In [88]:
```
import pandas as pd
import numpy as np
%matplotlib inline
import matplotlib.pyplot as plt
import seaborn as sns
from scipy import stats
#np.random.seed(101)
```

Reading the data

In [89]:
```
data = pd.read_csv("F:\machinfy\mohamed\dina.csv", sep=',',encoding="utf-8")
```

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

Out[90]:

eSecurity	...	DeviceProtection	TechSupport	StreamingTV	StreamingMovies	Contract	PaperlessBilli
No	...	No	No	No	No	Month-to-month	Y
Yes	...	Yes	No	No	No	One year	
Yes	...	No	No	No	No	Month-to-month	Y
Yes	...	Yes	Yes	No	No	One year	
No	...	No	No	No	No	Month-to-month	Y

In [87]:
```
1 data.drop_duplicates()
```

Out[87]:

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	MultipleLines
0	7590-VHVEG	Female	NaN	Yes	No	NaN	No	No phone service
1	5575-GNVDE	Male	NaN	No	No	34.0	Yes	No
2	3668-QPYBK	Male	NaN	No	No	2.0	Yes	No
3	7795-CFOCW	Male	NaN	No	No	45.0	No	No phone service
4	9237-HQITU	Female	NaN	No	No	2.0	Yes	No
...	...	...	...	...	...	...	...	...
7038	6840-RESVB	Male	0.0	Yes	Yes	24.0	Yes	Yes
7039	2234-XADUH	Female	0.0	Yes	Yes	72.0	Yes	Yes
7040	4801-JZAZL	Female	0.0	Yes	Yes	11.0	No	No phone service
7041	8361-LTMKD	Male	1.0	Yes	No	4.0	Yes	Yes
7042	3186-AJIEK	Male	0.0	No	No	66.0	Yes	No

7043 rows × 21 columns

In [91]:
```
### Data Information
data.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     7000 non-null   float64
 3   Partner           7043 non-null   object 
 4   Dependents        7043 non-null   object 
 5   tenure            6896 non-null   float64
 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(4), object(17)
memory usage: 1.1+ MB
```

In [92]:
```
1 data.describe(include='all')
```

Out[92]:

	customerID	gender	SeniorCitizen	Partner	Dependents	tenure	PhoneService	Multi
count	7043	7043	7000.000000	7043	7043	6896.000000	7043	
unique	7043	2	NaN	2	2	NaN	2	
top	1552-CZCLL	Male	NaN	No	No	NaN	Yes	
freq	1	3555	NaN	3641	4933	NaN	6361	
mean	NaN	NaN	0.163143	NaN	NaN	33.041473	NaN	
std	NaN	NaN	0.369522	NaN	NaN	24.382260	NaN	
min	NaN	NaN	0.000000	NaN	NaN	1.000000	NaN	
25%	NaN	NaN	0.000000	NaN	NaN	10.000000	NaN	
50%	NaN	NaN	0.000000	NaN	NaN	30.000000	NaN	
75%	NaN	NaN	0.000000	NaN	NaN	56.000000	NaN	
max	NaN	NaN	1.000000	NaN	NaN	72.000000	NaN	

11 rows × 21 columns

In [93]:
```
1 data.SeniorCitizen.value_counts()
```

Out[93]:
```
0.0    5858
1.0    1142
Name: SeniorCitizen, dtype: int64
```

In [94]:
```
1 data.tenure.value_counts()
```

Out[94]:
```
1.0     477
72.0    362
2.0     238
3.0     200
4.0     176
       ...
38.0     59
28.0     57
39.0     56
44.0     51
36.0     50
Name: tenure, Length: 72, dtype: int64
```

In [95]:
```
1 data.MonthlyCharges.mod(data.TotalCharges,fill_value=None)
```

Out[95]:
```
0         0.00
1        56.95
2        53.85
3        42.30
4        70.70
        ...
7038     84.80
7039    103.20
7040     29.60
7041     74.40
7042    105.65
Length: 7043, dtype: float64
```

In [96]:
```
1 data.MonthlyCharges.value_counts()
```

Out[96]:
```
20.05     61
19.85     45
19.95     44
19.90     44
20.00     43
          ..
114.75     1
103.60     1
113.40     1
57.65      1
113.30     1
Name: MonthlyCharges, Length: 1585, dtype: int64
```

In [201]:
```
1 data.TotalCharges.value_counts()
```

Out[201]:
```
2283.30    12
20.20      11
19.75       9
20.05       8
19.65       8
           ..
1066.15     1
249.95      1
8333.95     1
7171.70     1
1024.00     1
Name: TotalCharges, Length: 6530, dtype: int64
```

In [97]:
```
1 data.Dependents.value_counts()
```

Out[97]:
```
No     4933
Yes    2110
Name: Dependents, dtype: int64
```

In [99]:
```
1 data.MultipleLines.value_counts()
```

Out[99]:
```
No                  3390
Yes                 2971
No phone service     682
Name: MultipleLines, dtype: int64
```

In [100]:
```
1 data.InternetService.value_counts()
```

Out[100]:
```
Fiber optic    3096
DSL            2421
No             1526
Name: InternetService, dtype: int64
```

In [101]:
```
1 data.OnlineSecurity.value_counts()
```

Out[101]:
```
No                     3498
Yes                    2019
No internet service    1526
Name: OnlineSecurity, dtype: int64
```

In [102]:
```
1 data.DeviceProtection.value_counts()
```

Out[102]:
```
No                     3095
Yes                    2422
No internet service    1526
Name: DeviceProtection, dtype: int64
```

In [103]:
```
1 data.TechSupport.value_counts()
```

Out[103]:
```
No                     3473
Yes                    2044
No internet service    1526
Name: TechSupport, dtype: int64
```

In [104]:
```
1 data.StreamingTV.value_counts()
```

Out[104]:
```
No                     2810
Yes                    2707
No internet service    1526
Name: StreamingTV, dtype: int64
```

In [83]:
```
1 data.StreamingMovies.value_counts()
```

Out[83]:
```
No                     2785
Yes                    2732
No internet service    1526
Name: StreamingMovies, dtype: int64
```

In [105]:
```
1 data.Contract.value_counts()
```

Out[105]:
```
Month-to-month    3875
Two year          1695
One year          1473
Name: Contract, dtype: int64
```

