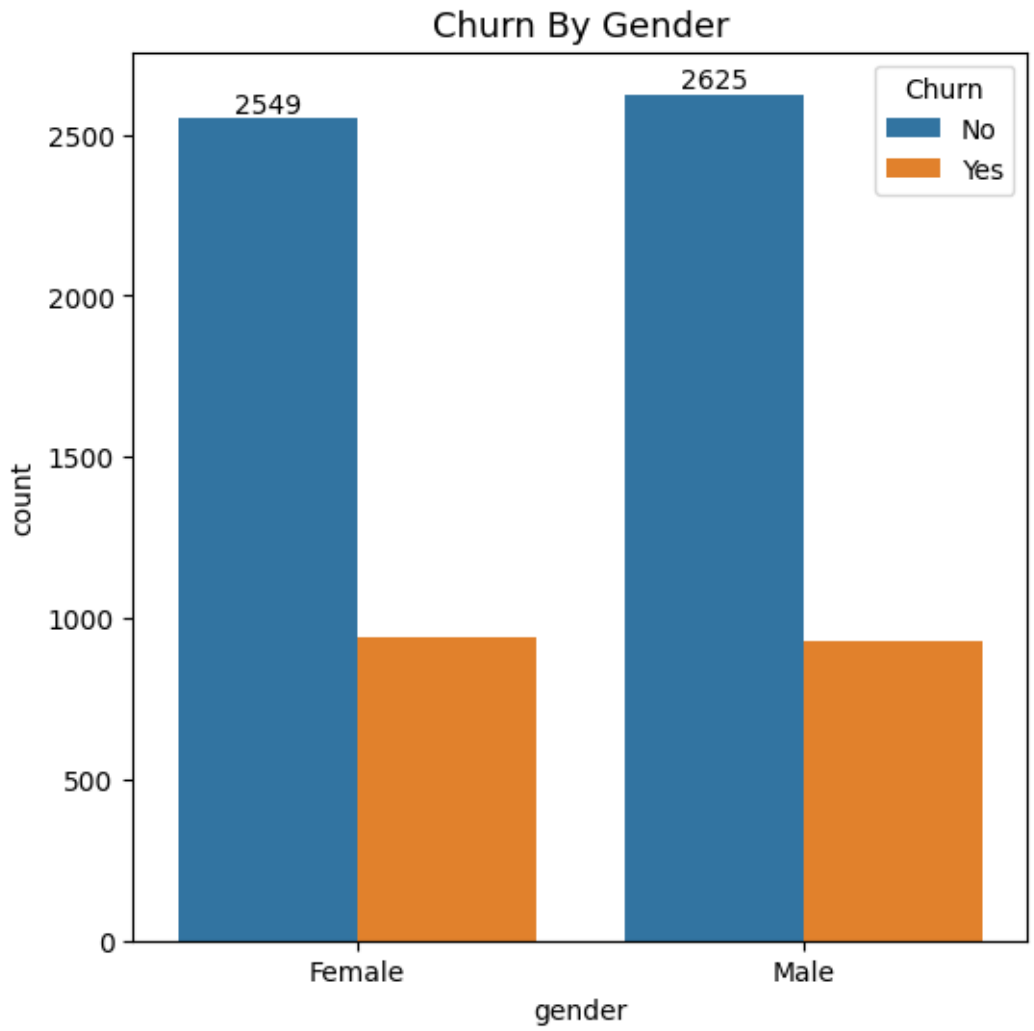
[15]:
```
ax = sns.countplot( x = 'Churn', data = df)
ax.bar_label(ax.containers[0])
plt.title("Count Cutomers By Churn",fontsize=13)
plt.show()
```



