## **Data exploration**

```
In []: from google.colab import drive
    drive.mount('/content/drive')
Mounted at /content/drive
In []: #optional to adjust coding space
    import pandas as pd
    pd.set_option('display.width', 180)
In []: #optional to adjust frame height
    from google.colab import output
    from IPython.display import Javascript
    def resize_colab_cell():
        display(Javascript('google.colab.output.setIframeHeight(0, true, {maxHeight:
    5000})'))
    get_ipython().events.register('pre_run_cell', resize_colab_cell)
In []: import pandas as pd
    df = pd.read_excel('/content/drive/MyDrive/Task14/Data/telecom_users.xlsx')
    # First 5 rows of the DataFrame
    print(df.head())
   customerID gender SeniorCitizen Partner Dependents Tenure PhoneService
                                                                                    MultipleLin
es InternetService OnlineSecurity
                                   ... StreamingTV StreamingMovies
                                                                            Contract
   7590-VHVEG Female
                                    0
                                          Yes
                                                      No
                                                               1
                                                                           No No phone servic
                                                               No Month-to-month
е
             DSL
                              No
                                               No
1
   5575-GNVDE
                 Male
                                    0
                                                              34
                                                                          Yes
                                                                                             No
                                          No
                                                     No
DSL
               Yes ...
                                 No
                                                 No
                                                           One year
2
   3668-QPYBK
                 Male
                                   0
                                                               2
                                                                          Yes
                                                                                             No
                                          No
                                                     No
                                                     Month-to-month
DSL
               Yes ...
                                 No
                                                 NO
3 7795-CFOCW
                 Male
                                   0
                                                     No
                                                              45
                                                                          No
                                                                              No phone service
                                          No
DSL
               Yes
                   . . .
                                 No
                                                 No
                                                           One year
4 9237-HQITU Female
                                   0
                                           No
                                                      No
                                                               2
                                                                          Yes
                                                                                             No
Fiber optic
                        No
                                         No
                                                         No Month-to-month
                           . . .
 PaperlessBilling
                                PaymentMethod MonthlyCharges TotalCharges Churn Provider Ag
е
0
                             Electronic check
                                                       29.85
                                                                     29.85
                                                                                       Nan Nan
               Yes
                                                                              No
                                                       56.95
                                Mailed check
                                                                    1889.5
1
               No
                                                                              No
                                                                                       NaN NaN
2.
                                Mailed check
                                                       53.85
                                                                    108.15
               Yes
                                                                             Yes
                                                                                       NaN NaN
3
               No
                   Bank transfer (automatic)
                                                        42.30
                                                                   1840.75
                                                                              No
                                                                                       NaN NaN
                             Electronic check
                                                       70.70
                                                                    151.65
                                                                                       NaN NaN
               Yes
                                                                             Yes
[5 rows x 23 columns]
In []: import pandas as pd
    df = pd.read_excel('/content/drive/MyDrive/Task14/Data/telecom_users.xlsx')
```

# First 10 rows of the DataFrame
print(df.head(10))

customerID ge									
es InternetServi			Stream	ningTV					
0 7590-VHVEG F	'emale	0	Yes		No	1	No	o No r	phone servic
e DSL		No		No			Month-to-	month	
1 5575-GNVDE	Male	0	No		No	34	Yes	3	No
-	es	No		No		One yea	ır		
2 3668-QPYBK	Male	0	No		No	2	Yes	5	No
DSL Ye	es	No		No	Month	n-to-mon	th		
3 7795-CFOCW	Male	0	No		No	45	No	No p	hone service
DSL Ye	es	No		No		One yea	ır		
4 9237-HQITU F	'emale	0	No		No	2	Yes	5	No
Fiber optic	No		No		N	No Month	n-to-month		
5 9305-CDSKC F	'emale	0	No		No	8	Yes	3	Yes
Fiber optic	No		Yes		Υe	es Mont	h-to-month	l	
6 1452-KIOVK	Male	0	No		Yes	22	Yes	5	Yes
Fiber optic	No		Yes		1	No Month	n-to-month	L	
7 6713-OKOMC F	'emale	0	No		No	10	No	o No p	hone servic
e DSL	J	Yes		No		No	Month-to-	-month	
8 6388-TABGU	Male	0	No		Yes	62	Yes	3	No
DSL Ye	es	No		No		One yea	ır		
9 9763-GRSKD	Male	0	Yes		Yes	13	Yes	5	No
DSL Ye		No		No	Month	n-to-mon	th		
PaperlessBillir	ng	Payment	Method	Month	lyChar	rges Tota	alCharges (	Churn	Provider Ag
е									
0 Ye	es	Electronic	check		29	.85	29.85	No	NaN NaN
1 N	10	Mailed	check		56.	. 95	1889.5	No	NaN NaN
2 Ye	es	Mailed	check		53.	.85	108.15	Yes	NaN NaN
2		<b>.</b>			4.0	2.0	1040 55		
3 N	No Bank trar	nsfer (auto	matic)		42	.30	1840.75	No	NaN NaN
4 Ye	es	Electronic	check		70	.70	151.65	Yes	NaN NaN
5 Ye	es	Electronic	check		99	.65	820.5	Yes	NaN NaN
6 Ye	es Credit	card (auto	matic)		89	.10	1949.4	No	NaN NaN
7 N	10	Mailed	check		29.	. 75	301.9	No	NaN NaN
	-					. <del>-</del>			
8 N	No Bank tran	nsfer (auto	matic)		56	.15	3487.95	No	Nan Nan
9 Ye	2 G	Mailed	check		49.	95	587.45	No	NaN NaN
, 16			0110017		1).	•	507.15	140	IVALV IVALV

```
[10 rows x 23 columns]
In []: import pandas as pd
```

df = pd.read\_excel('/content/drive/MyDrive/Task14/Data/telecom\_users.xlsx')