In [106]:
```
1 data.PaperlessBilling.value_counts()
```

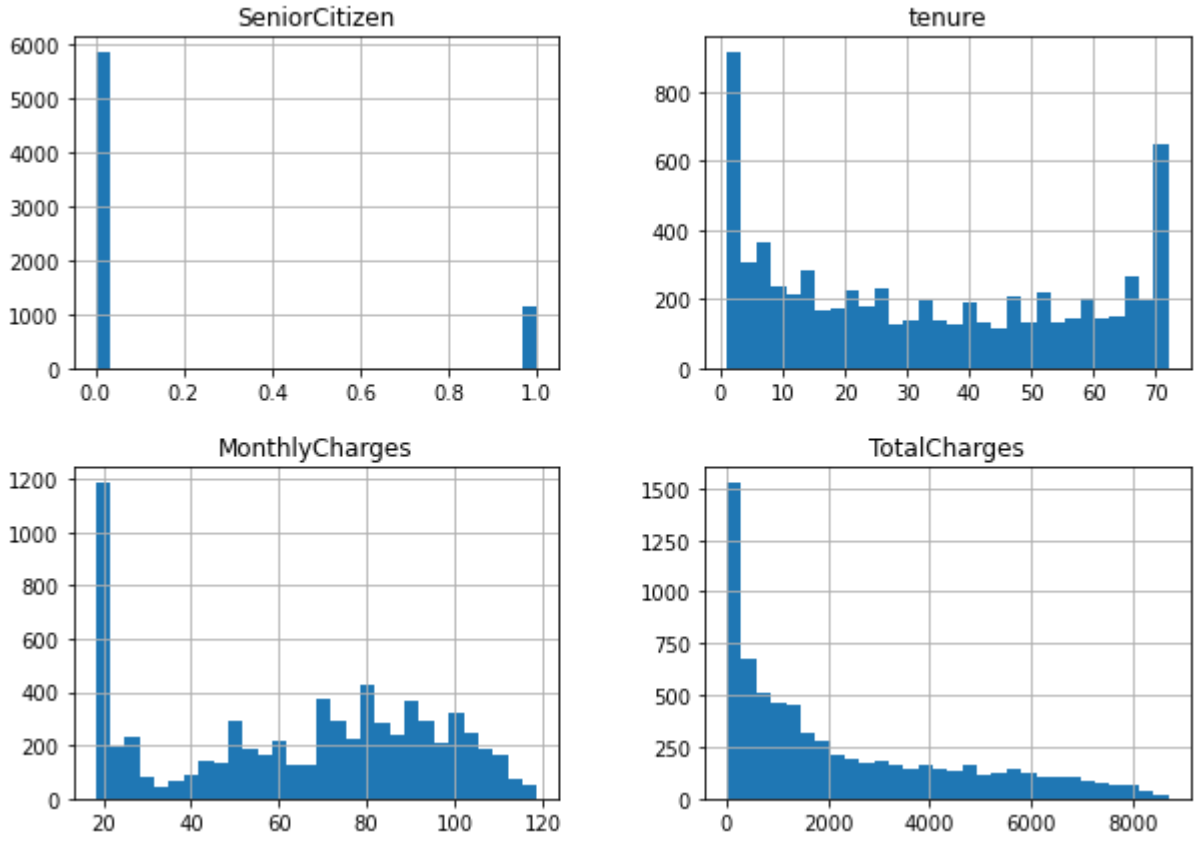
Out[106]:
```
Yes    4171
No     2872
Name: PaperlessBilling, dtype: int64
```

In [107]:
```
1 data.PaymentMethod.value_counts()
```

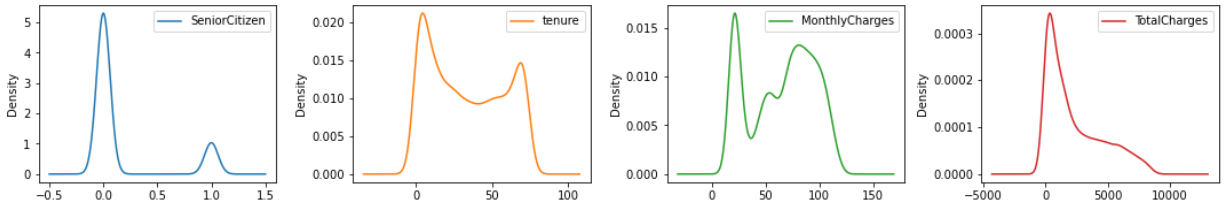
Out[107]:
```
Electronic check             2365
Mailed check                 1612
Bank transfer (automatic)    1544
Credit card (automatic)      1522
Name: PaymentMethod, dtype: int64
```

In [108]:
```
1 data.hist(bins=30 , figsize=(10,7))
2 plt.show
```

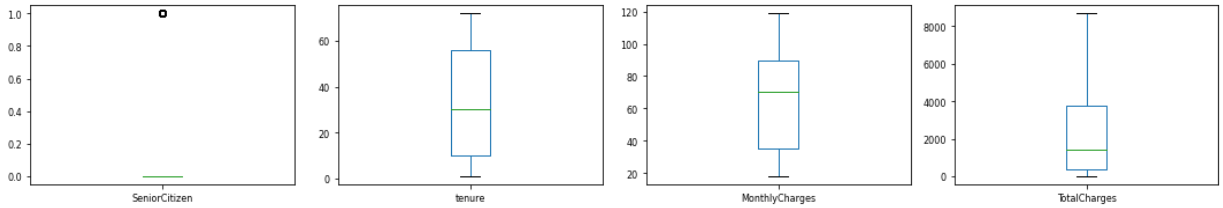
Out[108]:
```
<function matplotlib.pyplot.show(close=None, block=None)>
```



In [109]:
```
data.plot(kind='density',subplots=True,layout=(4,4),sharex=False,figsize=(15
plt.tight_layout()
```



In [110]:
```
data.plot(kind='box', subplots=True, layout=(4,4), sharex=False,
fontsize=8,figsize=(15,10))
plt.tight_layout()
```



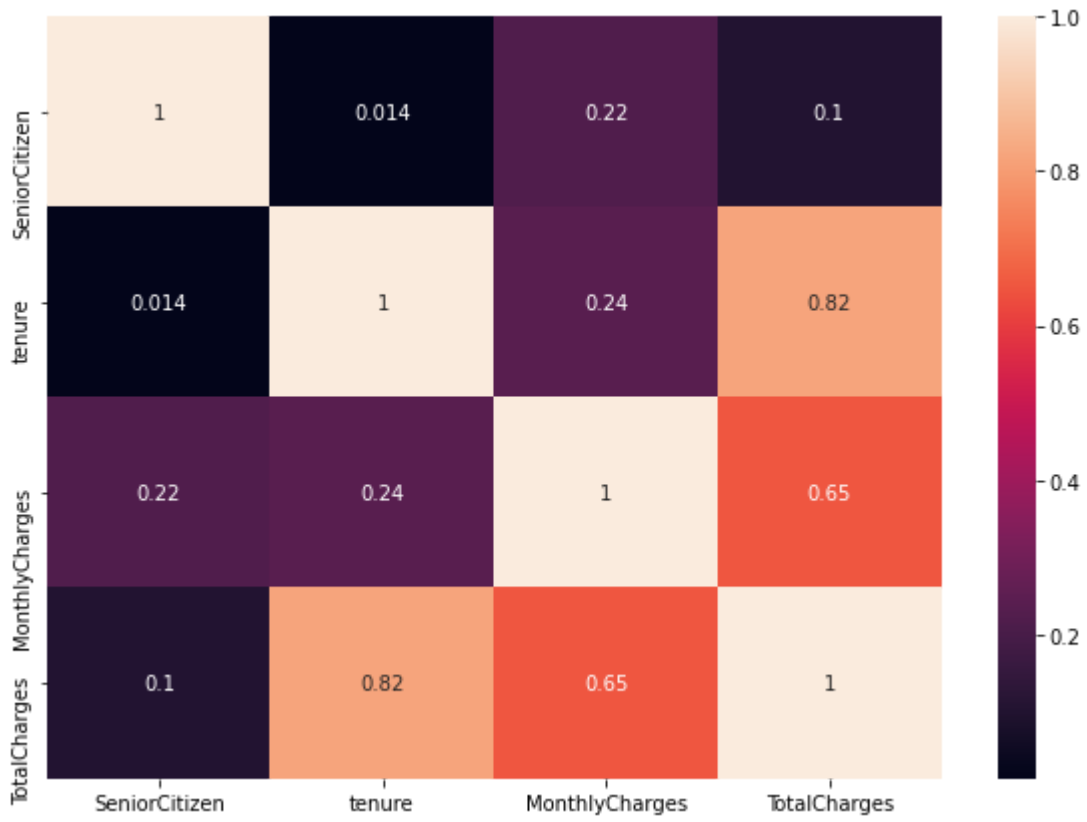
In [111]:
```
d_corr = data.corr()
d_corr.style.background_gradient()
```

Out[111]:

	SeniorCitizen	tenure	MonthlyCharges	TotalCharges
SeniorCitizen	1.000000	0.013521	0.221101	0.102831
tenure	0.013521	1.000000	0.238635	0.822171
MonthlyCharges	0.221101	0.238635	1.000000	0.650468
TotalCharges	0.102831	0.822171	0.650468	1.000000