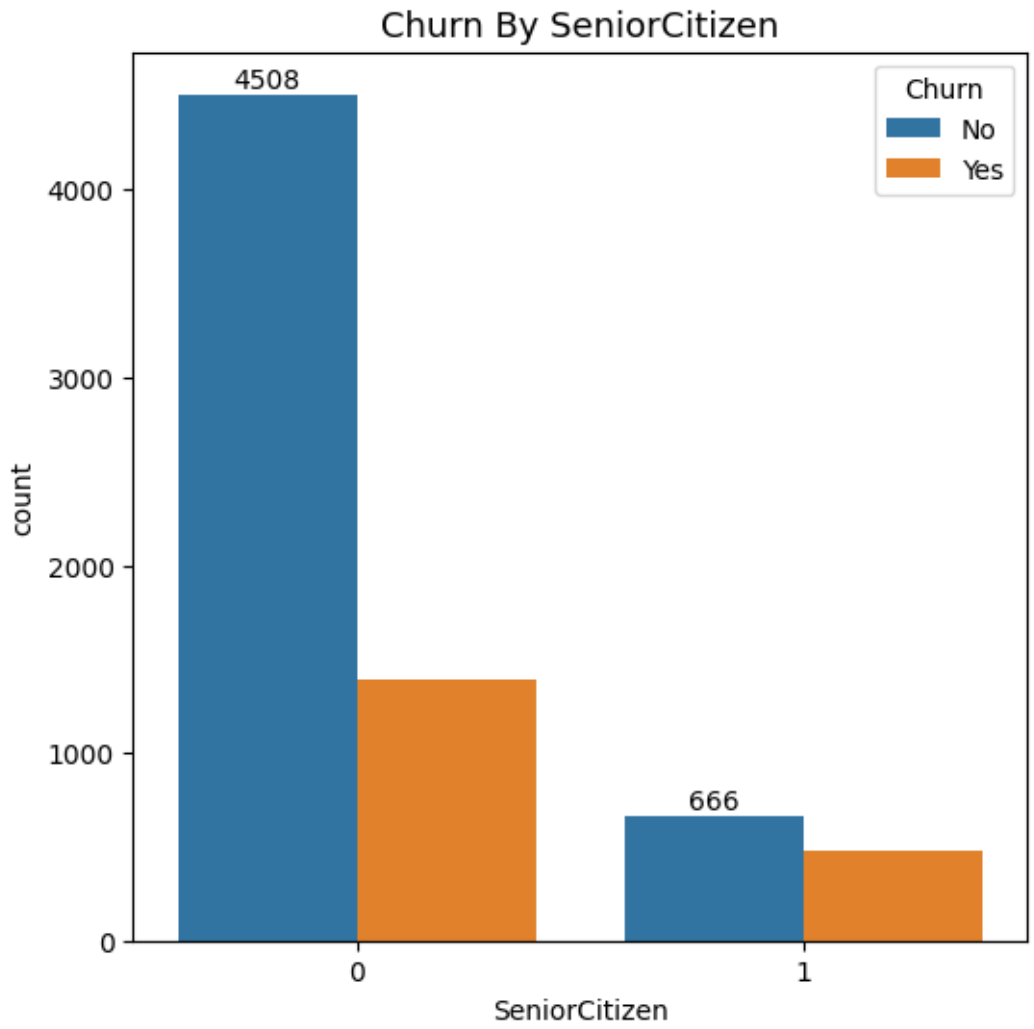
[16]:
```
plt.figure(figsize= (8,7))
gb = df.groupby("Churn").agg({"Churn" : "count"})
plt.pie(gb['Churn'], labels = gb.index, autopct= "%1.2f%%")
plt.title("Percentage Of Churn By Cutomer", fontsize=13)
plt.show()
```



[31]:
```
plt.figure(figsize = (6,6))
ax = sns.countplot(x = "gender", data=df , hue="Churn")
ax.bar_label(ax.containers[0])
plt.title("Churn By Gender", fontsize = 13)
plt.show()
```