# Print the first 5 rows of the DataFrame
print(df.head())

6041

No

	D gender Sen ervice OnlineS					vice Contr	
0 7590-VHVE	G Female	0	Yes	No	1	No No	phone servic
е	DSL	No	No		No Month-to	o-month	ı
1 5575-GNVD	E Male	0	No	No 34	4 Ye	es	No
DSL	Yes	No	No	One	year		
2 3668-QPYB	K Male	0	No	No 2	2 Ye	es	No
DSL	Yes	No	No	Month-to-	month		
3 7795-CFOC	W Male	0	No	No 4!	5 1	No No	phone service
DSL	Yes	No	No	One	year		
4 9237-HQIT	'U Female	0	No	No :	2 Y	es	No
Fiber optic	No		No	No Mo	onth-to-mont	h	
PaperlessB	illing	Payment	Method Mont	hlyCharges 1	TotalCharges	Churn	Provider Ag
е							
0	Yes	Electronic	check	29.85	29.85	No	NaN NaN
1	No	Mailed	check	56.95	1889.5	No	NaN NaN
2	Yes	Mailed	check	53.85	108.15	Yes	NaN NaN
3	No Bank tr	ansfer (auto	matic)	42.30	1840.75	No	NaN NaN
4	Yes	Electronic	check	70.70	151.65	Yes	NaN NaN
[5 rows x 23	columns]						
<pre>In []: print(d:</pre>	f tail(10))						
P11110 ( G	<b>1.</b> Call (10))						
		SeniorCitizen	n Partner De	ependents T	enure Phones	Service	Multiple
custom				_	enure PhoneS amingTV \	Service	. Multiple
custom Lines Intern	erID gender :		rity	_		Service Yes	. Multiple
custom Lines Intern	erID gender : etService PBXW Female	OnlineSecur	rity No	Strea No	amingTV \ 2		. Multiple
customous Intern 6040 0871-0	erID gender : etService PBXW Female No No inte	OnlineSecur O	rity No No i	Strea No	amingTV \ 2		e Multiple
customo Lines Intern 6040 0871-0 No	erID gender : etService PBXW Female No No inte	OnlineSecur 0 ernet service	rity No No i Yes	Strea No nternet serv	amingTV \ 2 <i>r</i> ice	Yes	e Multiple
custome Lines Intern 6040 0871-0 No 6041 3605-J	erID gender S etService PBXW Female No No inte ISKB Male DSL	OnlineSecur 0 ernet service 1	no No i Yes	Strea No nternet serv	amingTV \ 2 vice 55	Yes	e Multiple
customo Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L	erID gender S etService PBXW Female No No inte ISKB Male DSL	OnlineSecur 0 ernet service 1 Yes	rity No No i Yes 	Strea No nternet serv No	amingTV \ 2 vice 55 No	Yes Yes	e Multiple
customo Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L	erID gender S etService PBXW Female No No inte ISKB Male DSL FHLY Male r optic	OnlineSecur 0 ernet service 1 Yes 1	No No i Yes No No	Strea No nternet serv No	amingTV \ 2 7ice 55 No 1	Yes Yes	e Multiple
Customo Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F	erID gender S etService PBXW Female No No inte ISKB Male DSL FHLY Male r optic	OnlineSecur 0 ernet service 1 Yes 1	No No i Yes No No	Strea No nternet serv No No	amingTV \ 2 vice 55 No 1	Yes Yes Yes	e Multiple
Customo Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F	erID gender S etService PBXW Female No No inte ISKB Male DSL FHLY Male r optic FLEM Male	OnlineSecur 0 ernet service 1 Yes 1 No	No No Yes No No No No No	Strea No nternet serv No No	amingTV \ 2 vice 55 No 1 No 38	Yes Yes Yes	e Multiple
custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q	erID gender S etService PBXW Female No No inte ISKB Male DSL FHLY Male r optic FLEM Male optic	OnlineSecur 0 ernet service 1 Yes 1 No	No No Yes No No No No No	Streamon No No No No No	amingTV \ 2 vice 55 No 1 No 38	Yes Yes Yes	e Multiple
custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber	erID gender S etService PBXW Female No No interior ISKB Male DSL FHLY Male r optic FLEM Male optic DAVC Male	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0	No	Streamon No No No No No	amingTV \ 2 vice 55 No 1 No 38 No 19	Yes Yes Yes	e Multiple
Custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R	erID gender S etService PBXW Female No No interior ISKB Male DSL FHLY Male r optic FLEM Male optic DAVC Male	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 No	No N	Strea No nternet serv No No No No	amingTV \ 2 vice 55 No 1 No 38 No 19 Ves 24	Yes Yes Yes Yes Yes	e Multiple
custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes	erID gender setService PBXW Female No No interior ISKB Male DSL FHLY Male r optic FLEM Male optic DAVC Male optic ESVB Male	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0	No N	Streamon No No No Yes	amingTV \ 2 vice 55 No 1 No 38 No 19 Ves 24 Yes	Yes Yes Yes Yes Yes	e Multiple
custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes 6046 2234-X	erID gender setService PBXW Female No No interior ISKB Male DSL FHLY Male r optic FLEM Male optic DAVC Male optic ESVB Male DSL ADUH Female	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 No 0 Yes	No Yes Yes	Strea No nternet serv No No No No	amingTV \ 2 7ice 55 No 1 No 38 No 19 Yes 24 Yes 72	Yes Yes Yes Yes Yes	e Multiple
Custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes 6046 2234-X Yes Fibe	erID gender setService PBXW Female No No interior ISKB Male DSL FHLY Male r optic FLEM Male optic DAVC Male optic ESVB Male DSL ADUH Female r optic	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 Yes 0	No Yes Yes No Yes	Streamon No No No Yes	amingTV \ 2 7ice 55 No 1 No 38 No 19 Yes 24 Yes 72 Yes	Yes Yes Yes Yes Yes Yes Yes	
Custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes 6046 2234-X Yes Fibe 6047 4801-J	erID gender SetService PBXW Female No No interior ISKB Male DSL FHLY Male r optic FLEM Male optic DAVC Male optic ESVB Male DSL ADUH Female r optic ZAZL Female	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 Yes 0 No	No No No Yes No No No Yes Yes Yes	Streamon No No No Yes	amingTV \ 2 vice 55 No 1 No 38 No 19 Ves 24 Yes 72 Yes 11	Yes Yes Yes Yes Yes	Multiple  No phone ser
Custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes 6046 2234-X Yes Fibe 6047 4801-J vice	erID gender S etService PBXW Female No No interior ISKB Male DSL FHLY Male r optic FLEM Male optic DAVC Male optic ESVB Male DSL ADUH Female r optic TAZL Female	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 Yes 0 Yes	No No No No No No No No No Yes Yes Yes No Yes	Streamon No No No Yes Yes	amingTV \ 2 vice 55 No 1 No 38 No 19 Ves 24 Yes 72 Yes 11 No	Yes Yes Yes Yes Yes Yes You	
Custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes 6046 2234-X Yes Fibe 6047 4801-J Vice 6048 8361-L	erID gender setService PBXW Female No No interior ISKB Male DSL FHLY Male roptic FLEM Male optic DAVC Male optic ESVB Male DSL ADUH Female roptic ZAZL Female DSL TMKD Male	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 Yes 0 Yes	No Yes No Yes No Yes No Yes No Yes No Yes	Streamon No No No Yes	amingTV \ 2 vice 55 No 1 No 38 No 19 Ves 24 Yes 72 Yes 11 No 4	Yes Yes Yes Yes Yes Yes Yes	
Custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes 6046 2234-X Yes Fibe 6047 4801-J vice 6048 8361-L Yes Fibe	erID gender setService PBXW Female No No interior TSKB Male DSL FHLY Male roptic FLEM Male optic DAVC Male optic ESVB Male DSL ADUH Female roptic TAZL Female DSL TMKD Male roptic	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 Yes 0 Yes 1	No Yes No Yes No Yes No Yes No Yes No Yes	Streamon No No No Yes Yes No No	amingTV \ 2 vice 55 No 1 No 38 No 19 Ves 24 Yes 72 Yes 11 No 4 No	Yes Yes Yes Yes Yes Yes Yes Yes	
Custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes 6046 2234-X Yes Fibe 6047 4801-J Vice 6048 8361-L Yes Fibe 6049 3186-A	erID gender setService PBXW Female No No interior ISKB Male DSL FHLY Male r optic FLEM Male optic DAVC Male optic ESVB Male TADUH Female r optic ZAZL Female DSL TMKD Male r optic JIEK Male	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 Yes 0 Yes 1	No Yes No Yes No	Stream No No No Yes Yes No No No No No No No Yes Yes No	amingTV \ 2 vice 55 No 1 No 38 No 19 Ves 24 Yes 72 Yes 11 No 4 No 66	Yes Yes Yes Yes Yes Yes You	
Custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes 6046 2234-X Yes Fibe 6047 4801-J Vice 6048 8361-L Yes Fibe 6049 3186-A	erID gender setService PBXW Female No No interior TSKB Male DSL FHLY Male roptic FLEM Male optic DAVC Male optic ESVB Male DSL ADUH Female roptic TAZL Female DSL TMKD Male roptic	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 Yes 0 Yes 1	No Yes No Yes No Yes No Yes No Yes No Yes	Stream No No No Yes Yes No No No No No No No Yes Yes No	amingTV \ 2 vice 55 No 1 No 38 No 19 Ves 24 Yes 72 Yes 11 No 4 No	Yes Yes Yes Yes Yes Yes Yes Yes	
Custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes 6046 2234-X Yes Fibe 6047 4801-J vice 6048 8361-L Yes Fibe 6049 3186-A No Fiber	erID gender setService PBXW Female No No interior ISKB Male DSL FHLY Male r optic FLEM Male optic DAVC Male optic ESVB Male DSL ADUH Female r optic ZAZL Female DSL TMKD Male r optic JIEK Male optic	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 No 0 Yes 1 No 0 Yes	No No No Yes No No No Yes No Yes No Yes No Yes No	Stream No No No No Yes Yes No	amingTV \ 2 vice 55 No 1 No 38 No 19 Ves 24 Yes 72 Yes 11 No 4 No 66 Ves	Yes Yes Yes Yes Yes Yes Yes Yes Yes	No phone ser
Custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes 6046 2234-X Yes Fibe 6047 4801-J vice 6048 8361-L Yes Fibe 6049 3186-A No Fiber	erID gender setService PBXW Female No No interior ISKB Male DSL FHLY Male roptic FLEM Male optic DAVC Male optic ESVB Male DSL ADUH Female roptic ZAZL Female DSL TMKD Male roptic JIEK Male optic	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 Yes 0 Yes 1 No 0 Yes 1 No 0 Yes 1 No 0 Yes	No Yes No Yes No Yes No Yes No No Yes No No Yes No	Stream No No No No Yes Yes No	amingTV \ 2 vice 55 No 1 No 38 No 19 Ves 24 Yes 72 Yes 11 No 4 No 66 Ves	Yes Yes Yes Yes Yes Yes Yes Yes Yes	
Custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes 6046 2234-X Yes Fibe 6047 4801-J Vice 6048 8361-L Yes Fibe 6049 3186-A No Fiber Charges Tota	erID gender setService PBXW Female No No interior TSKB Male DSL FHLY Male roptic FLEM Male optic DAVC Male optic ESVB Male TADUH Female roptic ZAZL Female DSL TMKD Male roptic JIEK Male optic creamingMovies lCharges Churn	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 Yes 0 Yes 1 No 0 Yes 1 Provider Ag	No Yes No Yes No Yes No	Stream No No No Yes Yes No No No Seilling	amingTV \ 2 vice 55 No 1 No 38 No 19 Ves 24 Yes 72 Yes 11 No 4 No 66 Yes	Yes Yes Yes Yes Yes Yes Yes Yes Yes Aves Yes	No phone ser
Custome Lines Intern 6040 0871-0 No 6041 3605-J Yes 6042 6894-L Yes Fibe 6043 9767-F No Fiber 6044 8456-Q No Fiber 6045 6840-R Yes 6046 2234-X Yes Fibe 6047 4801-J Vice 6048 8361-L Yes Fibe 6049 3186-A No Fiber Charges Tota	erID gender setService PBXW Female No No interior ISKB Male DSL FHLY Male roptic FLEM Male optic DAVC Male optic ESVB Male DSL ADUH Female roptic ZAZL Female DSL TMKD Male roptic JIEK Male optic	OnlineSecur 0 ernet service 1 Yes 1 No 0 No 0 Yes 0 Yes 1 No 0 Yes 1 Provider Ag	No Yes No Yes No Yes No	Stream No No No No Yes Yes No	amingTV \ 2 vice 55 No 1 No 38 No 19 Ves 24 Yes 72 Yes 11 No 4 No 66 Yes	Yes Yes Yes Yes Yes Yes Yes Yes Yes	No phone ser

No Credit card (automatic)

One year

60.00	3316.1	No	NaN NaN		
6042		No	Month-to-month	Yes	Electronic check
75.75	75.75	Yes	NaN NaN		
6043		No	Month-to-month	Yes	Credit card (automatic)
69.50	2625.25	No	NaN NaN		
6044		No	Month-to-month	Yes	Bank transfer (automatic)
78.70	1495.1	No	NaN NaN		
6045		Yes	One year	Yes	Mailed check
84.80	1990.5	No	NaN NaN		
6046		Yes	One year	Yes	Credit card (automatic)
103.20	7362.9	No	NaN NaN		
6047		No	Month-to-month	Yes	Electronic check
29.60	346.45	No	NaN NaN		
6048		No	Month-to-month	Yes	Mailed check
74.40	306.6	Yes	NaN NaN		
6049		Yes	Two year	Yes	Bank transfer (automatic)
105.65	6844.5	No	NaN NaN		