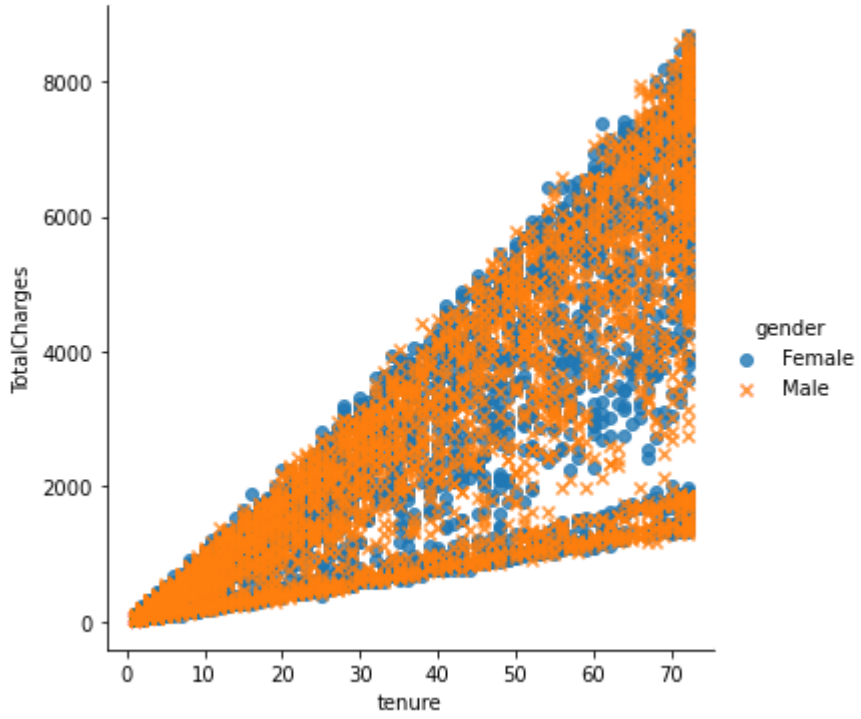
In [112]:
```
1 plt.figure(figsize=(10,7))
2 sns.heatmap(data.corr(), annot=True)
```

Out[112]: <AxesSubplot:>



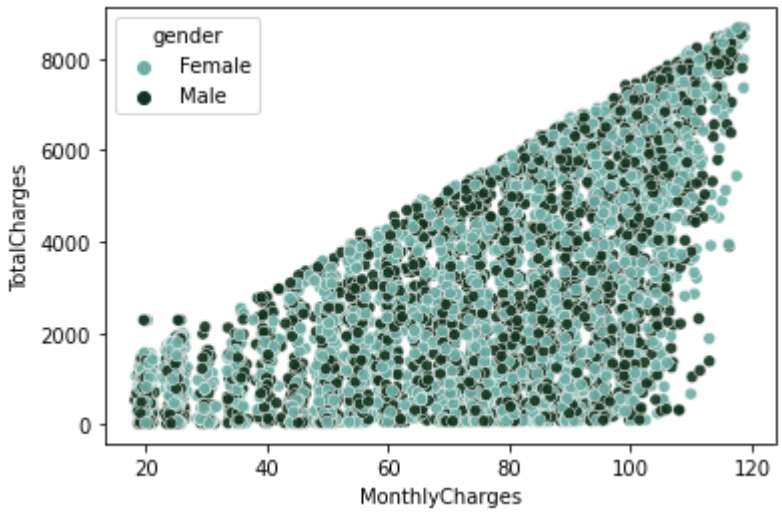
In [46]:
```
sns.lmplot('tenure', 'TotalCharges', data=data, hue='gender',markers=["o", "
   legend=True,
 fit_reg=False, height=5)
plt.show()
```

```
C:\Users\Qebaa\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWar
ning: Pass the following variables as keyword args: x, y. From version 0.12, th
e only valid positional argument will be `data`, and passing other arguments wi
thout an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



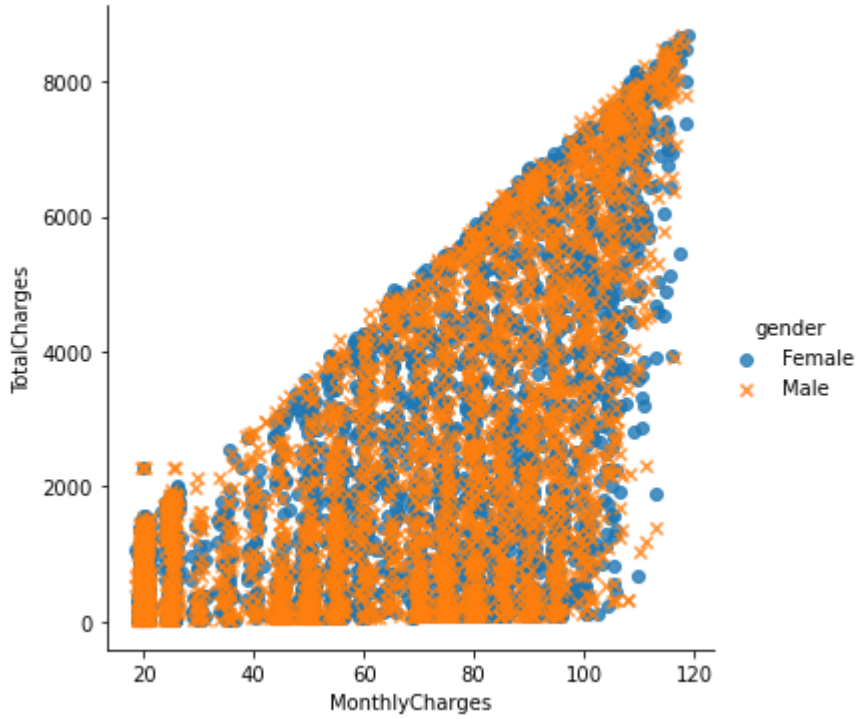
In [73]:
```
sns.scatterplot('MonthlyCharges','TotalCharges',data=data, hue='gender',mark
  , legend=True,palette=("ch:2,r=.2,l=.6"))
plt.show()
```

```
C:\Users\Qebaa\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWar
ning: Pass the following variables as keyword args: x, y. From version 0.12, th
e only valid positional argument will be `data`, and passing other arguments wi
thout an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