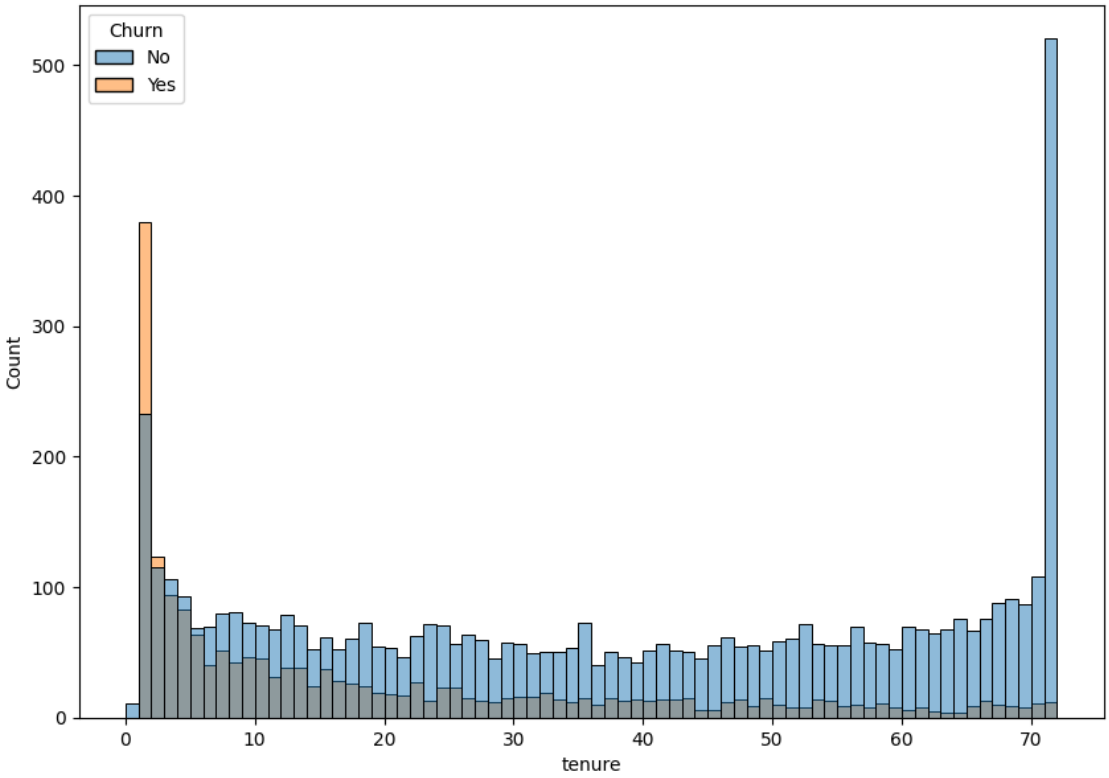


[36]:
```
plt.figure(figsize = (6,6))
ax = sns.countplot(x = "SeniorCitizen", data=df , hue="Churn")
ax.bar_label(ax.containers[0])
plt.title("Churn By SeniorCitizen", fontsize = 13)
plt.show()
```



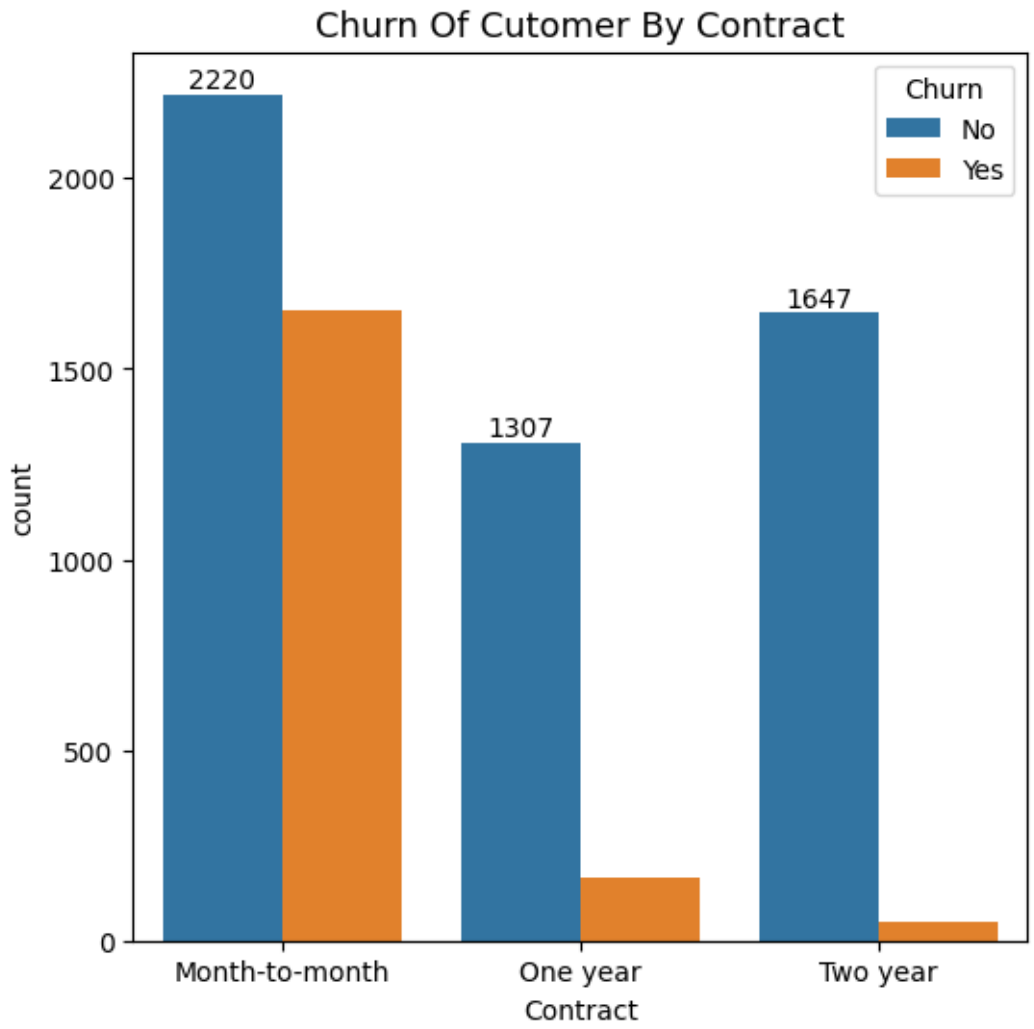
6 People who have used our services for a long time have stayed and people who have used our services 1 or 2 months have churned