[10 rows x 23 columns]

In[]: # Information about the data:

print(df.info())

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6050 entries, 0 to 6049
Data columns (total 23 columns):

#	Column	Non-Null Count	Dtype
0	customerID	6050 non-null	object
1	gender	6050 non-null	object
2	SeniorCitizen	6050 non-null	int64
3	Partner	6050 non-null	object
4	Dependents	6050 non-null	object
5	Tenure	6050 non-null	int64
6	PhoneService	6050 non-null	object
7	MultipleLines	6050 non-null	object
8	InternetService	6050 non-null	object
9	OnlineSecurity	6050 non-null	object
10	OnlineBackup	6050 non-null	object
11	DeviceProtection	6050 non-null	object
12	TechSupport	6050 non-null	object
13	StreamingTV	6050 non-null	object
14	StreamingMovies	6050 non-null	object
15	Contract	6050 non-null	object
16	PaperlessBilling	6050 non-null	object
17	PaymentMethod	6050 non-null	object
18	MonthlyCharges	6050 non-null	float64
19	TotalCharges	6050 non-null	object
20	Churn	6050 non-null	object
21	Provider	0 non-null	float64
22	Age	0 non-null	float64
·		1 ( 1 ( 0 ) 1 1 1 1 1	

dtypes: float64(3), int64(2), object(18)

memory usage: 1.1+ MB

None

In []: # Descriptive statistics

df.describe()

```
Out[]:
            SeniorCitizen
                           Tenure MonthlyCharges Provider Age
      count 6050.000000
                        6050.000000
                                   6050.000000
                                                 0.0
                                                          0.0
            0.162149
                        32.479174
      mean
                                   64.836719
                                                 NaN
                                                          NaN
            0.368618
                        24.517192
                                   30.099479
                                                 NaN
                                                          NaN
       std
            0.000000
                        0.000000
                                   18.250000
                                                 NaN
                                                          NaN
      min
      25%
            0.000000
                        9.000000
                                   35.750000
                                                 NaN
                                                          NaN
      50%
            0.000000
                        29.000000
                                   70.400000
                                                 NaN
                                                          NaN
      75%
            0.000000
                                                 NaN
                                                          NaN
                        56.000000
                                   89.900000
           1.000000
                        72.000000
                                   118.750000
                                                 NaN
                                                          NaN
      max
In[]: df.shape # Number of rows and columns
Out[]:(6050, 23)
In []: # Names of columns
     df.columns
Out[]:Index(['customerID', 'gender', 'SeniorCitizen', 'Partner', 'Dependents', 'Tenure', 'Pho
     neService', 'MultipleLines', 'InternetService', 'OnlineSecurity', 'OnlineBackup',
             'DeviceProtection', 'TechSupport', 'StreamingTV', 'StreamingMovies', 'Contract',
     'PaperlessBilling', 'PaymentMethod', 'MonthlyCharges', 'TotalCharges', 'Churn', 'Provid
     er',
             'Age'],
           dtype='object')
In []: # Data types
     df.dtypes
Out[]:customerID
                            object
     gender
                            object
     SeniorCitizen
                             int64
                            object
     Partner
                            object
     Dependents
     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
     Provider
                           float64
     Age
                           float64
     dtype: object
In []: # Check a column
```

df['Churn'].dtype

Out[]:dtype('0')

In[]: df.describe()

Out[]:					
Out[ ].	SeniorCitizen	Tenure	MonthlyCharges	Provider	Age
count	6050.000000	6050.000000	6050.000000	0.0	0.0
mean	0.162149	32.479174	64.836719	NaN	NaN
std	0.368618	24.517192	30.099479	NaN	NaN
min	0.000000	0.000000	18.250000	NaN	NaN
25%	0.000000	9.000000	35.750000	NaN	NaN
50%	0.000000	29.000000	70.400000	NaN	NaN
75%	0.000000	56.000000	89.900000	NaN	NaN
max	1.000000	72.000000	118.750000	NaN	NaN

Out[]:	customerID	gender	SeniorCitizen	Partner	Dependents	Tenure	PhoneService	MultipleLines	InternetServic
3333	8261- GWDBQ	Female	1	Yes	No	60	Yes	Yes	Fiber optic
414	6579-JPICP	Male	0	No	No	1	Yes	No	No
2532	5590-BYNII	Male	0	No	No	22	Yes	Yes	Fiber optic
828	9489-UTFKA	Male	1	Yes	No	8	Yes	No	DSL
4637	6005- OBZPH	Female	1	No	No	26	Yes	Yes	Fiber optic
2951	8566-YPRGL	Female	0	No	No	1	Yes	No	No
1314	2886-KEFUM	Female	0	Yes	No	63	Yes	Yes	Fiber optic
5041	6131- JLWZM	Female	0	No	No	13	Yes	No	No
5208	9526-BIHHD	Male	0	No	No	1	No	No phone service	DSL
4608	9637-EIHEQ	Female	0	No	No	1	Yes	No	DSL

#### 10 rows × 23 columns

<pre>In []: #Checking of unique       df.nunique()</pre>	values
Out[]:customerID gender SeniorCitizen Partner Dependents Tenure PhoneService MultipleLines InternetService OnlineSecurity OnlineBackup DeviceProtection TechSupport StreamingTV StreamingMovies Contract	5986 2 2 2 2 73 2 3 3 3 3 3 3 3
PaperlessBilling PaymentMethod MonthlyCharges TotalCharges Churn Provider Age dtype: int64  In []: # Missing values df.isna().sum()	2 4 1526 5611 2 0
Out[]:customerID gender SeniorCitizen Partner Dependents Tenure PhoneService MultipleLines InternetService OnlineSecurity OnlineBackup DeviceProtection TechSupport StreamingTV StreamingMovies Contract PaperlessBilling PaymentMethod MonthlyCharges TotalCharges Churn Provider Age dtype: int64	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

```
In []: #create a subset of not Senior Citizens
     df_notsenior = df[(df["SeniorCitizen"] == 0)]
     print(df_notsenior)
```

```
customerID gender SeniorCitizen Partner Dependents Tenure PhoneService
                                                                                     Contract
Lines InternetService OnlineSecurity ... StreamingTV StreamingMovies
0
      7590-VHVEG Female
                                         0
                                                Yes
                                                            No
                                                                      1
                                                                                   No No phone ser
                  DSL
                                                                      No
                                                                           Month-to-month
vice
                                   No
                                                     No
1
      5575-GNVDE
                     Male
                                         0
                                                                     34
                                                                                  Yes
                                                No
                                                            No
No
               DSL
                                                   No
                                                                    No
                                                                               One year
                                Yes
2
      3668-QPYBK
                     Male
                                         0
                                                                      2
                                                                                  Yes
                                                No
                                                            No
No
               DSL
                                Yes
                                                   No
                                                                    No
                                                                         Month-to-month
3
      7795-CFOCW
                                         0
                                                                     45
                                                                                   No No phone serv
                     Male
                                                No
                                                            No
ice
                 DSL
                                                                                One year
                                                    No
                                                                     No
                                 Yes
4
      9237-HQITU Female
                                         0
                                                No
                                                            No
                                                                      2
                                                                                  Yes
No
       Fiber optic
                                 No
                                                   No
                                                                     No
                                                                         Month-to-month
                                      . . .
. . .
              . . .
                      . . .
                                       . . .
                                                                    . . .
. . .
                                       . . .
                                                    . . .
                                                                     . . .
6044
      8456-QDAVC
                                         0
                                                                     19
                      Male
                                                No
                                                            No
                                                                                  Yes
No
       Fiber optic
                                                   Yes
                                                                     No
                                                                         Month-to-month
                                 No
6045
      6840-RESVB
                      Male
                                         0
                                                            Yes
                                                                     24
                                                                                  Yes
                                                Yes
Yes
                 DSL
                                 Yes
                                                   Yes
                                                                     Yes
                                                                                One year
                                      . . .
6046
      2234-XADUH Female
                                         0
                                                Yes
                                                            Yes
                                                                     72
                                                                                  Yes
Yes
        Fiber optic
                                  No
                                                    Yes
                                                                     Yes
                                                                                 One year
                                       . . .
6047
      4801-JZAZL Female
                                         0
                                                                     11
                                                                                   No No phone ser
                                                Yes
                                                            Yes
                  DSL
vice
                                                                      No
                                                                          Month-to-month
                                  Yes
                                        . . .
                                                     No
6049
      3186-AJIEK
                     Male
                                         0
                                                                     66
                                                                                  Yes
                                                No
                                                            No
No
       Fiber optic
                                Yes
                                                   Yes
                                                                    Yes
                                                                                Two year
                                     . . .
     PaperlessBilling
                                      PaymentMethod MonthlyCharges TotalCharges Churn
Age
0
                                  Electronic check
                                                              29.85
                                                                             29.85
                   Yes
                                                                                      No
                                                                                                NaN N
aN
1
                                      Mailed check
                                                              56.95
                                                                           1889.5
                    No
                                                                                      No
                                                                                                NaN N
aN
2
                                                              53.85
                                                                           108.15
                   Yes
                                      Mailed check
                                                                                     Yes
                                                                                                NaN N
aN
3
                        Bank transfer (automatic)
                                                               42.30
                                                                           1840.75
                    No
                                                                                       No
                                                                                                NaN
NaN
                   Yes
                                  Electronic check
                                                              70.70
                                                                           151.65
                                                                                      Yes
                                                                                                NaN
NaN
. . .
                                                . . .
                                                                                     . . .
                                                                . . .
                                                                              . . .
                   . . .
. .
                        Bank transfer (automatic)
                                                               78.70
                                                                            1495.1
6044
                   Yes
                                                                                                 NaN
                                                                                       No
NaN
6045
                                      Mailed check
                                                              84.80
                                                                           1990.5
                                                                                                NaN N
                   Yes
                                                                                      No
aN
6046
                           Credit card (automatic)
                                                              103.20
                                                                            7362.9
                   Yes
                                                                                       No
                                                                                                NaN
NaN
6047
                   Yes
                                  Electronic check
                                                              29.60
                                                                            346.45
                                                                                      No
                                                                                                NaN
NaN
6049
                        Bank transfer (automatic)
                                                              105.65
                                                                            6844.5
                                                                                                 NaN
                   Yes
                                                                                       No
NaN
```