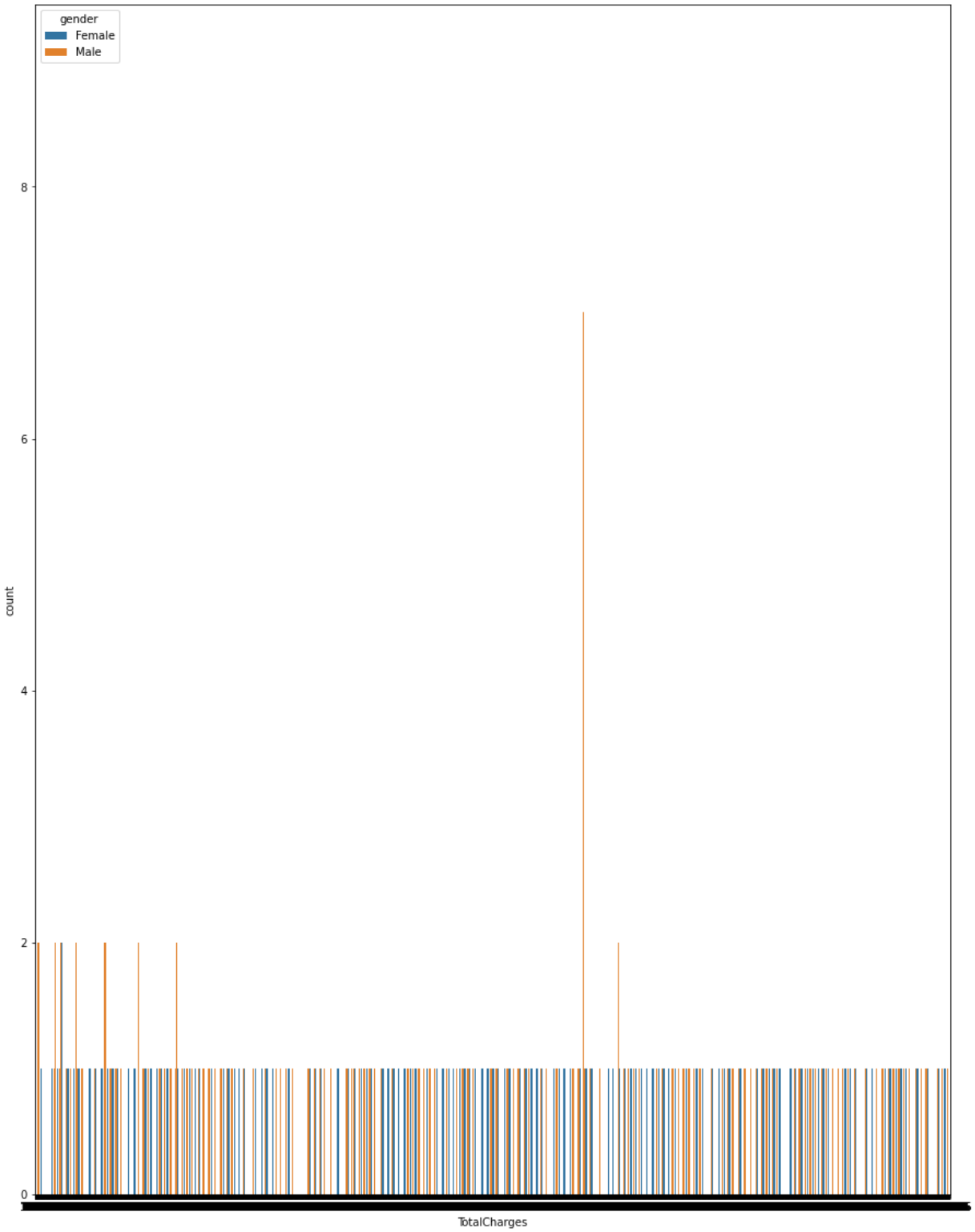
In [47]:
```
sns.lmplot('MonthlyCharges', 'TotalCharges', data=data, hue='gender',markers
   legend=True,
 fit_reg=False, height=5)
plt.show()
```

```
C:\Users\Qebaa\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWar
ning: Pass the following variables as keyword args: x, y. From version 0.12, th
e only valid positional argument will be `data`, and passing other arguments wi
thout an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



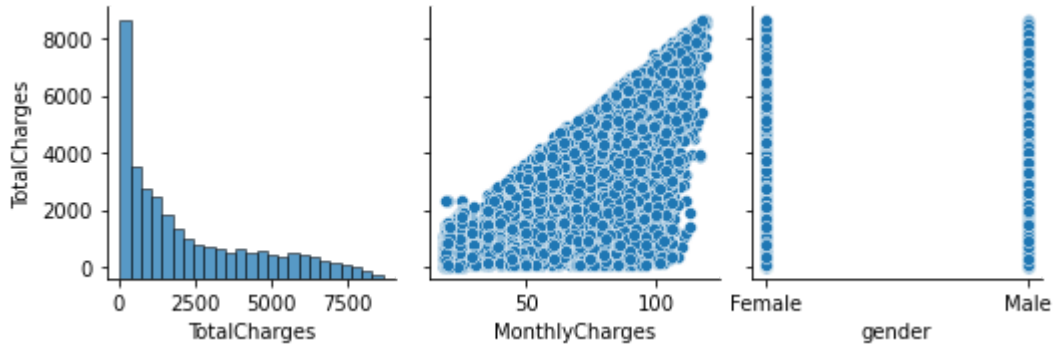
In [64]:
```
1 plt.figure(figsize=(15,20))
2 sns.countplot(x= 'TotalCharges', data=data, hue='gender')
```

Out[64]: <AxesSubplot:xlabel='TotalCharges', ylabel='count'>

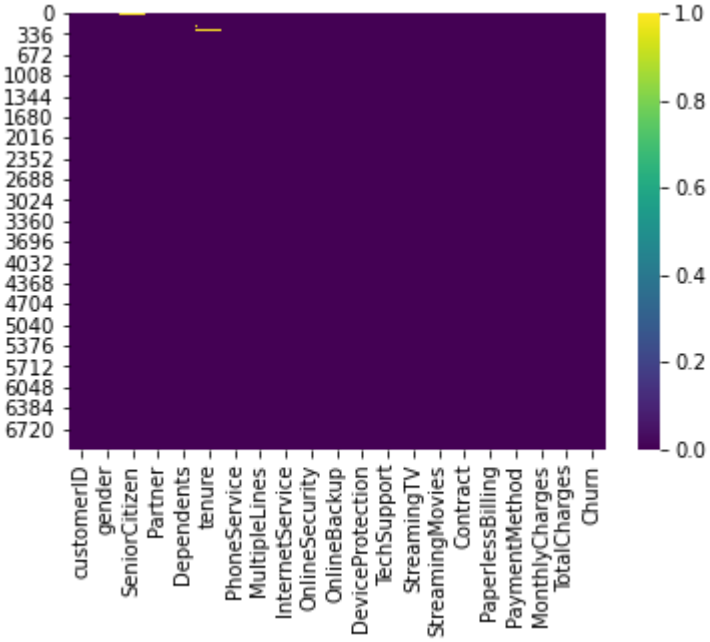


In [68]:
```
plt.figure(figsize=(7,7))
sns.pairplot(data, y_vars= 'TotalCharges', x_vars=['TotalCharges','MonthlyCh
plt.show()
```

```
<Figure size 504x504 with 0 Axes>
```



In [113]:
```
sns.heatmap(data.isnull(), cmap='viridis')
plt.show()
```



In [115]:
```
data.tenure.replace(np.nan,data.tenure.mean(),inplace=True)
```

In [116]:
```
1 data.isnull().sum()
```

Out[116]:
```
customerID          0
gender              0
SeniorCitizen      43
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
```

In [117]:
```
1 data.SeniorCitizen.replace(np.nan,0,inplace=True)
```

In [118]:
```
1 data.isnull().sum()
```

Out[118]:
```
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
```

In [137]:
```
1 data['gender'].replace("Male",0,inplace=True)
2 data['gender'].replace("Female",1,inplace= True)
```

In [119]:
```
1 data.PhoneService.value_counts()
```

Out[119]:
```
Yes    6361
No      682
Name: PhoneService, dtype: int64
```

In [120]:
```
1 data.PhoneService.replace('Yes',0,inplace=True)
2 data.PhoneService.replace('No',1,inplace=True)
3
```

In [121]:
```
1 data.describe()
```

Out[121]:

	SeniorCitizen	tenure	PhoneService	MonthlyCharges	TotalCharges
count	7043.000000	7043.000000	7043.000000	7043.000000	7043.000000
mean	0.162147	33.041473	0.096834	64.761692	2283.300440
std	0.368612	24.126431	0.295752	30.090047	2265.000258
min	0.000000	1.000000	0.000000	18.250000	18.800000
25%	0.000000	10.000000	0.000000	35.500000	402.225000
50%	0.000000	31.000000	0.000000	70.350000	1400.550000
75%	0.000000	55.000000	0.000000	89.850000	3786.600000
max	1.000000	72.000000	1.000000	118.750000	8684.800000

In [33]:
```
1 data.Partner.value_counts()
```

Out[33]:
```
No     3641
Yes    3402
Name: Partner, dtype: int64
```

In [124]:
```
1 data.Partner.replace('Yes',0,inplace=True)
2 data.Partner.replace('No',1,inplace=True)
3
```

In [125]:
```
1 data.InternetService.value_counts()
```

Out[125]:
```
Fiber optic    3096
DSL            2421
No             1526
Name: InternetService, dtype: int64
```

In [126]:
```
1 data.InternetService.replace('Fiber optic',0,inplace=True)
2 data.InternetService.replace('DSL',1,inplace=True)
3 data.InternetService.replace('No',2,inplace=True)
```

In [127]:
```
1 data.OnlineSecurity.value_counts()
```

Out[127]:
```
No                     3498
Yes                    2019
No internet service    1526
Name: OnlineSecurity, dtype: int64
```

In [128]:
```
1 data.OnlineSecurity.replace('Yes',0,inplace=True)
2 data.OnlineSecurity.replace('No',1,inplace=True)
3 data.OnlineSecurity.replace('No internet service',2,inplace=True)
```

In [130]:
```
1 data.PaymentMethod.value_counts()
```

Out[130]:
```
Electronic check             2365
Mailed check                 1612
Bank transfer (automatic)    1544
Credit card (automatic)      1522
Name: PaymentMethod, dtype: int64
```

In [149]:
```
1 data.PaymentMethod.replace('Electronic check',0,inplace=True)
2 data.PaymentMethod.replace('Mailed check ',1,inplace=True)
3 data.PaymentMethod.replace('Bank transfer',2,inplace=True)
4 data.PaymentMethod.replace('Credit card',3,inplace=True)
5
6
```

In [150]:
```
1 data.describe()
```

Out[150]:

	gender	SeniorCitizen	Partner	tenure	PhoneService	InternetService	OnlineSecu
count	7043.000000	7043.000000	7043.0	7043.000000	7043.000000	7043.000000	7043.000(
mean	0.495244	0.162147	0.0	33.041473	0.096834	0.777084	0.930(
std	0.500013	0.368612	0.0	24.126431	0.295752	0.778877	0.706(
min	0.000000	0.000000	0.0	1.000000	0.000000	0.000000	0.000(
25%	0.000000	0.000000	0.0	10.000000	0.000000	0.000000	0.000(
50%	0.000000	0.000000	0.0	31.000000	0.000000	1.000000	1.000(
75%	1.000000	0.000000	0.0	55.000000	0.000000	1.000000	1.000(
max	1.000000	1.000000	0.0	72.000000	1.000000	2.000000	2.000(

In [144]:
```
1 data_corr=data.corr()
2 data_corr.style.background_gradient()
```