[44]:
```
plt.figure(figsize = (10,7))
sns.histplot(x = "tenure" , data = df, bins = 72 , hue = "Churn")
plt.show()
```



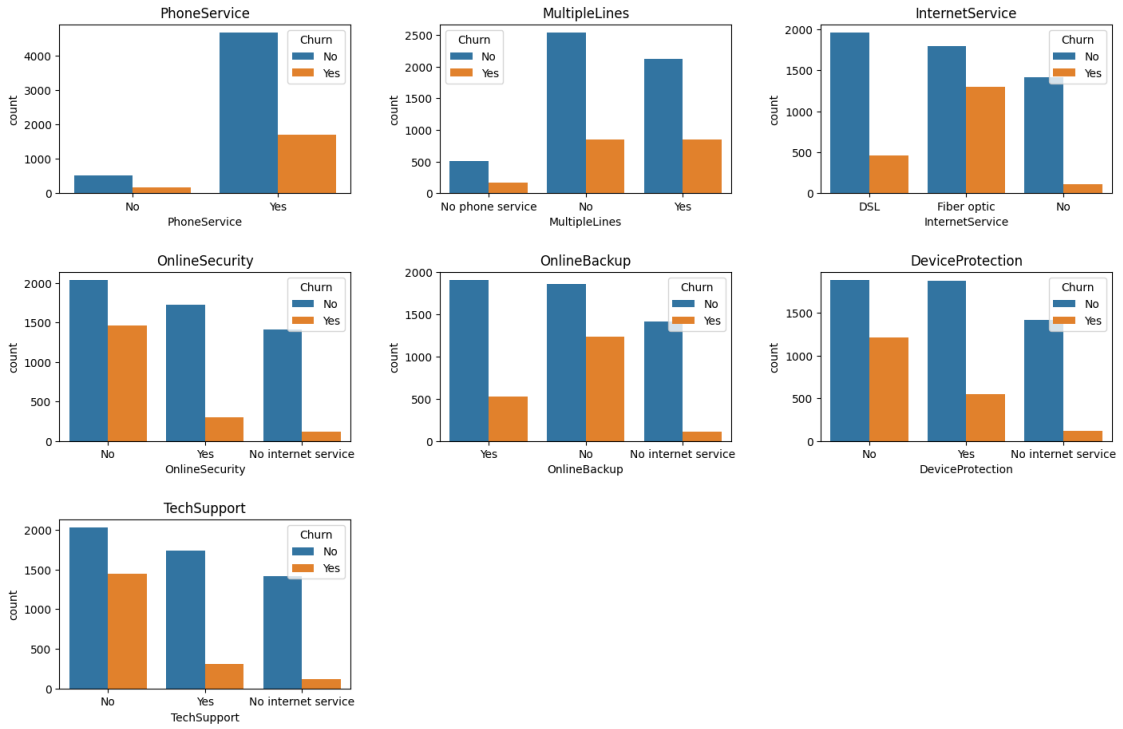
7 People Who Have Month To Month Contract Are Likely To Churn Then From Those Who Have 1 OR 2 Years Or Contract

[50]:
```
plt.figure(figsize = (6,6))
ax = sns.countplot(x = "Contract", data=df , hue = "Churn")
ax.bar_label(ax.containers[0])
plt.title("Churn Of Cutomer By Contract", fontsize = 13)
plt.show()
```