[5069 rows x 23 columns]

print(df\_notsenior\_m)

df\_notsenior\_f = df\_notsenior[(df\_notsenior["gender"] == "Female")] print(df\_notsenior\_f)

	customerID gend	er SeniorCitizen	Partner Depe	endents	Tenure	PhoneServi	ce	MultipleL
ines	InternetService	OnlineSecurity .	Streaming	TV Stream	mingMov	ies	Contra	act \
1	5575-GNVDE Ma	ile 0	No	No	34	Yes		
No	DSL	Yes	No		No	One y	/ear	
2	3668-QPYBK Ma	ile 0	No	No	2	Yes		
No	DSL	Yes	No		No	Month-to-m	onth	
3	7795-CFOCW Ma	ile 0	No	No	45	No	No 1	phone servi
ce	DSL	Yes	No		No	One y	/ear	
6	1452-KIOVK Ma	ile 0	No	Yes	22	Yes		Y
es	Fiber optic	No	Yes		No	Month-to-r	nonth	
8	6388-TABGU Ma	ile 0	No	Yes	62	Yes		
No	DSL	Yes	No		No	One y	/ear	
6037	0550-DCXLH Ma	ale 0	No	No	13	Yes		
No	DSL	No	Yes		Yes	Month-to-m	onth	
6043	9767-FFLEM Ma	ale 0	No	No	38	Yes		
No	Fiber optic	No	No		No	Month-to-m	nonth	
6044	_	ale 0	No	No	19	Yes		
No	Fiber optic	No	Yes		No	Month-to-m	nonth	
6045	_	ale 0	Yes	Yes	24	Yes	}	Y
es	DSL	Yes	Yes		Yes	One y	vear	
6049		ale 0	No	No	66	Yes		
No	Fiber optic	Yes	Yes		Yes		year	
							2	
	PaperlessBilling	Paym	entMethod Mo	nthlyChai	rges To	talCharges	Churn	Provider
Age								
1	No	Mail	led check	56	.95	1889.5	No	NaN N
aN								
2	Yes	Mail	led check	53	.85	108.15	Yes	NaN N
aN								
3	No	Bank transfer (a	utomatic)	42	2.30	1840.75	No	NaN
NaN		·	•					
6	Yes	Credit card (a	utomatic)	89	0.10	1949.4	No	NaN
NaN		, , , , , , , , , , , , , , , , , , , ,	,					
8	No	Bank transfer (a	utomatic)	56	5.15	3487.95	No	NaN
NaN		(	, ,					
				_				
	•••			•	• •			
6037	No	Mai <sup>-</sup>	led check	73	.35	931.55	No	NaN N
aN	110	110.11		, 3		731.33	110	110111 11
6043	Yes	Credit card (a	utomatic)	69	9.50	2625.25	No	NaN
NaN	100	creare cara (a	ideomacie,	0.5	.50	2023.23	110	Ivaiv
6044	Yes	Bank transfer (a	automatic)	7,9	3.70	1495.1	No	NaN
NaN	105	Dain Clansici (C	racomacic,	7.0	3.70	11/5.1	110	IVAIN
6045	Yes	Mai	led check	QΛ	.80	1990.5	No	NaN N
aN	162	ria1.	ICA CIICCN	01	.00	10000	110	TACTA TA
6049	Yes	Bank transfer (a	automatic)	105	5.65	6844.5	No	NaN
NaN	162	Dann Cransier (c	ideomacic)	103	.03	0011.3	110	Ivaiv
TACTA								

[2591 rows x 23 columns]

customerID gender SeniorCitizen Partner Dependents Tenure PhoneService Multiple

```
OnlineSecurity ...
Lines InternetService
                                                       StreamingTV \
     7590-VHVEG Female
                                     0
                                                               1
                                                                           No No phone ser
                                           Yes
                                                       No
vice
                DSL
                                     No
                                                               No
                                         . . .
4
     9237-HQITU Female
                                     0
                                            No
                                                       No
                                                               2
                                                                          Yes
No
      Fiber optic
                                    No
                                                             No
5
     9305-CDSKC Female
                                     0
                                                               8
                                            No
                                                       No
                                                                          Yes
Yes
       Fiber optic
                                    No
                                                             Yes
7
      6713-OKOMC Female
                                     0
                                                              10
                                                                           No No phone serv
                                            No
                                                       No
ice
               DSL
                                   Yes ...
                                                              No
13
     3655-SNQYZ Female
                                     0
                                          Yes
                                                              69
                                                      Yes
                                                                          Yes
Yes
       Fiber optic
                                    Yes ...
                                                             Yes
            . . .
                                   . . .
                                                              . . .
. . .
                                   . . .
                                                             . . .
6036
    8775-CEBBJ Female
                                    0
                                           No
                                                       No
                                                                          Yes
              DSL
                                                             No
                                   No
                                       . . .
6038
      9281-CEDRU Female
                                     0
                                          Yes
                                                       No
                                                               68
                                                                          Yes
              DSL
                                                            Yes
No
                                   No
6040
      0871-OPBXW Female
                                     0
                                                                2
                                            No
                                                       No
                                                                          Yes
No
              No No internet service ... No internet service
6046 2234-XADUH Female
                                     0
                                          Yes
                                                               72
                                                      Yes
                                                                          Yes
Yes
      Fiber optic
                                    No ...
                                                             Yes
6047 4801-JZAZL Female
                                     0
                                                               11
                                                                           No No phone ser
                                           Yes
                                                      Yes
vice
                DSL
                                                               No
                                    Yes
                                         . . .
                                                                       PaymentMethod Monthly
         StreamingMovies
                               Contract PaperlessBilling
Charges TotalCharges Churn Provider Age
                                                                   Electronic check
                     No Month-to-month
                                                      Yes
29.85
            29.85
                     No
                              NaN NaN
                     No Month-to-month
                                                     Yes
                                                                   Electronic check
70.70
           151.65
                              Nan Nan
                    Yes
                                                                   Electronic check
                    Yes Month-to-month
                                                      Yes
99.65
            820.5
                              Nan Nan
                    Yes
7
                                                                       Mailed check
                     No Month-to-month
                                                      No
29.75
            301.9
                             Nan Nan
                     No
13
                     Yes
                               Two year
                                                      No
                                                           Credit card (automatic)
113.25
           7895.15
                               Nan Nan
                     No
. . .
                     . . .
                                                     . . .
                                                                               . . .
. . .
                  . . .
6036
                      No Month-to-month
                                                     Yes Bank transfer (automatic)
44.20
            403.35
                              Nan Nan
                    Yes
6038
                                                     No Bank transfer (automatic)
                      No
                               Two year
64.10
          4326.25
                     No
                              NaN NaN
6040 No internet service Month-to-month
                                                                        Mailed check
                                                      Yes
20.05
            39.25
                     No
                              NaN NaN
6046
                     Yes
                               One year
                                                     Yes
                                                            Credit card (automatic)
103.20
            7362.9
                               Nan Nan
                      No
6047
                                                                   Electronic check
                      No Month-to-month
                                                      Yes
29.60
           346.45
                     No
                          NaN NaN
[2478 rows x 23 columns]
In []: #Males_Not Senior_Phone
    df_notsenior_m.groupby('PhoneService').count()
    df_males_notsenior_phone = df_notsenior_m.groupby('PhoneService').count()
    print(df_males_notsenior_phone)
             customerID gender SeniorCitizen Partner Dependents Tenure MultipleLines
InternetService OnlineSecurity OnlineBackup ... StreamingTV StreamingMovies \
```

```
PhoneService
. . .
                     255
                              255
                                             255
                                                      255
                                                                   255
                                                                           255
                                                                                           255
No
255
                255
                               255
                                                  255
                                                                   255
                    2336
                             2336
                                            2336
                                                      2336
                                                                  2336
                                                                          2336
                                                                                          2336
Yes
2336
                2336
                               2336
                                                  2336
                                                                   2336
                                    . . .
              Contract PaperlessBilling PaymentMethod MonthlyCharges TotalCharges Churn
Provider Age
PhoneService
No
                   255
                                      255
                                                     255
                                                                      255
                                                                                    255
                                                                                            255
0
     0
Yes
                  2336
                                     2336
                                                    2336
                                                                     2336
                                                                                   2336
                                                                                           2336
0
     0
[2 rows x 22 columns]
In []: df_males_notsenior_phone.to_excel('males_not_senior_phones.xlsx', index=False,
     sheet name='Sheet1')
In []: #Males_Not Senior_Internet
    df_notsenior_m.groupby('InternetService').count()
    df_males_notsenior_internet = df_notsenior_m.groupby('InternetService').count()
    print(df_males_notsenior_internet)
                 customerID gender SeniorCitizen Partner Dependents Tenure PhoneServic
e MultipleLines OnlineSecurity OnlineBackup ... StreamingTV StreamingMovies
InternetService
. . .
                        959
                                 959
                                                959
                                                          959
                                                                      959
                                                                               959
                                                                                             959
DSL
                                                                   959
959
                959
                               959
                                    . . .
                                                  959
                         988
                                 988
                                                 988
                                                          988
                                                                       988
                                                                               988
                                                                                             988
Fiber optic
988
                988
                               988
                                                  988
                                                                   988
                                    . . .
No
                        644
                                 644
                                                644
                                                          644
                                                                      644
                                                                              644
                                                                                             644
644
                                                                   644
                644
                               644
                                                  644
                                    . . .
                 Contract PaperlessBilling PaymentMethod MonthlyCharges TotalCharges
urn Provider
InternetService
                      959
                                         959
                                                        959
                                                                         959
                                                                                       959
                                                                                               95
DSL
          0
                                                                                               98
Fiber optic
                       988
                                         988
                                                         988
                                                                         988
                                                                                        988
          \cap
               0
                                         644
                                                        644
                                                                         644
                                                                                       644
                                                                                               644
                      644
No
     0
[3 rows x 22 columns]
In []: df_males_notsenior_internet.to_excel('males_not_senior_internet.xlsx', index=False,
     sheet name='Sheet1')
In []: #Males_Not Senior_DeviceProtection
    df notsenior m.groupby('DeviceProtection').count()
    df_males_notsenior_device = df_notsenior_m.groupby('DeviceProtection').count()
    print(df_males_notsenior_device)
```