```
C:\Users\Qebaa\anaconda3\lib\site-packages\pandas\io\formats\style.py:1126: Run
timeWarning: All-NaN slice encountered
  smin = np.nanmin(s.to_numpy()) if vmin is None else vmin
C:\Users\Qebaa\anaconda3\lib\site-packages\pandas\io\formats\style.py:1127: Run
timeWarning: All-NaN slice encountered
  smax = np.nanmax(s.to_numpy()) if vmax is None else vmax
```

Out[144]:

	gender	SeniorCitizen	Partner	tenure	PhoneService	InternetService	Online
gender	1.000000	0.001874	nan	-0.010031	-0.006488	-0.010380	-(
SeniorCitizen	0.001874	1.000000	nan	0.013338	-0.008576	-0.259390	-(
Partner	nan	nan	nan	nan	nan	nan	
tenure	-0.010031	0.013338	nan	1.000000	-0.005542	-0.025102	-(
PhoneService	-0.006488	-0.008576	nan	-0.005542	1.000000	0.093720	-(
InternetService	-0.010380	-0.259390	nan	-0.025102	0.093720	1.000000	(
OnlineSecurity	-0.014418	-0.081878	nan	-0.223622	-0.159989	0.582325	
MonthlyCharges	0.014569	0.220173	nan	0.236084	-0.247398	-0.905491	-(
TotalCharges	-0.000048	0.102395	nan	0.814245	-0.112851	-0.427749	-(

In [134]:
```
1 data_corr
```

Out[134]:

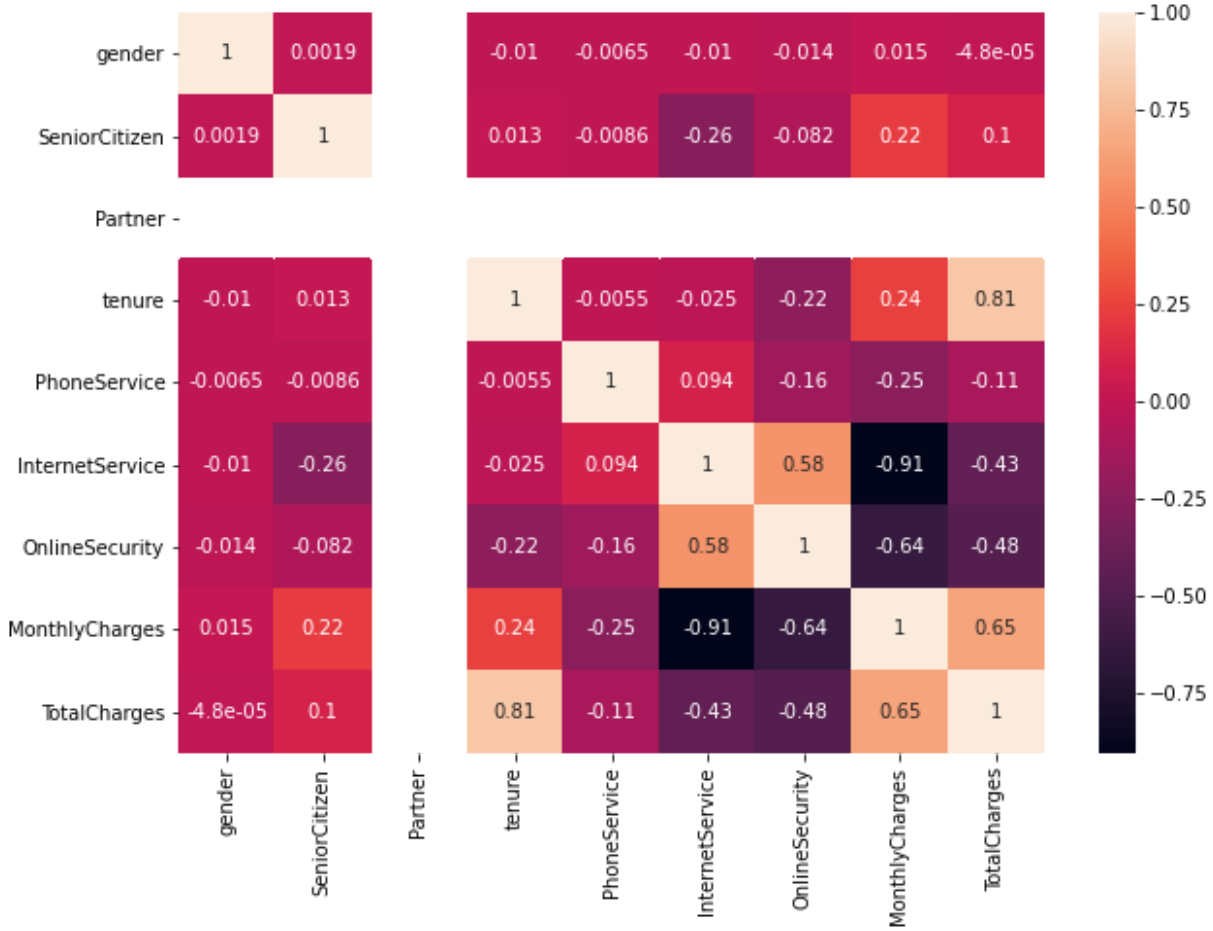
	SeniorCitizen	Partner	tenure	PhoneService	InternetService	OnlineSecurity	M
SeniorCitizen	1.000000	NaN	0.013338	-0.008576	-0.259390	-0.081878	
Partner	NaN	NaN	NaN	NaN	NaN	NaN	
tenure	0.013338	NaN	1.000000	-0.005542	-0.025102	-0.223622	
PhoneService	-0.008576	NaN	-0.005542	1.000000	0.093720	-0.159989	
InternetService	-0.259390	NaN	-0.025102	0.093720	1.000000	0.582325	
OnlineSecurity	-0.081878	NaN	-0.223622	-0.159989	0.582325	1.000000	
MonthlyCharges	0.220173	NaN	0.236084	-0.247398	-0.905491	-0.635534	
TotalCharges	0.102395	NaN	0.814245	-0.112851	-0.427749	-0.482445	

In [143]:
```
1 data_corr.TotalCharges.sort_values()
```

Out[143]:
```
OnlineSecurity    -0.482445
InternetService   -0.427749
PhoneService      -0.112851
SeniorCitizen      0.102395
MonthlyCharges     0.650468
tenure             0.814245
TotalCharges       1.000000
Partner                 NaN
Name: TotalCharges, dtype: float64
```

In [146]:
```
1 plt.figure(figsize=(10,7))
2 sns.heatmap(data.corr(), annot=True)
```

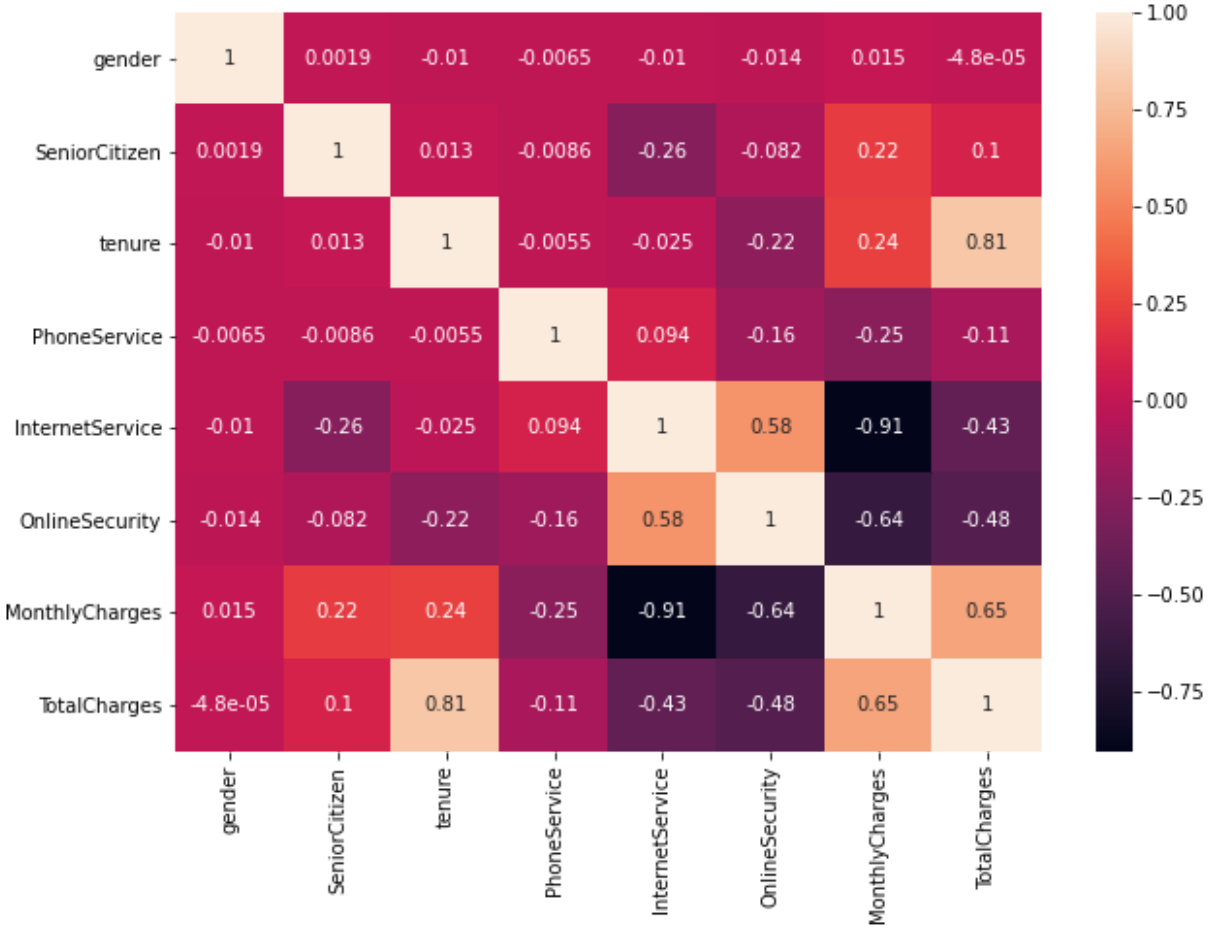
Out[146]: <AxesSubplot:>



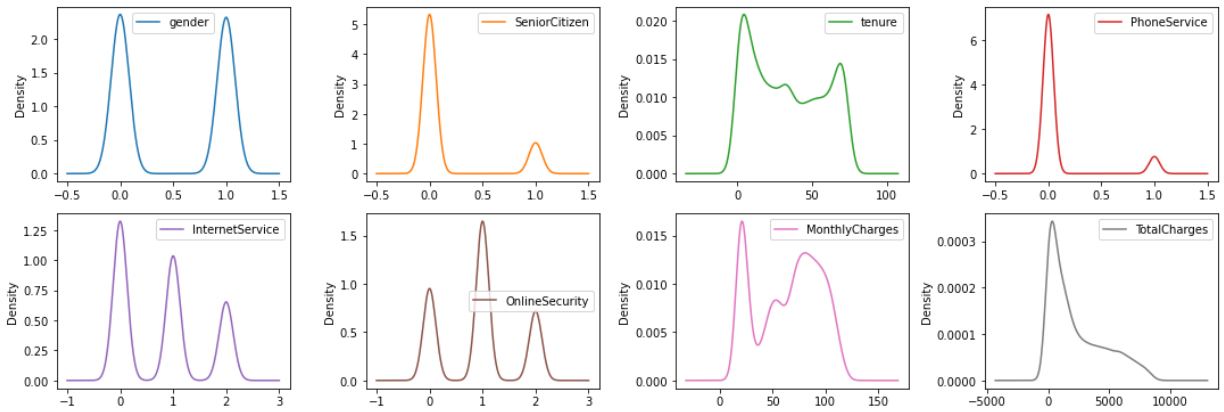
In [155]:
```
1 data.drop("Partner",axis=1 ,inplace=True)
```

In [156]:
```
1 plt.figure(figsize=(10,7))
2 sns.heatmap(data.corr(), annot=True)
```

Out[156]: <AxesSubplot:>



In [157]:
```
data.plot(kind='density',subplots=True,layout=(4,4),sharex=False,figsize=(15
plt.tight_layout()
```



In [164]:
```
data_info = data.describe()
```

In [165]:
```