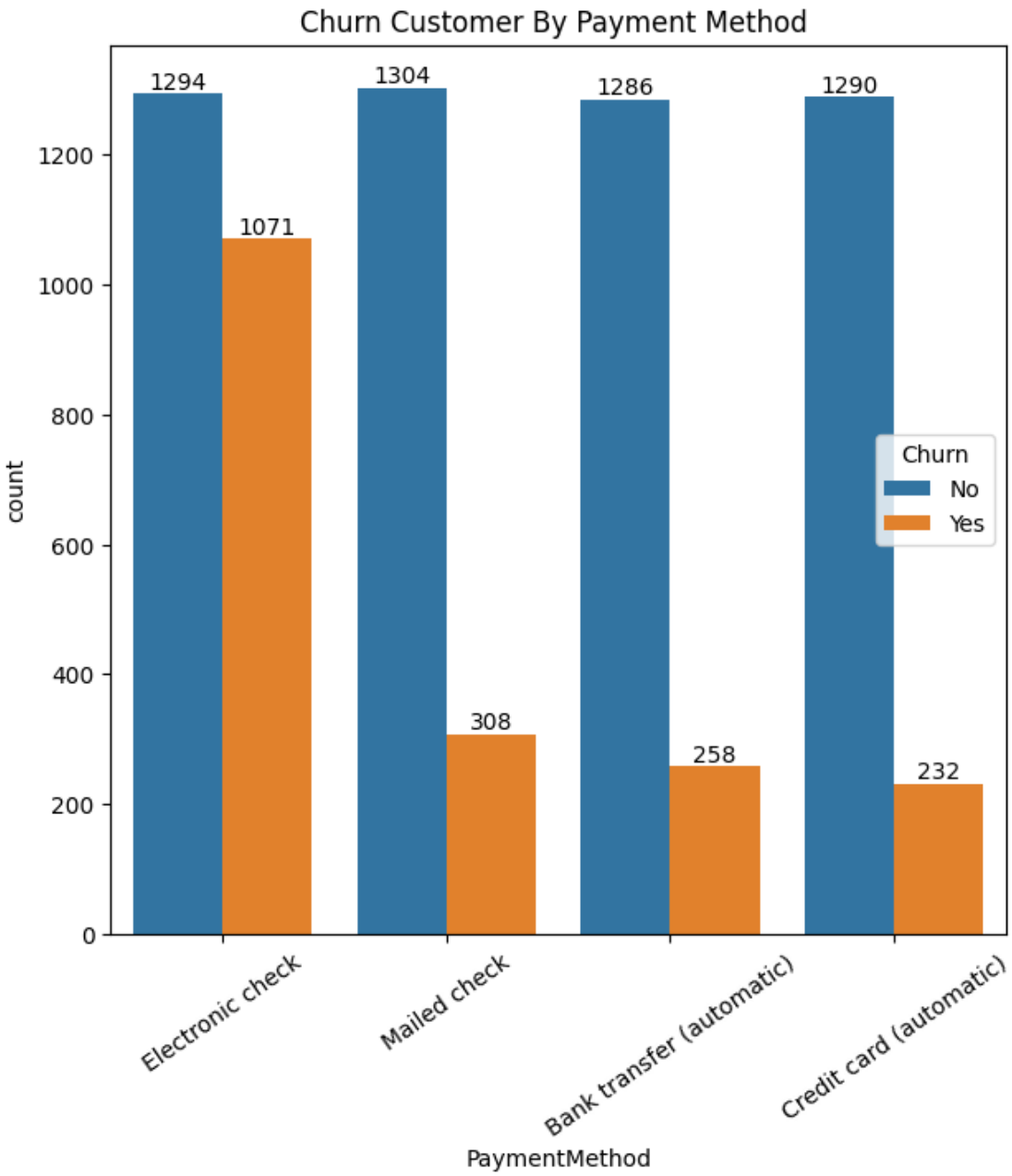
[61]:
```
import matplotlib.pyplot as plt
import seaborn as sns

# Corrected list of column names
columns = ['PhoneService', 'MultipleLines', 'InternetService', 'OnlineSecurity',
           'OnlineBackup', 'DeviceProtection', 'TechSupport']

# Set up the matplotlib figure and subplots
fig, axes = plt.subplots(nrows=3, ncols=3, figsize=(15, 10))
fig.tight_layout(pad=5.0)

# Flatten axes for easier iteration
axes = axes.flatten()

# Create countplots for each column
```

```
for i, col in enumerate(columns):
    sns.countplot(data=df, x=col, ax=axes[i], hue = df['Churn'])
    axes[i].set_title(col)

# Remove any empty subplots (if there are more subplots than columns)
for j in range(len(columns), len(axes)):
    fig.delaxes(axes[j])

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



8 Customer is likely to churn when he using Electronic check as a payment method

[74]:
```
plt.figure(figsize = (7,7))
ax = sns.countplot(x = "PaymentMethod", data = df , hue = "Churn")
ax.bar_label(ax.containers[0])
ax.bar_label(ax.containers[1])
plt.title("Churn Customer By Payment Method ")
plt.xticks(rotation = 35)
plt.show()
```


Churn Customer By Payment Method
1294
1071
1304
308
1286
258
1290
232
1200
1000
800
600
400
200
0
count
Churn
No
Yes
Electronic check
Mailed check
Bank transfer (automatic)
Credit card (automatic)
PaymentMethod