customerID gender SeniorCitizen Partner Dependents Tenure PhoneSer

```
vice MultipleLines
                      InternetService OnlineSecurity ... StreamingTV \
DeviceProtection
. . .
No
                           1089
                                   1089
                                                   1089
                                                            1089
                                                                         1089
                                                                                 1089
                                                                                               1
                                                                   1089
089
              1089
                               1089
                                                1089
No internet service
                             644
                                     644
                                                     644
                                                              644
                                                                           644
                                                                                   644
644
               644
                                 644
                                                 644
                                                                    644
                            858
                                     858
                                                    858
                                                             858
                                                                          858
                                                                                  858
Yes
858
               858
                                 858
                                                 858
                                                                    858
                                                      . . .
                     StreamingMovies Contract PaperlessBilling PaymentMethod MonthlyCharg
es TotalCharges Churn Provider Age
DeviceProtection
                                1089
                                          1089
                                                             1089
                                                                            1089
No
                                                                                             1089
1089
                         0
       1089
                    \cap
                                  644
                                             644
                                                               644
                                                                              644
                                                                                               64
No internet service
4
            644
                   644
                                     0
Yes
                                 858
                                            858
                                                              858
                                                                              858
                                                                                              858
858
       858
                   0
                        0
[3 rows x 22 columns]
In []: df_males_notsenior_device.to_excel('males_not_senior_device.xlsx', index=False,
     sheet_name='Sheet1')
In []: #Males_Not Senior_StreamingTV
    df_notsenior_m.groupby('StreamingTV').count()
    df_males_notsenior_streaming = df_notsenior_m.groupby('StreamingTV').count()
    print(df_males_notsenior_streaming)
                     customerID gender SeniorCitizen Partner Dependents Tenure
vice MultipleLines InternetService OnlineSecurity ... TechSupport
StreamingTV
. . .
No
                           1014
                                   1014
                                                   1014
                                                            1014
                                                                         1014
                                                                                 1014
                                                                                               1
014
              1014
                               1014
                                                1014
                                                                   1014
No internet service
                             644
                                     644
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                                                                           644
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644
               644
                                                 644
                                                                    644
                                 644
                            933
                                     933
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                                                                                  933
                                                             933
Yes
933
               933
                                933
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                                                      . . .
                     StreamingMovies Contract PaperlessBilling PaymentMethod MonthlyCharg
es TotalCharges Churn Provider Age
StreamingTV
No
                                1014
                                          1014
                                                             1014
                                                                            1014
                                                                                             1014
1014
       1014
                    0
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No internet service
                                  644
                                             644
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            644
                   644
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                                            933
                                                              933
                                                                              933
                                                                                              933
Yes
       933
                   0
933
                        0
[3 rows x 22 columns]
In []: df_males_notsenior_streaming.to_excel('males_not_senior_streaming.xlsx', index=False,
    sheet_name = 'Sheet1')
```

In []: #Males\_Not Senior\_PaperlessBilling

file:///C|/...alysis%20Bootcamp%20(JustIT)/Ali%20Kanji%20(Trainer)/Portfolio/Python/Telecom\_Users\_Data\_Analysis\_rev.html[06/08/2024 21:07:21]

```
df_notsenior_m.groupby('PaperlessBilling').count()
    df_males_notsenior_paperless = df_notsenior_m.groupby('PaperlessBilling').count()
    print(df males notsenior paperless)
                 customerID gender SeniorCitizen Partner Dependents Tenure PhoneServi
ce MultipleLines InternetService OnlineSecurity \dots TechSupport StreamingTV \setminus
PaperlessBilling
No
                       1167
                               1167
                                               1167
                                                        1167
                                                                    1167
                                                                            1167
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1167
                 1167
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                                               1424
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                                                                            1424
Yes
1424
                 1424
                                1424
                                                   1424
                                                                1424
                 StreamingMovies Contract PaymentMethod MonthlyCharges TotalCharges Ch
urn Provider Age
PaperlessBilling
No
                            1167
                                      1167
                                                     1167
                                                                      1167
                                                                                   1167
                                                                                           1167
     0
0
Yes
                             1424
                                       1424
                                                     1424
                                                                      1424
                                                                                    1424
                                                                                           142
4
          0
               0
[2 rows x 22 columns]
In []: df_males_notsenior_paperless.to_excel('males_not_senior_paperless.xlsx', index=False,
    sheet name='Sheet1')
In[]: #Females Not Senior Phone
    df_notsenior_f.groupby('PhoneService').count()
    df_females_notsenior_phone = df_notsenior_f.groupby('PhoneService').count()
    print(df_females_notsenior_phone)
             customerID gender SeniorCitizen Partner Dependents Tenure MultipleLines
InternetService OnlineSecurity OnlineBackup ... StreamingTV StreamingMovies
PhoneService
. . .
                    254
                             254
                                            254
                                                     254
                                                                 254
                                                                         254
                                                                                        254
No
254
                254
                              254
                                                254
                                                                 254
                    2224
                                           2224
                                                    2224
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                                                                        2224
                                                                                       2224
Yes
                            2224
                                                2224
2224
                2224
                              2224
                                                                 2224
             Contract PaperlessBilling PaymentMethod MonthlyCharges TotalCharges Churn
Provider Age
PhoneService
                   254
                                    254
                                                   254
                                                                    254
                                                                                  254
                                                                                         254
No
\cap
     \cap
                                    2224
                                                   2224
                                                                   2224
                                                                                 2224
                                                                                        2224
Yes
                  2224
     0
[2 rows x 22 columns]
In []: df females_notsenior_phone.to_excel('females_not_senior_phone.xlsx', index=False,
    sheet name='Sheet1')
In []: #Females Not Senior Internet
    df_notsenior_f.groupby('InternetService').count()
    df_females_notsenior_internet = df_notsenior_f.groupby('InternetService').count()
    print(df_females_notsenior_internet)
```

[3 rows x 22 columns]

sheet name='Sheet1')

```
customerID gender SeniorCitizen Partner Dependents Tenure PhoneServic
e MultipleLines OnlineSecurity OnlineBackup ... StreamingTV StreamingMovies
InternetService
. . .
                        909
                                 909
                                                909
                                                          909
                                                                              909
                                                                                             909
DSL
                                                                      909
                                                                   909
909
                909
                               909
                                                 909
                                    . . .
Fiber optic
                         954
                                 954
                                                 954
                                                          954
                                                                      954
                                                                               954
                                                                                             954
954
                954
                               954
                                                 954
                                                                   954
                                    . . .
No
                        615
                                615
                                                615
                                                         615
                                                                      615
                                                                              615
                                                                                             615
615
                615
                               615
                                                 615
                                                                   615
                 Contract PaperlessBilling PaymentMethod MonthlyCharges TotalCharges Ch
urn Provider
InternetService
                      909
                                         909
                                                        909
                                                                         909
                                                                                       909
DSL
                                                                                               90
9
          0
               0
Fiber optic
                       954
                                         954
                                                         954
                                                                         954
                                                                                        954
                                                                                               95
          0
                      615
                                         615
                                                        615
                                                                         615
                                                                                       615
                                                                                              615
No
     0
0
[3 rows x 22 columns]
In []: df_females_notsenior_internet.to_excel('females_not_senior_internet.xlsx',
     index=False, sheet_name='Sheet1')
In []: #Females Not Senior Device Protection
    df_notsenior_f.groupby('DeviceProtection').count()
    df_females_notsenior_device = df_notsenior_f.groupby('DeviceProtection').count()
    print(df_females_notsenior_device)
                     customerID gender SeniorCitizen Partner Dependents Tenure PhoneSer
vice MultipleLines InternetService OnlineSecurity ... StreamingTV \
DeviceProtection
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In []: df\_females\_notsenior\_device.to\_excel('females\_not\_senior\_device.xlsx', index=False,

file:///C|/...alysis%20Bootcamp%20(JustIT)/Ali%20Kanji%20(Trainer)/Portfolio/Python/Telecom\_Users\_Data\_Analysis\_rev.html[06/08/2024 21:07:21]

```
In[]: # Females Not Senior Streaming TV
          df_notsenior_f.groupby('StreamingTV').count()
          df_females_notsenior_streaming = df_notsenior_f.groupby('StreamingTV').count()
          print(df females notsenior streaming)
                                            customerID gender SeniorCitizen Partner Dependents Tenure PhoneSer
vice MultipleLines InternetService OnlineSecurity ... TechSupport \
StreamingTV
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\label{local_serior_streaming.to_excel('females_not_senior_streaming.xlsx', and the property of the property
          index=False, sheet name='Sheet1')
In []: #Females Not Senior Paperless
          df_notsenior_f.groupby('PaperlessBilling').count()
          df_females_notsenior_paperless = df_notsenior_f.groupby('PaperlessBilling').count()
          print(df_females_notsenior_paperless)
                                     customerID gender SeniorCitizen Partner Dependents Tenure PhoneServi
ce MultipleLines InternetService OnlineSecurity ... TechSupport StreamingTV \
PaperlessBilling
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[2 rows x 22 columns]
In []: df_females_notsenior_paperless.to_excel('females_not_senior_paperless.xlsx',
          index=False, sheet_name='Sheet1')
```