data_info.loc['median']=data.median()
```

In [166]:
```
data_info.loc['median']
```

Out[166]:
```
gender              0.00
SeniorCitizen       0.00
tenure             31.00
PhoneService        0.00
InternetService     1.00
OnlineSecurity      1.00
MonthlyCharges     70.35
TotalCharges     1400.55
Name: median, dtype: float64
```

In [171]:
```
def offer(row):
    if row['gender']==0 and row['tenure']>=30:
        return "An_Old_Men_Agent"
    elif row['gender']==0 and row['tenure']<=30:
        return "An_younger_Men_Agent"
    elif row['gender']==1 and row['tenure']>=30:
        return "An_Old_Women_Agent"
    elif row['gender']==1 and row['tenure']<=30:
        return "An_younger_Women_Agent"
    else:
        return "Other"
```

In [172]:
```
data['offer']=data.apply(offer,axis=1)
```

In [173]:
```
1 data.head()
```

Out[173]:

	...	TechSupport	StreamingTV	StreamingMovies	Contract	PaperlessBilling	PaymentMethod	Mont
	...	No	No	No	Month-to-month	Yes	0	
	...	No	No	No	One year	No	Mailed check	
	...	No	No	No	Month-to-month	Yes	Mailed check	
	...	Yes	No	No	One year	No	Bank transfer (automatic)	
	...	No	No	No	Month-to-month	Yes	0	

In [185]:
```
1 data.offer.value_counts()
```

Out[185]:
```
An_Old_Men_Agent          1842
An_Old_Women_Agent        1779
An_younger_Men_Agent      1713
An_younger_Women_Agent    1709
Name: offer, dtype: int64
```

In [174]:
```
1 data[['gender','offer']]
```

Out[174]:

	gender	offer
0	1	An_Old_Women_Agent
1	0	An_Old_Men_Agent
2	0	An_younger_Men_Agent
3	0	An_Old_Men_Agent
4	1	An_younger_Women_Agent
...	...	...
7038	0	An_younger_Men_Agent
7039	1	An_Old_Women_Agent
7040	1	An_younger_Women_Agent
7041	0	An_younger_Men_Agent
7042	0	An_Old_Men_Agent

7043 rows × 2 columns

In [177]:
```
df=data[(data['gender']==0) & (data['offer']=='An_Old_Men_Agent')]
```

In [178]:
```
df
```

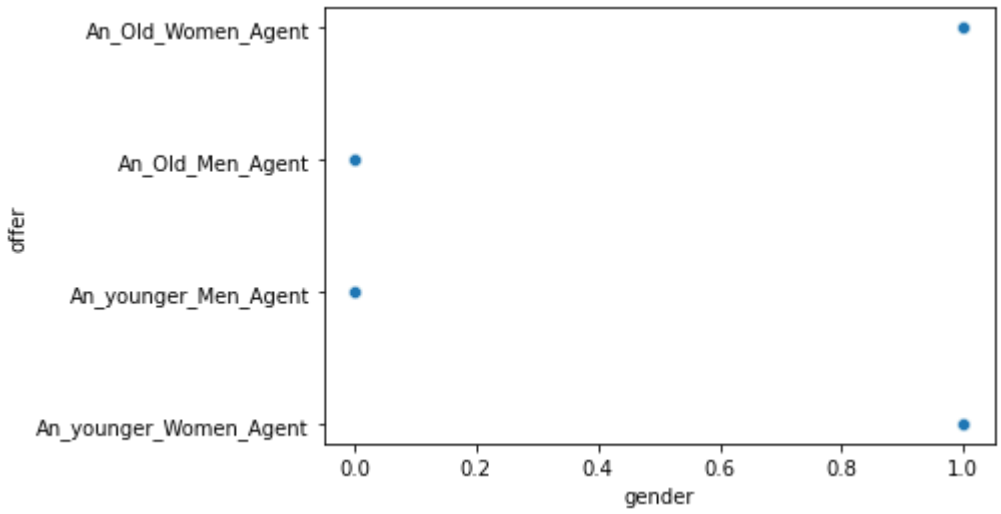
Out[178]:

	customerID	gender	SeniorCitizen	Dependents	tenure	PhoneService	MultipleLines	Internet
1	5575-GNVDE	0	0.0	No	34.0	0	No	
3	7795-CFOCW	0	0.0	No	45.0	1	No phone service	
9	6388-TABGU	0	0.0	Yes	62.0	0	No	
12	8091-TTVAX	0	0.0	No	58.0	0	Yes	
13	0280-XJGEX	0	0.0	No	49.0	0	Yes	
...	...	...	...	...	...	...	...	...
7022	7203-OYKCT	0	0.0	No	72.0	0	Yes	
7024	7398-LXGYX	0	0.0	No	44.0	0	Yes	
7031	3605-JISKB	0	1.0	No	55.0	0	Yes	
7033	9767-FFLEM	0	0.0	No	38.0	0	No	
7042	3186-AJIEK	0	0.0	No	66.0	0	No	

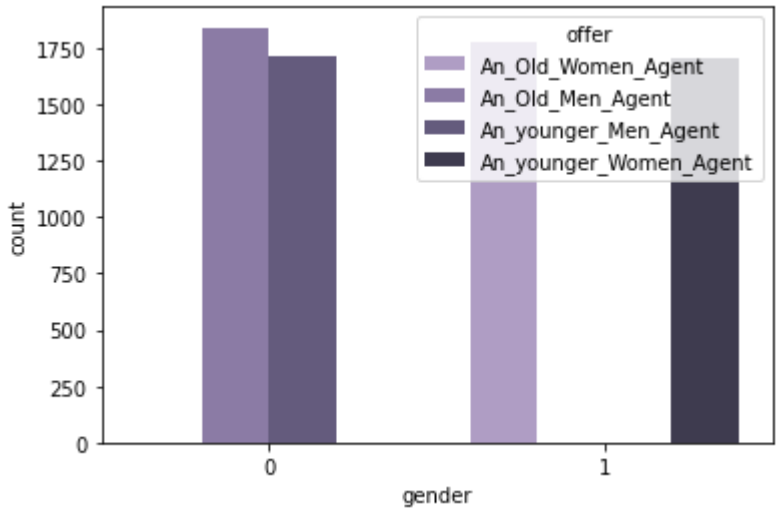
1842 rows × 21 columns

In [182]:
```
sns.scatterplot('gender','offer',data=data,alpha=0.9
  , legend=True,palette=("ch:2,r=.2,l=.6"))
plt.show()
```

```
C:\Users\Qebaa\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWar
ning: Pass the following variables as keyword args: x, y. From version 0.12, th
e only valid positional argument will be `data`, and passing other arguments wi
thout an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```

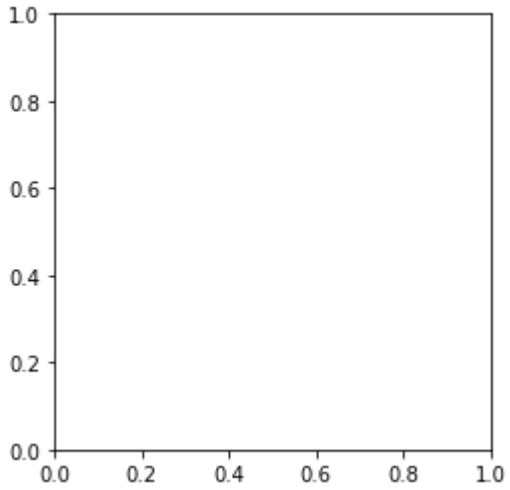


In [195]:
```
sns.countplot(x='gender',hue='offer',data=data,alpha=0.9,palette=("ch:6,r=.1
plt.show()
```



In [199]:
```
1 plt.pie('offer', labels='gender', colors=True, explode=True)
2 plt.axis('equal')
```

```
---------------------------------------------------------------------------
ValueError                                Traceback (most recent call last)
<ipython-input-199-4e61809d4cf4> in <module>
----> 1 plt.pie('offer', labels='gender', colors=True, explode=True)
      2 plt.axis('equal')

~\anaconda3\lib\site-packages\matplotlib\pyplot.py in pie(x, explode, labels, c
olors, autopct, pctdistance, shadow, labeldistance, startangle, radius, counter
clock, wedgeprops, textprops, center, frame, rotatelabels, normalize, data)
   2825         textprops=None, center=(0, 0), frame=False,
   2826         rotatelabels=False, *, normalize=None, data=None):
-> 2827     return gca().pie(
   2828         x, explode=explode, labels=labels, colors=colors,
   2829         autopct=autopct, pctdistance=pctdistance, shadow=shadow,

~\anaconda3\lib\site-packages\matplotlib\__init__.py in inner(ax, data, *args,
 **kwargs)
   1436     def inner(ax, *args, data=None, **kwargs):
   1437         if data is None:
-> 1438             return func(ax, *map(sanitize_sequence, args), **kwargs)
   1439
   1440         bound = new_sig.bind(ax, *args, **kwargs)

~\anaconda3\lib\site-packages\matplotlib\axes\_axes.py in pie(self, x, explode,
labels, colors, autopct, pctdistance, shadow, labeldistance, startangle, radiu
s, counterclock, wedgeprops, textprops, center, frame, rotatelabels, normalize)
   2993         # The use of float32 is "historical", but can't be changed with
out
   2994         # regenerating the test baselines.
-> 2995         x = np.asarray(x, np.float32)
   2996         if x.ndim > 1:
   2997             raise ValueError("x must be 1D")

~\anaconda3\lib\site-packages\numpy\core\_asarray.py in asarray(a, dtype, orde
r)
     81
     82     """
---> 83     return array(a, dtype, copy=False, order=order)
     84
     85

ValueError: could not convert string to float: 'offer'
```