```
In []: #my own analysis
     # average monthly charges
     #create a subset of not Senior Citizens
     df_senior = df[(df["SeniorCitizen"] == 1)]
     print(df_senior)
```

1	,							
	customerID gender		_					_
	InternetService On	_	_		_			
16	8779-QRDMV Male		No	No	1		_	hone serv
ice	DSL	No	No			Month-to-n		
25	3841-NFECX Female	1	Yes	No	71	Yes		
Yes	Fiber optic	Yes	No		No		year	
28	3413-BMNZE Male		No	No	1	Yes		
No	DSL	No	No			onth-to-mo		
43	6575-SUVOI Female		Yes	No	25	Yes		
Yes	DSL	Yes	Yes			Month-to-r		
44	7495-OOKFY Female		Yes	No	8	Yes		
Yes	Fiber optic	No	No		No	Month-to-	month	
	•••	• • • • • • •			• • •			
6027	0666-UXTJO Male		Yes	No	34	Yes		
No	Fiber optic	No	Yes			Ionth-to-m		_
6039	2235-DWLJU Female	1	No	No	6		_	hone ser
vice	DSL	No	Yes		Yes	Month-to-		
6041	3605-JISKB Male	1	Yes	No	55	Yes		
Yes	DSL	Yes	No		No	One	_	
6042		1	No	No	1	Yes		
Yes	Fiber optic	No	No			Month-to-		
6048		1	Yes	No	4	Yes		
Yes	Fiber optic	No	No		No	Month-to-	month	
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25	Yes	Credit card (auto	matic)	96.35		6766.95	No	NaN
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28	No Ba	nk transfer (auto	matic)	45.25		45.25	No	NaN
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43	Yes	Credit card (auto	matic)	69.50		1752.65	No	NaN
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44	Yes	Credit card (auto	matic)	80.65		633.3	Yes	NaN
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6027	Yes	Credit card (auto	matic)	85.20		2874.45	No	NaN
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6039	Yes	Electronic	cneck	44.40		263.05	No	NaN
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6048	Yes	Mailed	cileck	74.40		306.6	Yes	NaN N
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[981 rows x 23 columns]

```
In []: # Males and Females (Senior Citizens)
     df_senior_m = df_senior[(df_senior["gender"] == "Male")]
     print(df_senior_m)
     df senior f = df senior[(df senior["gender"] == "Female")]
     print(df_senior_f)
      customerID gender SeniorCitizen Partner Dependents Tenure PhoneService
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ines InternetService OnlineSecurity ... StreamingTV StreamingMovies
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16
      8779-ORDMV
                    Male
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46
      1658-BYGOY
                    Male
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61
      1891-QRQSA
                    Male
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      8361-LTMKD
                    Male
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       Fiber optic
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                                     PaymentMethod MonthlyCharges TotalCharges Churn Provider
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28
                        Bank transfer (automatic)
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[490 rows x 23 columns]
      customerID gender SeniorCitizen Partner Dependents Tenure PhoneService
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      3841-NFECX Female
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Yes
        Fiber optic
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43
      6575-SUVOI
                   Female
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44
      7495-OOKFY Female
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      2673-CXQEU Female
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5987
      9972-VAFJJ Female
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      5981-ZVXOT Female
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6022
      0723-DRCLG Female
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        Fiber optic
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[491 rows x 23 columns]
In []: #Males_Senior_Phone
     df_senior_m.groupby('PhoneService').count()
     df_males_senior_phone = df_senior_m.groupby('PhoneService').count()
     print(df_males_senior_phone)
```

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customerID gender SeniorCitizen Partner Dependents Tenure MultipleLines
InternetService OnlineSecurity OnlineBackup ... StreamingTV StreamingMovies \
PhoneService
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              Contract PaperlessBilling PaymentMethod MonthlyCharges TotalCharges
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Provider Age
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[2 rows x 22 columns]
In []: df_males_senior_phone.to_excel('males_senior_phone.xlsx', index=False,
    sheet_name = 'Sheet1')
In []: #Males_Senior_Internet
    df_senior_m.groupby('InternetService').count()
    df_males_senior_internet = df_senior_m.groupby('InternetService').count()
    print(df males senior internet)
                 customerID gender SeniorCitizen Partner Dependents Tenure PhoneServic
e MultipleLines OnlineSecurity OnlineBackup \dots StreamingTV StreamingMovies \setminus
InternetService
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In []: df males_senior_internet.to_excel('males_senior_internet.xlsx', index=False,
     sheet name='Sheet1')
In []: #Males_Device Protection_Phone
    df_senior_m.groupby('DeviceProtection').count()
    df_males_senior_device = df_senior_m.groupby('DeviceProtection').count()
    print(df_males_senior_device)
```

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customerID gender SeniorCitizen Partner Dependents Tenure PhoneSer
vice MultipleLines InternetService OnlineSecurity ...
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DeviceProtection
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                     StreamingMovies Contract PaperlessBilling PaymentMethod MonthlyCharg
es TotalCharges
                  Churn Provider Age
DeviceProtection
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No internet service
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Yes
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[3 rows x 22 columns]
In []: df_males_senior_device.to_excel('males_senior_device.xlsx', index=False,
     sheet name='Sheet1')
In []: #Males_Senior_Streaming TV
    df senior m.groupby('StreamingTV').count()
    df_males_senior_streaming = df_senior_m.groupby('StreamingTV').count()
    print(df_males_senior_streaming)
                     customerID gender SeniorCitizen Partner Dependents Tenure PhoneSer
vice MultipleLines InternetService OnlineSecurity ...
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                                 225
                                            225
                                                              225
                                                                              225
                                                                                              225
No
       225
                         0
225
                   0
No internet service
                                   26
                                             26
                                                                26
                                                                               26
                                                                                               26
                  0
26
       26
                        0
Yes
                                 239
                                            239
                                                              239
                                                                              239
                                                                                              239
239
       239
                   0
                         0
[3 rows x 22 columns]
```

In []: df\_males\_senior\_streaming.to\_excel('males\_senior\_streaming.xlsx', index=False,

sheet name='Sheet1')

file:///C|/...alysis%20Bootcamp%20(JustIT)/Ali%20Kanji%20(Trainer)/Portfolio/Python/Telecom\_Users\_Data\_Analysis\_rev.html[06/08/2024 21:07:21]

```
In []: #Males_Senior_Paperless
    df_senior_m.groupby('PaperlessBilling').count()
    df_males_senior_paperless = df_senior_m.groupby('PaperlessBilling').count()
    print(df males senior paperless)
                 customerID gender SeniorCitizen Partner Dependents Tenure PhoneServi
ce MultipleLines InternetService OnlineSecurity \dots TechSupport StreamingTV \setminus
PaperlessBilling
. . .
No
                         117
                                 117
                                                117
                                                         117
                                                                     117
                                                                              117
                                                                                            117
117
                 117
                                 117
                                                   117
                                                                 117
                         373
                                 373
                                                373
                                                                     373
                                                                              373
                                                                                            373
Yes
                                                         373
373
                 373
                                 373
                                                   373
                                                                 373
                 StreamingMovies Contract PaymentMethod MonthlyCharges TotalCharges
                                                                                            Ch
urn Provider Age
PaperlessBilling
                             117
                                        117
                                                       117
                                                                       117
                                                                                     117
                                                                                            117
No
0
     0
                              373
                                        373
                                                       373
                                                                       373
                                                                                     373
                                                                                             37
Yes
3
          0
[2 rows x 22 columns]
In[]: df males senior_paperless.to_excel('males_senior_paperless.xlsx', index=False,
    sheet name='Sheet1')
In []: #Females_Senior_Phone
    df_senior_f.groupby('PhoneService').count()
    df_females_senior_phone = df_senior_f.groupby('PhoneService').count()
    print(df_females_senior_phone)
             customerID gender SeniorCitizen Partner Dependents Tenure MultipleLines
InternetService OnlineSecurity OnlineBackup ... StreamingTV StreamingMovies \
PhoneService
No
                      37
                              37
                                             37
                                                      37
                                                                  37
                                                                          37
                                                                                         37
37
                37
                              37
                                                37
                                                                 37
                     454
                             454
                                            454
                                                     454
                                                                  454
                                                                          454
                                                                                         454
Yes
454
                454
                              454
                                                                  454
                                                454
                                  . . .
             Contract PaperlessBilling PaymentMethod MonthlyCharges TotalCharges
                                                                                         Churn
Provider Age
PhoneService
                    37
                                      37
                                                     37
                                                                                   37
                                                                                          37
No
                                                                     37
0
     \cap
                   454
                                     454
                                                    454
                                                                    454
                                                                                  454
                                                                                          454
Yes
0
     0
[2 rows x 22 columns]
In []: df_females_senior_phone.to_excel('females_senior_phone.xlsx', index=False,
    sheet name='Sheet1')
In []: #Females_Senior_Internet
    df_senior_f.groupby('InternetService').count()
    df_females_senior_internet = df_senior_f.groupby('InternetService').count()
```