In [207]:
```
def offer1(row):
    if row['gender']==0 and row['tenure']>=30 and row['TotalCharges']>=4000:
        return "Excellent_Men_Agent"
    elif row['gender']==0 and row['tenure']<=30 and row['TotalCharges']<=400
        return "Good_Men_Agent"
    elif row['gender']==1 and row['tenure']>=30 and row['TotalCharges']>=400
        return "Excellent_Women_Agent"
    elif row['gender']==1 and row['tenure']<=30 and row['TotalCharges']>=400
        return "Good_Women_Agent"
    else:
        return "Other"
```

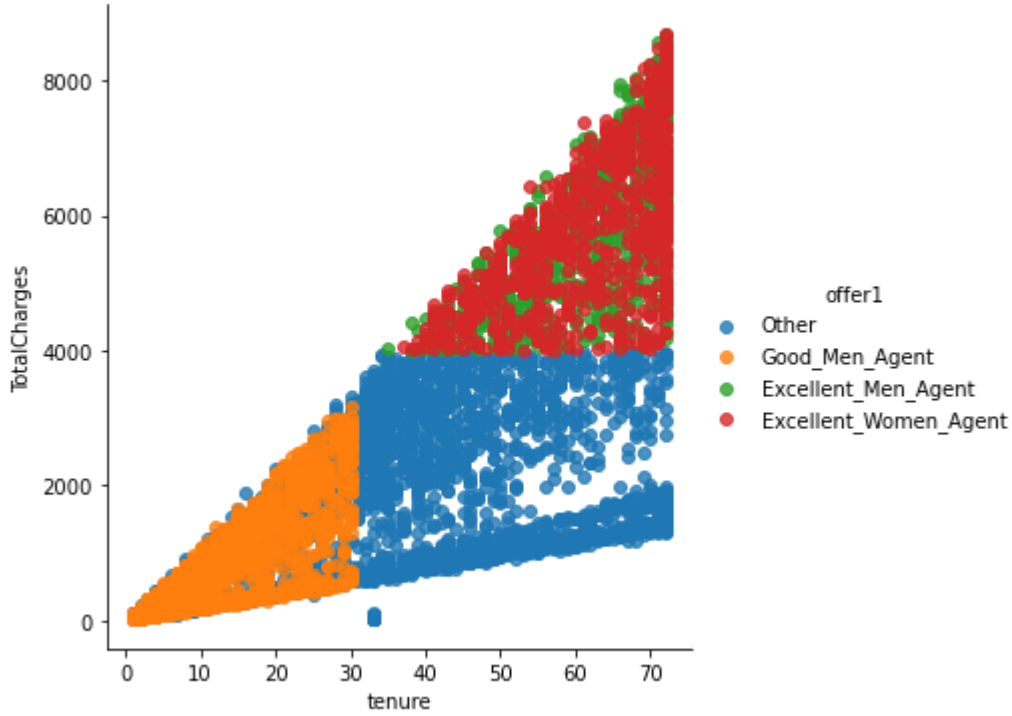
In [208]:
```
data['offer1']=data.apply(offer1,axis=1)
```

In [209]:
```
data['offer1']
```

Out[209]:
```
0                     Other
1                     Other
2             Good_Men_Agent
3                     Other
4                     Other
                 ...
7038          Good_Men_Agent
7039    Excellent_Women_Agent
7040                  Other
7041          Good_Men_Agent
7042      Excellent_Men_Agent
Name: offer1, Length: 7043, dtype: object
```

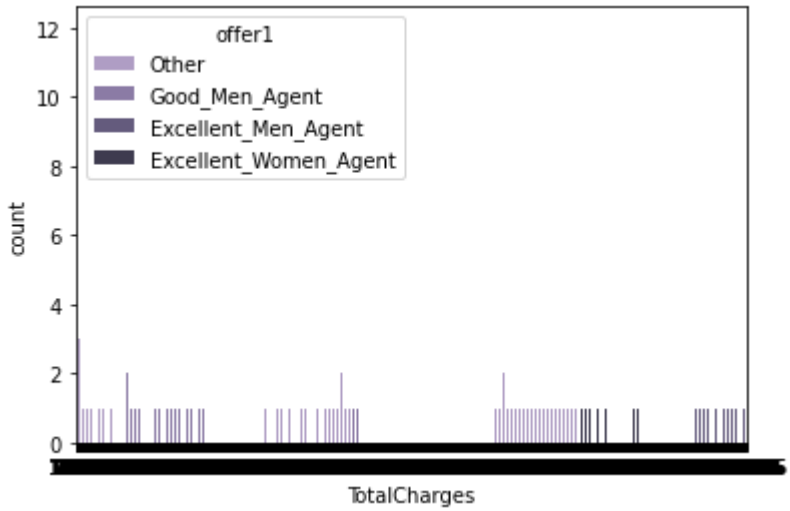
In [211]:
```
1 sns.lmplot('tenure', 'TotalCharges', data=data, hue='offer1', fit_reg=False,
2 plt.show()
```

```
C:\Users\Qebaa\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWar
ning: Pass the following variables as keyword args: x, y. From version 0.12, th
e only valid positional argument will be `data`, and passing other arguments wi
thout an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



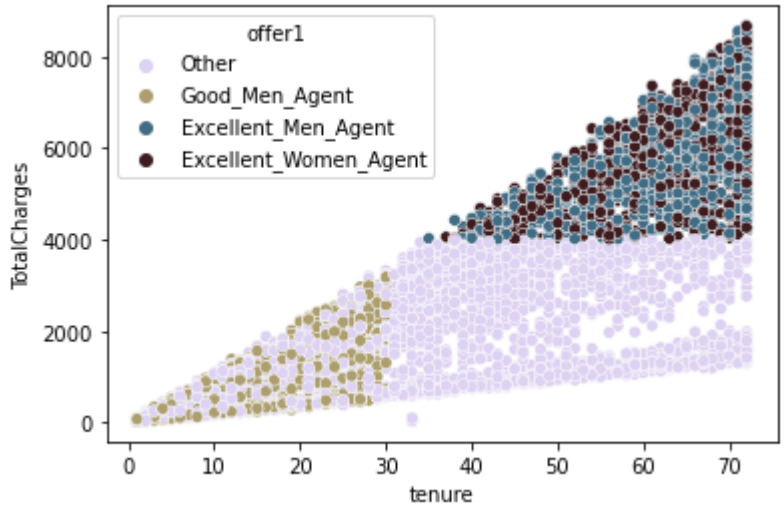
In [214]:
```
sns.countplot('TotalCharges', hue='offer1',data=data,alpha=0.9,palette=("ch:
plt.show()
```

```
C:\Users\Qebaa\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWar
ning: Pass the following variable as a keyword arg: x. From version 0.12, the o
nly valid positional argument will be `data`, and passing other arguments witho
ut an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



In [218]:
```
x1= data['tenure']
y2= data['TotalCharges']
sns.scatterplot(x1,y2, data=data, hue='offer1',palette= 'ch:s=2.75,rot=2.50'
plt.xlabel='tenure'
plt.ylael='TotalCharges'
plt.show()

```

```
C:\Users\Qebaa\anaconda3\lib\site-packages\seaborn\_decorators.py:36: FutureWar
ning: Pass the following variables as keyword args: x, y. From version 0.12, th
e only valid positional argument will be `data`, and passing other arguments wi
thout an explicit keyword will result in an error or misinterpretation.
  warnings.warn(
```



In [ ]:
```

```