```
print(df_females_senior_internet)
```

customerID gender SeniorCitizen Partner Dependents Tenure PhoneServic e MultipleLines OnlineSecurity OnlineBackup ... StreamingTV StreamingMovies InternetService . . . DSL . . . Fiber optic . . . No . . . Contract PaperlessBilling PaymentMethod MonthlyCharges TotalCharges urn Provider InternetService DSL Fiber optic No  $\cap$ [3 rows x 22 columns] In []: df\_females\_senior\_internet.to\_excel('females\_senior\_internet.xlsx', index=False, sheet\_name = 'Sheet1') In []: #Females\_Senior\_Device Protection df\_senior\_f.groupby('DeviceProtection').count() df\_females\_senior\_device = df\_senior\_f.groupby('DeviceProtection').count() print(df\_females\_senior\_device) customerID gender SeniorCitizen Partner Dependents Tenure vice MultipleLines InternetService OnlineSecurity ... StreamingTV \ DeviceProtection . . . No No internet service . . . Yes . . . StreamingMovies Contract PaperlessBilling PaymentMethod MonthlyCharg es TotalCharges Churn Provider Age DeviceProtection No No internet service Yes 

<sup>[3</sup> rows x 22 columns]

In []: df\_females\_senior\_device.to\_excel('females\_senior\_device.xlsx', index=False,

[2 rows x 22 columns]

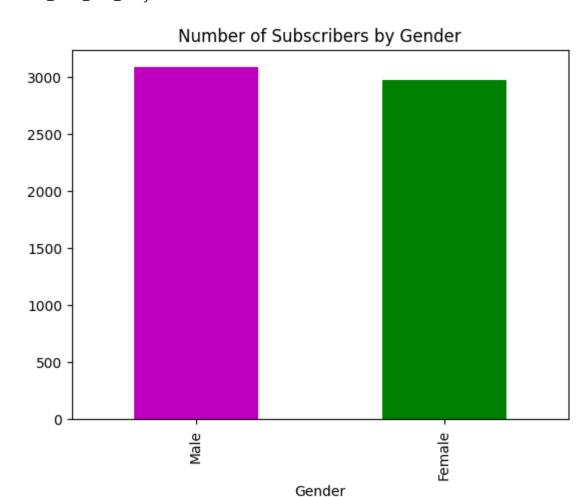
In [ ]:

```
df_females_senior_paperless.to_excel('females_senior_paperless.xlsx', index=False,
sheet_name='Sheet1')
```

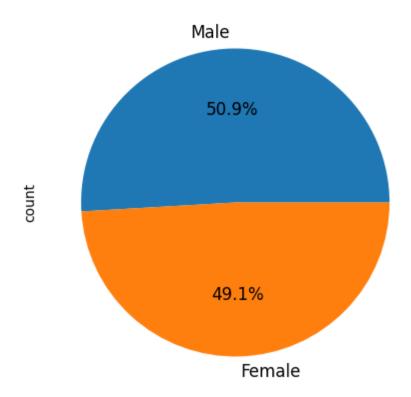
Out[]:	customerID	gender	SeniorCitizen	Partner	Dependents	Tenure	PhoneService	MultipleLines	In
PaymentMethod									
Bank transfer (automatic)	1321	1321	1321	1321	1321	1321	1321	1321	13
Credit card (automatic)	1315	1315	1315	1315	1315	1315	1315	1315	13
Electronic check	2033	2033	2033	2033	2033	2033	2033	2033	20
Mailed check	1381	1381	1381	1381	1381	1381	1381	1381	13

4 rows × 22 columns

```
In []: #Visualisation
    import matplotlib.pyplot as plt
In[]: gender = df["gender"].value_counts()
    print(gender)
gender
Male
          3081
Female
          2969
Name: count, dtype: int64
In []: #visualisation - gender
    import matplotlib.pyplot as plt
    gender.plot(kind = 'bar', color=['m', 'g'])
    plt.title('Number of Subscribers by Gender')
    plt.xlabel('Gender')
    plt.show()
```

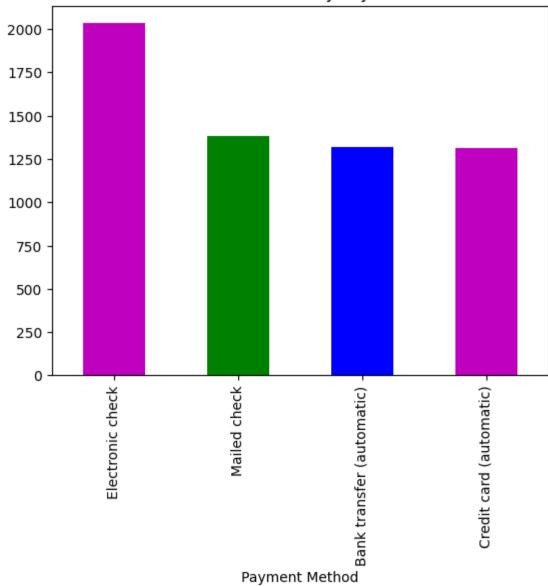


In []: # Pie chart for gender distribution
 axis = (df['gender'].value\_counts() \* 100.0 / len(df)).plot.pie(autopct='%.1f%%',
 labels = ['Male', 'Female'] ,figsize = (5,5), fontsize = 12)



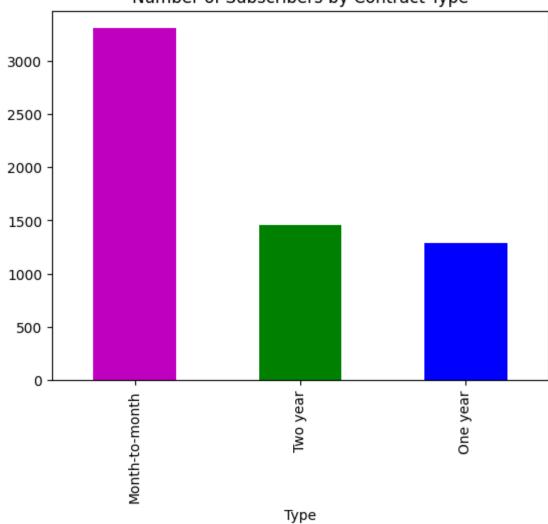
```
In []: paymethod = df["PaymentMethod"].value_counts()
    print(paymethod)
PaymentMethod
                             2033
Electronic check
Mailed check
                             1381
Bank transfer (automatic)
                              1321
Credit card (automatic)
                              1315
Name: count, dtype: int64
In []: \# visualisation payment method
     import matplotlib.pyplot as plt
    paymethod.plot(kind = 'bar', color=['m', 'g', 'b'])
    plt.title('Number of Subscribers by Payment Method')
    plt.xlabel('Payment Method')
    plt.show()
```

### Number of Subscribers by Payment Method

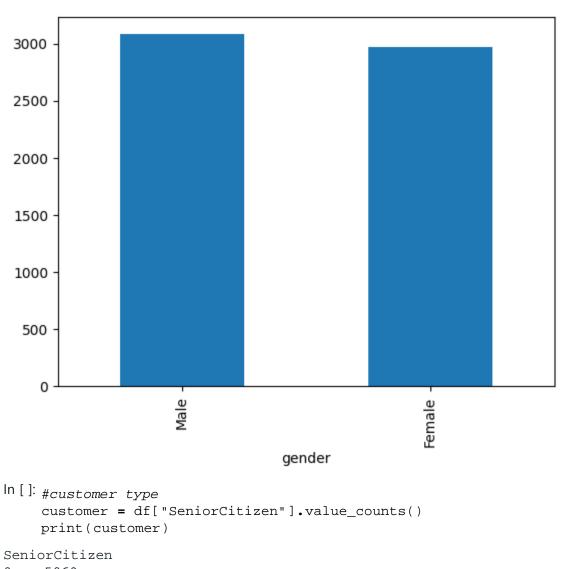


In []: #contract
 contract = df["Contract"].value\_counts()
 print(contract)

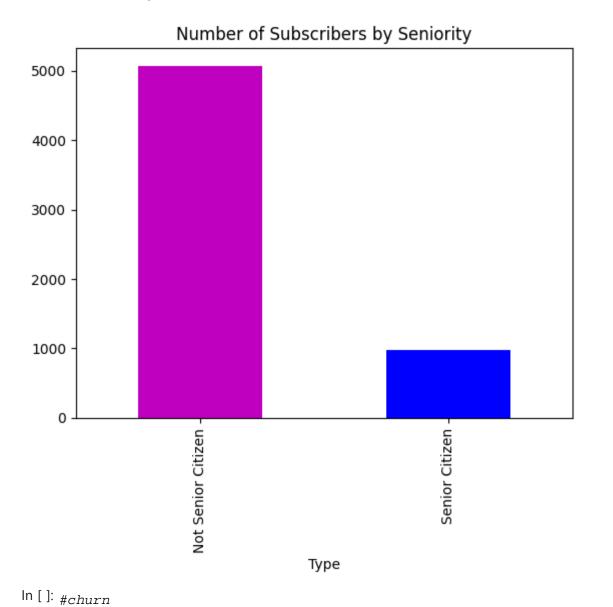
# Number of Subscribers by Contract Type

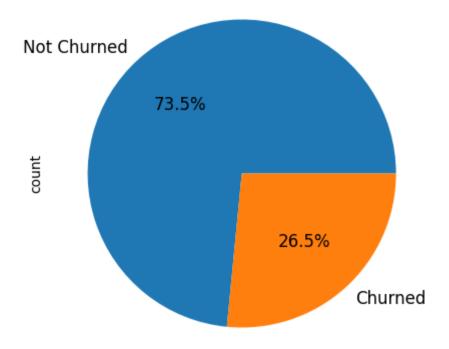


```
In []: #Visualisation
    import matplotlib.pyplot as plt; ax = plt.subplots(1,1)
    import matplotlib.pyplot as plt
    gender.plot(kind = 'bar')
    plt.show()
    title = 'Gender Distribution'
```



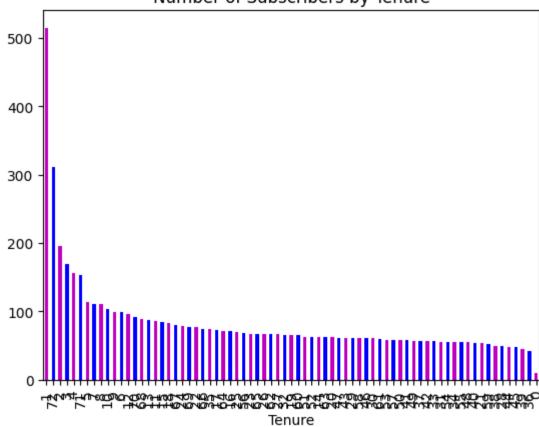
```
SeniorCitizen
0
     5069
      981
Name: count, dtype: int64
In []: \# replace 1 and 0 with senior citizen and not senior citizen
    df['SeniorCitizen'].replace([0,1],['Not Senior Citizen','Senior
    Citizen'],inplace=True)
In []: #customer type
    customer = df["SeniorCitizen"].value_counts()
    print(customer)
SeniorCitizen
Not Senior Citizen
                      5069
                       981
Senior Citizen
Name: count, dtype: int64
In []: \# visualisation senior citizen
    import matplotlib.pyplot as plt
    customer.plot(kind = 'bar', color=['m', 'b'])
    plt.title('Number of Subscribers by Seniority')
    plt.xlabel('Type')
    plt.show()
```



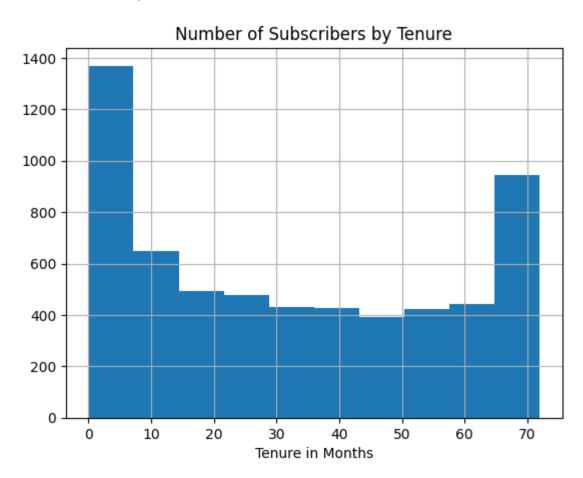


```
In []: \#tenure
     tenure = df["Tenure"].value_counts()
    print(tenure)
Tenure
      514
1
72
      311
2
      196
3
      170
      156
44
       48
45
       48
       45
39
36
       43
       10
Name: count, Length: 73, dtype: int64
In[]: # visualisation tenure
     import matplotlib.pyplot as plt
     tenure.plot(kind = 'bar', color=['m', 'b'])
    plt.title('Number of Subscribers by Tenure')
    plt.xlabel('Tenure')
    plt.show()
```

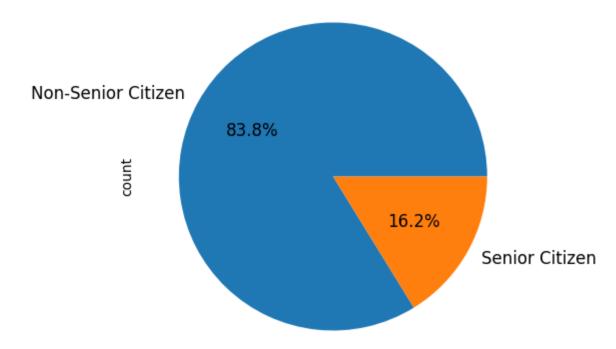
# Number of Subscribers by Tenure



```
In []: # Histogram for tenure
    df.hist(column='Tenure')
    plt.title('Number of Subscribers by Tenure')
    plt.xlabel('Tenure in Months')
    plt.show()
```



In []: # Pie chart for seniority
 axis = (df['SeniorCitizen'].value\_counts() \* 100.0 /
 len(df)).plot.pie(autopct='%.1f%%', labels = ['Non-Senior Citizen', 'Senior Citizen']
 ,figsize =(5,5), fontsize = 12)



In []:

```
# check colums
    df.columns
Out[]:Index(['customerID', 'gender', 'SeniorCitizen', 'Partner', 'Dependents', 'Tenure', 'Pho
    neService', 'MultipleLines', 'InternetService', 'OnlineSecurity', 'OnlineBackup',
            'DeviceProtection', 'TechSupport', 'StreamingTV', 'StreamingMovies', 'Contract',
     'PaperlessBilling', 'PaymentMethod', 'MonthlyCharges', 'TotalCharges', 'Churn', 'Provid
     er',
            'Age'],
          dtype='object')
In []: # grouping by select variables - trial
    df.groupby('PhoneService').count()
Out[]:
                 customerID gender SeniorCitizen Partner Dependents Tenure MultipleLines InternetService Onl
     PhoneService
         No
                 598
                           598
                                 598
                                            598
                                                   598
                                                              598
                                                                    598
                                                                                598
                                                                                            598
                          5452 5452
                                          5452
                                                   5452
                                                             5452
                                                                    5452
                                                                                5452
                                                                                            545
         Yes
                 5452
    2 rows × 22 columns
In []: df.columns
Out[]:Index(['customerID', 'gender', 'SeniorCitizen', 'Partner', 'Dependents', 'Tenure', 'Pho
    neService', 'MultipleLines', 'InternetService', 'OnlineSecurity', 'OnlineBackup',
            'DeviceProtection', 'TechSupport', 'StreamingTV', 'StreamingMovies', 'Contract',
     'PaperlessBilling', 'PaymentMethod', 'MonthlyCharges', 'TotalCharges', 'Churn', 'Provid
    er',
            'Age'l,
          dtype='object')
In []: # Phone Service
    df_gp_data = df.groupby(['gender', 'SeniorCitizen', 'PhoneService'])
In[]: # Phone Service
    phone_group = df_gp_data['PhoneService'].count()
    print(phone_group)
gender SeniorCitizen
                        PhoneService
                                             254
Female Not Senior Citizen No
                                           2224
                          Yes
       Senior Citizen
                           No
                                              37
                                            454
                           Yes
Male
      Not Senior Citizen No
                                             255
                                           2336
                           Yes
       Senior Citizen
                           No
                                              52
                                            438
Name: PhoneService, dtype: int64
In []: phone group.to_excel('phone groups.xlsx', index=False, sheet_name='Sheet1')
In []: df.columns
Out[]:Index(['customerID', 'gender', 'SeniorCitizen', 'Partner', 'Dependents', 'Tenure', 'Pho
    neService', 'MultipleLines', 'InternetService', 'OnlineSecurity', 'OnlineBackup',
            'DeviceProtection', 'TechSupport', 'StreamingTV', 'StreamingMovies', 'Contract',
     'PaperlessBilling', 'PaymentMethod', 'MonthlyCharges', 'TotalCharges', 'Churn', 'Provid
```

No internet service

Yes

No

1014

644 933

225

Not Senior Citizen No

Senior Citizen

Male

```
239
Name: StreamingTV, dtype: int64
In[]: # Paperless Billing
    df_gp_data5 = df.groupby(['gender', 'SeniorCitizen', 'PaperlessBilling'])
    paperless_group = df_gp_data5['PaperlessBilling'].count()
    print(paperless_group)
gender SeniorCitizen
                            PaperlessBilling
Female Not Senior Citizen No
                                                1077
                           Yes
                                              1401
       Senior Citizen
                                                116
                           No
                           Yes
                                               375
Male
       Not Senior Citizen No
                                               1167
                           Yes
                                              1424
       Senior Citizen
                                                117
                           No
                                               373
                           Yes
Name: PaperlessBilling, dtype: int64
In[]: # Payment Method
    df qp data6 = df.qroupby(['qender', 'SeniorCitizen', 'PaymentMethod'])
    paymethod_group = df_gp_data6['PaymentMethod'].count()
    print(paymethod_group)
gender SeniorCitizen
                            PaymentMethod
Female Not Senior Citizen Bank transfer (automatic)
                                                         571
                           Credit card (automatic)
                                                        545
                           Electronic check
                                                        734
                           Mailed check
                                                        628
       Senior Citizen
                           Bank transfer (automatic)
                                                         100
                           Credit card (automatic)
                                                        98
                           Electronic check
                                                        253
                          Mailed check
                                                        40
       Not Senior Citizen Bank transfer (automatic)
                                                         547
Male
                           Credit card (automatic)
                                                        584
                           Electronic check
                                                        790
                           Mailed check
                                                       670
       Senior Citizen
                           Bank transfer (automatic)
                                                        103
                           Credit card (automatic)
                                                        88
                           Electronic check
                                                        256
                          Mailed check
                                                        43
Name: PaymentMethod, dtype: int64
In []: # Contract
    df_gp_data7 = df.groupby(['gender', 'SeniorCitizen', 'Contract'])
    contract_group = df_gp_data7['Contract'].count()
    print(contract_group)
gender SeniorCitizen
                            Contract
Female Not Senior Citizen Month-to-month
                                              1287
                           One year
                                              523
                                             668
                           Two year
       Senior Citizen
                           Month-to-month
                                               346
                           One year
                                               87
                           Two year
                                              58
       Not Senior Citizen Month-to-month
Male
                                              1325
                           One year
                                              594
                                              672
                           Two year
       Senior Citizen
                           Month-to-month
                                               347
```

No internet service

26

One year 84
Two year 59

Name: Contract, dtype: int64 In[]: # Convert the file to html

%%shell

jupyter nbconvert --to html /content/Telecom\_Users\_Data\_Analysis.ipynb

[NbConvertApp] Converting notebook /content/Telecom\_Users\_Data\_Analysis.ipynb to html [NbConvertApp] Writing 1556729 bytes to /content/Telecom\_Users\_Data\_Analysis.html Out[]: