به نام خدا

دانشگاه صنعتی شاهرود

Shahrood University of Technology

دانشکده مهندسی کامپیوتر و فناوری اطلاعات

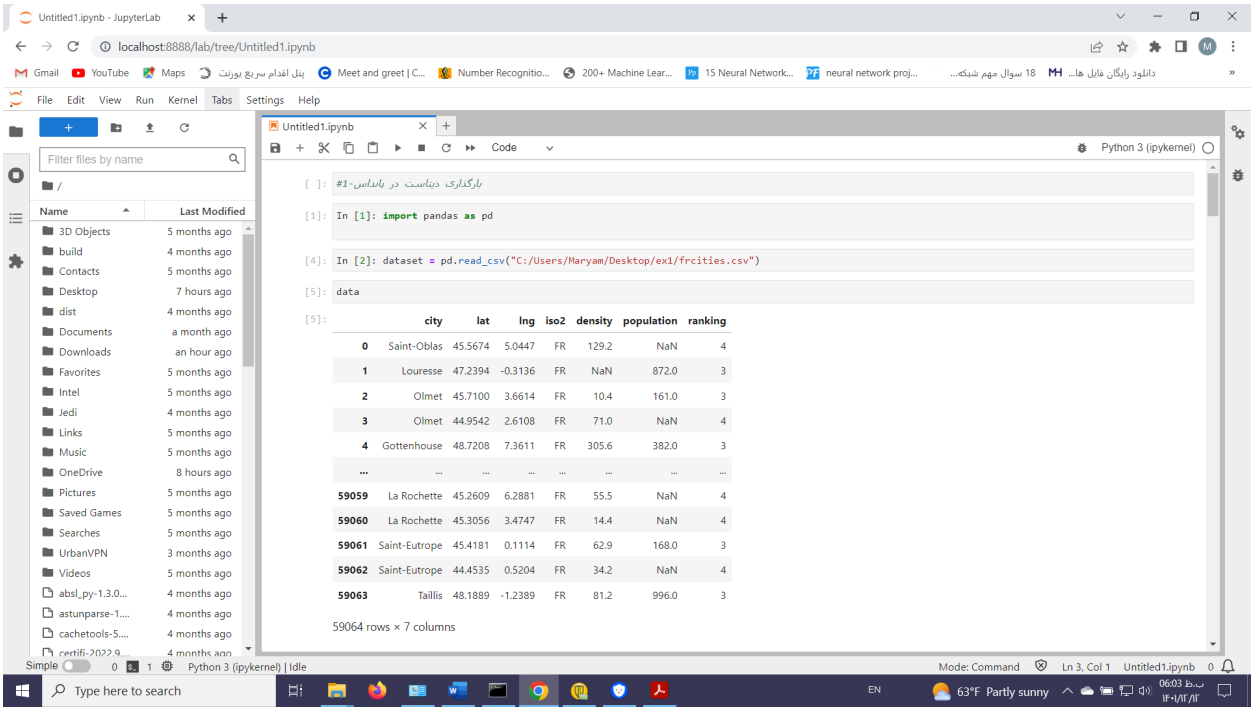
عنوان تمرین:آشنایی با کتابخانه های پایه

استاد: دکتر مرضیه رحیمی

نویسنده: مریم درویشیان

تاریخ:1401/12/12

در این قسمت دیتاست بارگذاری شده و از محتوای آن خروجی گرفتم.



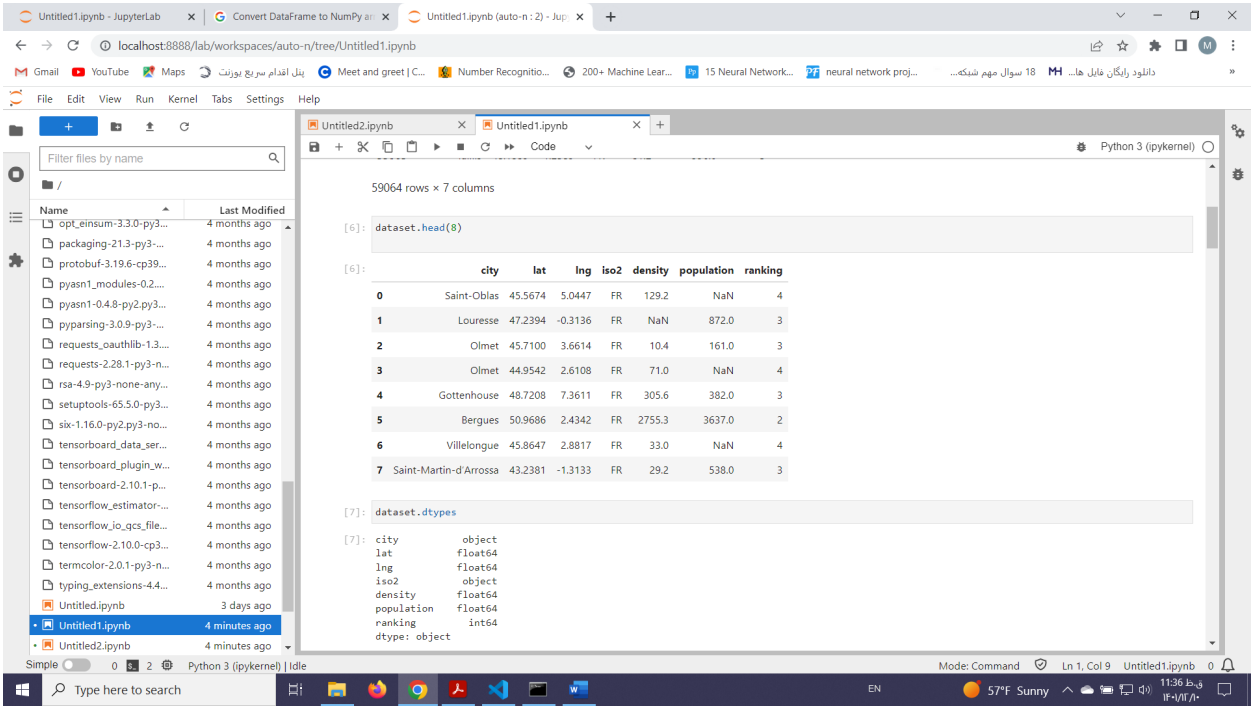
```
#بارگذاری دیتاست در پانداس-1
In [1]: import pandas as pd
In [2]: dataset = pd.read_csv("C:/Users/Maryam/Desktop/ex1/frcities.csv")
In [5]: data
```

Out[5]:

	city	lat	lng	iso2	density	population	ranking
0	Saint-Oblas	45.5674	5.0447	FR	129.2	NaN	4
1	Louresse	47.2394	-0.3136	FR	NaN	872.0	3
2	Olmet	45.7100	3.6614	FR	10.4	161.0	3
3	Olmet	44.9542	2.6108	FR	71.0	NaN	4
4	Gottenhouse	48.7208	7.3611	FR	305.6	382.0	3
...	...	...	...	...	...	...	...
59059	La Rochette	45.2609	6.2881	FR	55.5	NaN	4
59060	La Rochette	45.3056	3.4747	FR	14.4	NaN	4
59061	Saint-Eutrope	45.4181	0.1114	FR	62.9	168.0	3
59062	Saint-Eutrope	44.4535	0.5204	FR	34.2	NaN	4
59063	Taillis	48.1889	-1.2389	FR	81.2	996.0	3

59064 rows × 7 columns

خروجی هشت سطر اول دیتاست:



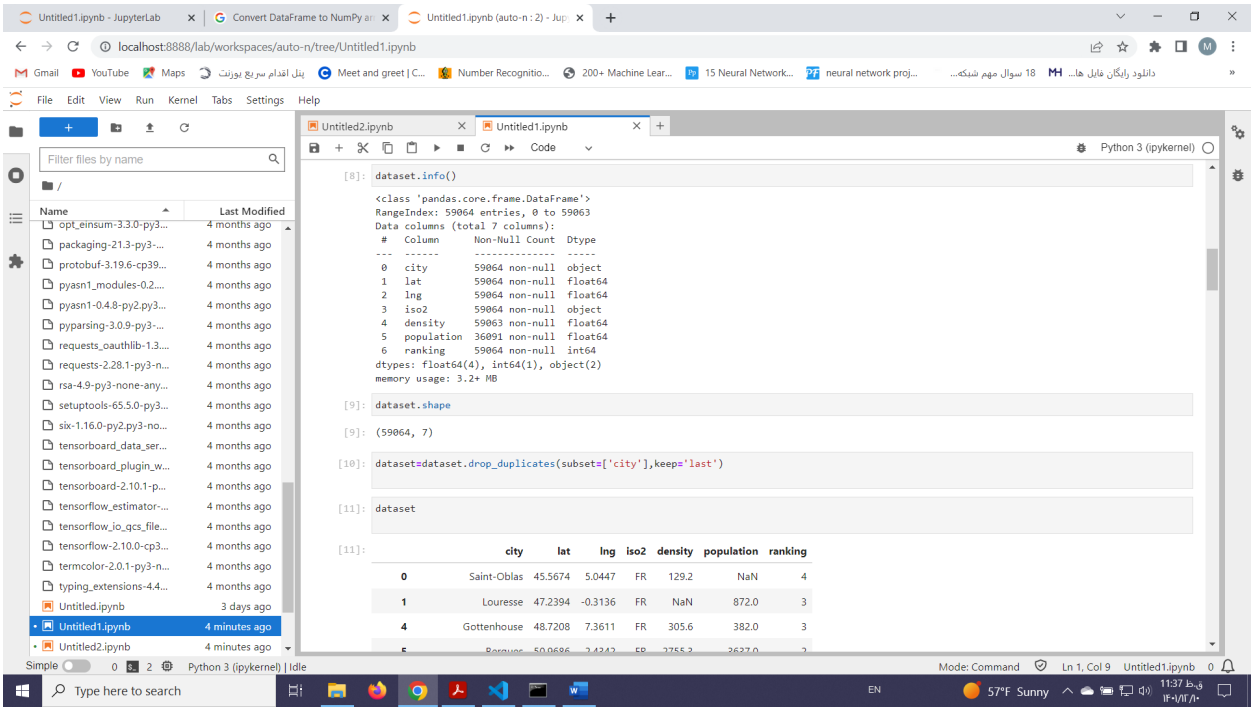
```
In [6]: dataset.head(8)
```

Out[6]:

	city	lat	lng	iso2	density	population	ranking
0	Saint-Oblas	45.5674	5.0447	FR	129.2	NaN	4
1	Louresse	47.2394	-0.3136	FR	NaN	872.0	3
2	Olmet	45.7100	3.6614	FR	10.4	161.0	3
3	Olmet	44.9542	2.6108	FR	71.0	NaN	4
4	Gottenhouse	48.7208	7.3611	FR	305.6	382.0	3
5	Bergues	50.9686	2.4342	FR	2755.3	3637.0	2
6	Villelongue	45.8647	2.8817	FR	33.0	NaN	4
7	Saint-Martin-d'Arrossa	43.2381	-1.3133	FR	29.2	538.0	3

```
In [7]: dataset.dtypes
Out[7]: city          object
        lat          float64
        lng          float64
        iso2          object
        density      float64
        population   float64
        ranking        int64
        dtype: object
```

خروجی اطلاعاتی راجع به دیتاست از قبیل تعداد ستونها و نوع آنها و مقدار حافظه مصرفی:

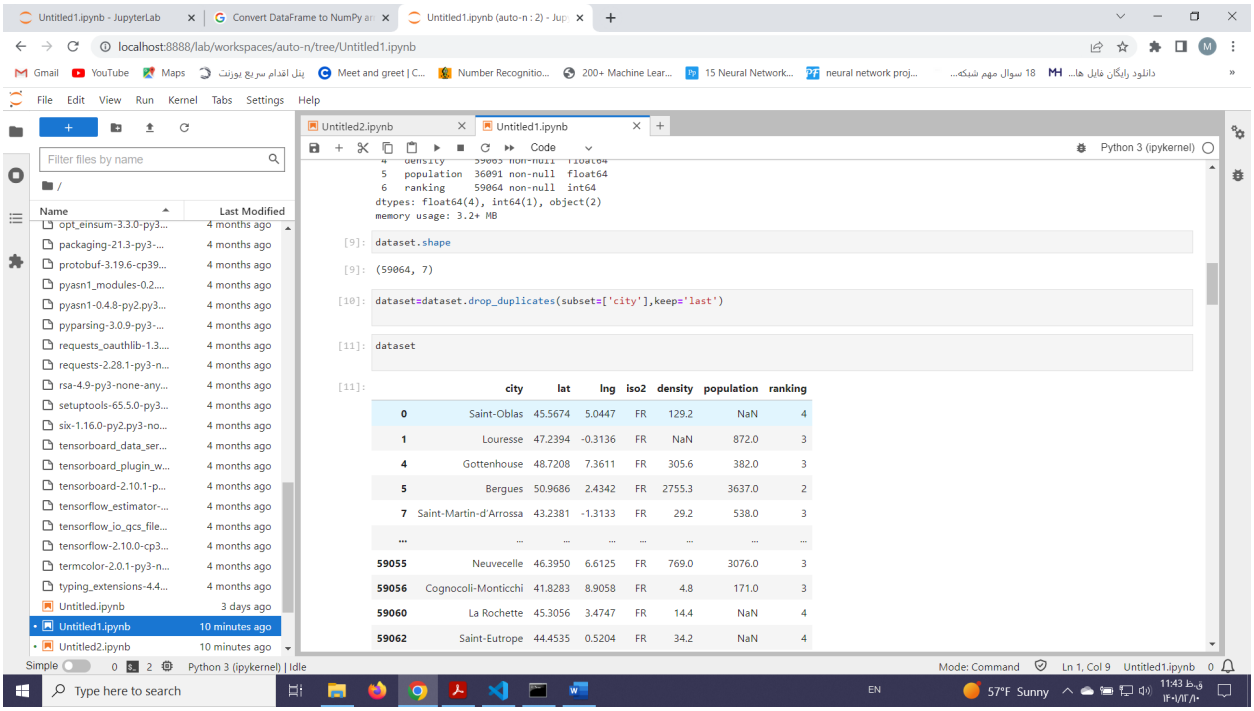


```
[8]: dataset.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 59064 entries, 0 to 59063
Data columns (total 7 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   city        59064 non-null  object
 1   lat         59064 non-null  float64
 2   lng         59064 non-null  float64
 3   iso2        59064 non-null  object
 4   density     59063 non-null  float64
 5   population  36091 non-null  float64
 6   ranking     59064 non-null  int64
dtypes: float64(4), int64(1), object(2)
memory usage: 3.2+ MB

[9]: dataset.shape

[9]: (59064, 7)

[10]: dataset=dataset.drop_duplicates(subset=['city'],keep='last')

[11]: dataset
```

[11]:

	city	lat	lng	iso2	density	population	ranking
0	Saint-Oblas	45.5674	5.0447	FR	129.2	NaN	4
1	Louresse	47.2394	-0.3136	FR	NaN	872.0	3
4	Gottenhouse	48.7208	7.3611	FR	305.6	382.0	3

تعداد و نوع ستونها با دستور Shape :

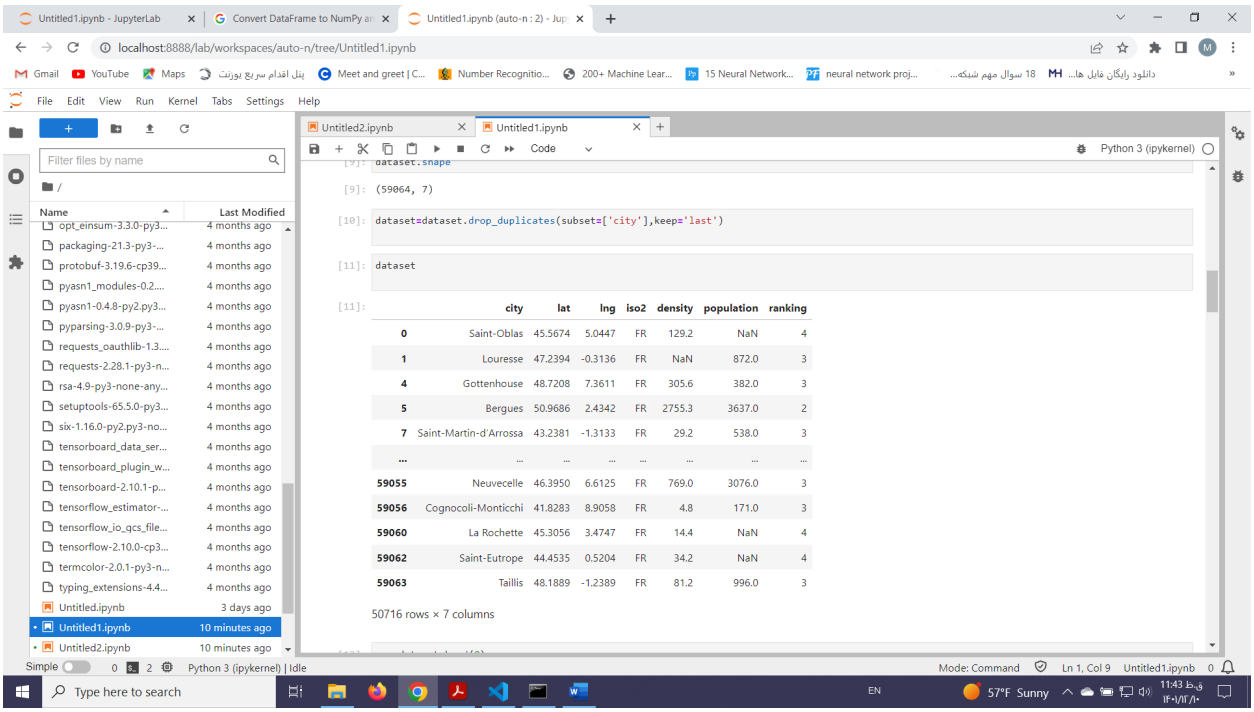


```
dtypes: float64(4), int64(1), object(2)
memory usage: 3.2+ MB

[9]: dataset.shape

[9]: (59064, 7)

[10]: dataset=dataset.drop_duplicates(subset=['city'],keep='last')

[11]: dataset
```

[11]:

	city	lat	lng	iso2	density	population	ranking
0	Saint-Oblas	45.5674	5.0447	FR	129.2	NaN	4
1	Louresse	47.2394	-0.3136	FR	NaN	872.0	3
4	Gottenhouse	48.7208	7.3611	FR	305.6	382.0	3
5	Bergues	50.9686	2.4342	FR	2755.3	3637.0	2
7	Saint-Martin-d'Arrossa	43.2381	-1.3133	FR	29.2	538.0	3
...	...	...	...	...	...	...	...
59055	Neuvecelle	46.3950	6.6125	FR	769.0	3076.0	3
59056	Cognocoli-Monticchi	41.8283	8.9058	FR	4.8	171.0	3
59060	La Rochette	45.3056	3.4747	FR	14.4	NaN	4
59062	Saint-Eutrope	44.4535	0.5204	FR	34.2	NaN	4

حذف سطرهایی با نام شهر تکراری و کاهش سطرها از 59063 به 50716 سطر و بخاطر وجود last اخرین سطر duplicate را نگه میدارد:



```
dataset.shape
```

```
(59064, 7)
```

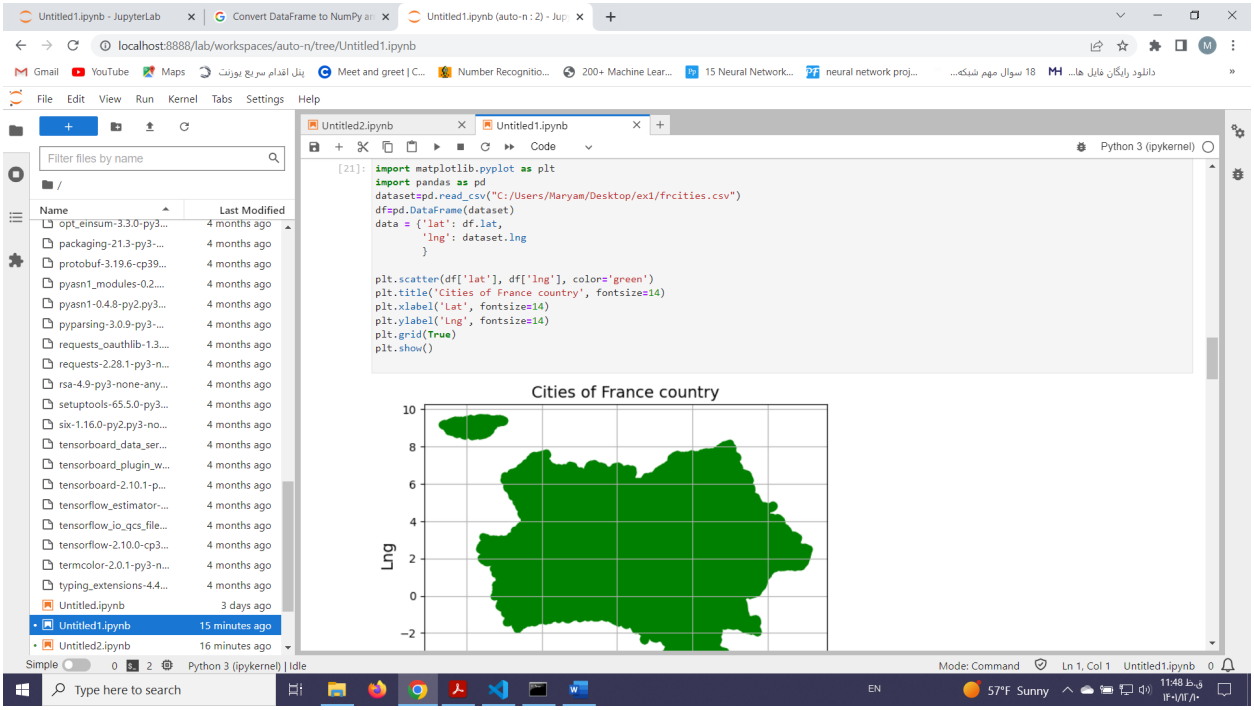
```
dataset=dataset.drop_duplicates(subset=['city'],keep='last')
```

```
dataset
```

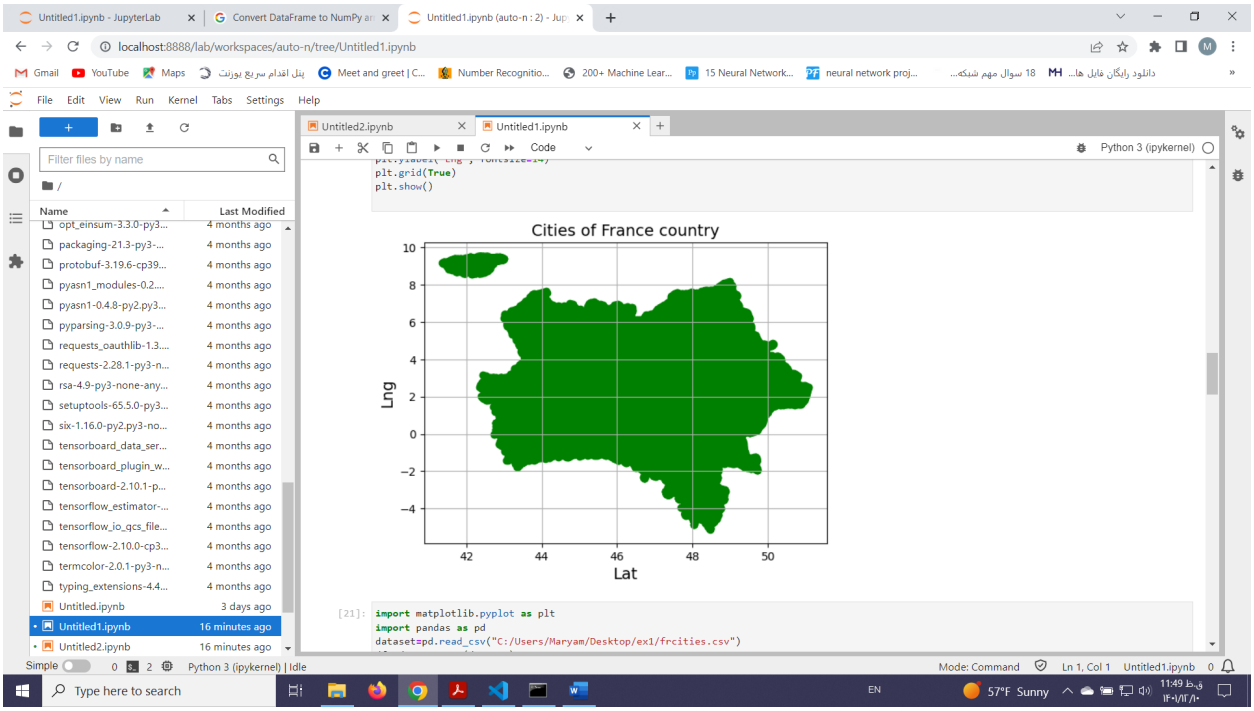
	city	lat	lng	iso2	density	population	ranking
0	Saint-Oblas	45.5674	5.0447	FR	129.2	NaN	4
1	Louresse	47.2394	-0.3136	FR	NaN	872.0	3
4	Gottenhouse	48.7208	7.3611	FR	305.6	382.0	3
5	Bergues	50.9686	2.4342	FR	2755.3	3637.0	2
7	Saint-Martin-d'Arrossa	43.2381	-1.3133	FR	29.2	538.0	3
...	...	...	...	...	...	...	...
59055	Neuvecelle	46.3950	6.6125	FR	769.0	3076.0	3
59056	Cognocoli-Monticchi	41.8283	8.9058	FR	4.8	171.0	3
59060	La Rochette	45.3056	3.4747	FR	14.4	NaN	4
59062	Saint-Eutrope	44.4535	0.5204	FR	34.2	NaN	4
59063	Taillis	48.1889	-1.2389	FR	81.2	996.0	3

50716 rows × 7 columns

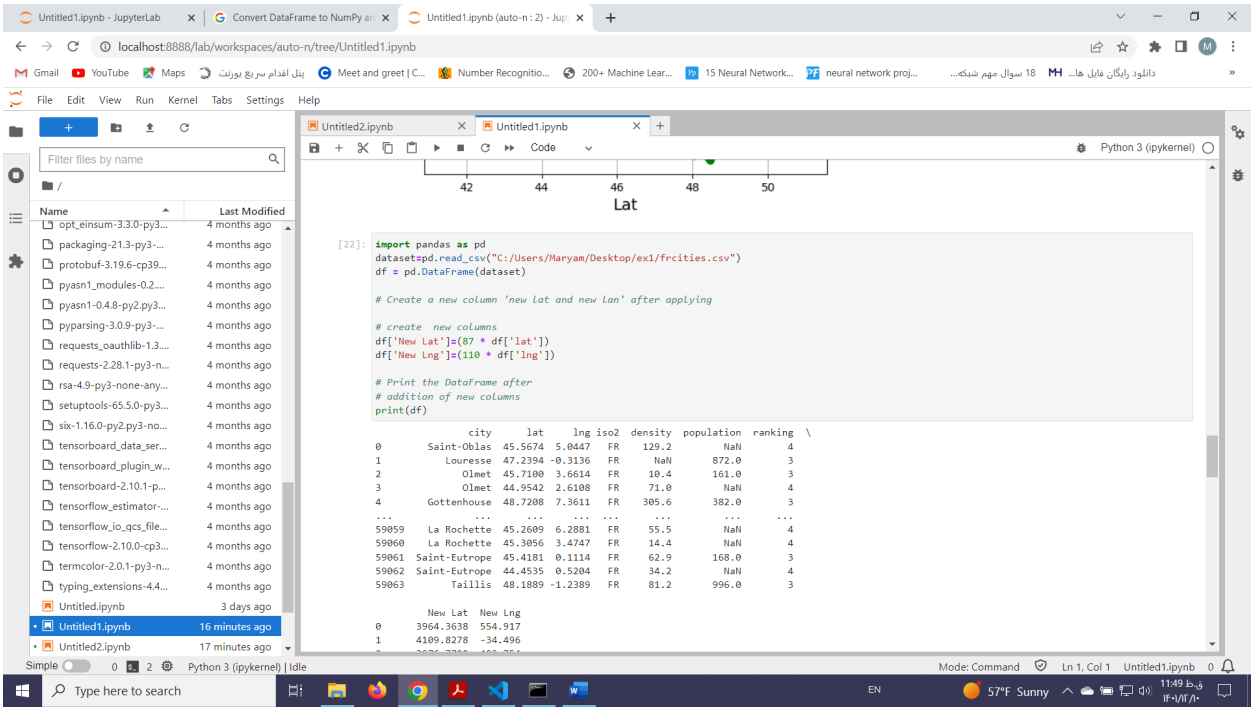
استفاده از کتابخانه Matplotlib برای رسم نمودار دیتا ست بر اساس Lat و Lng :



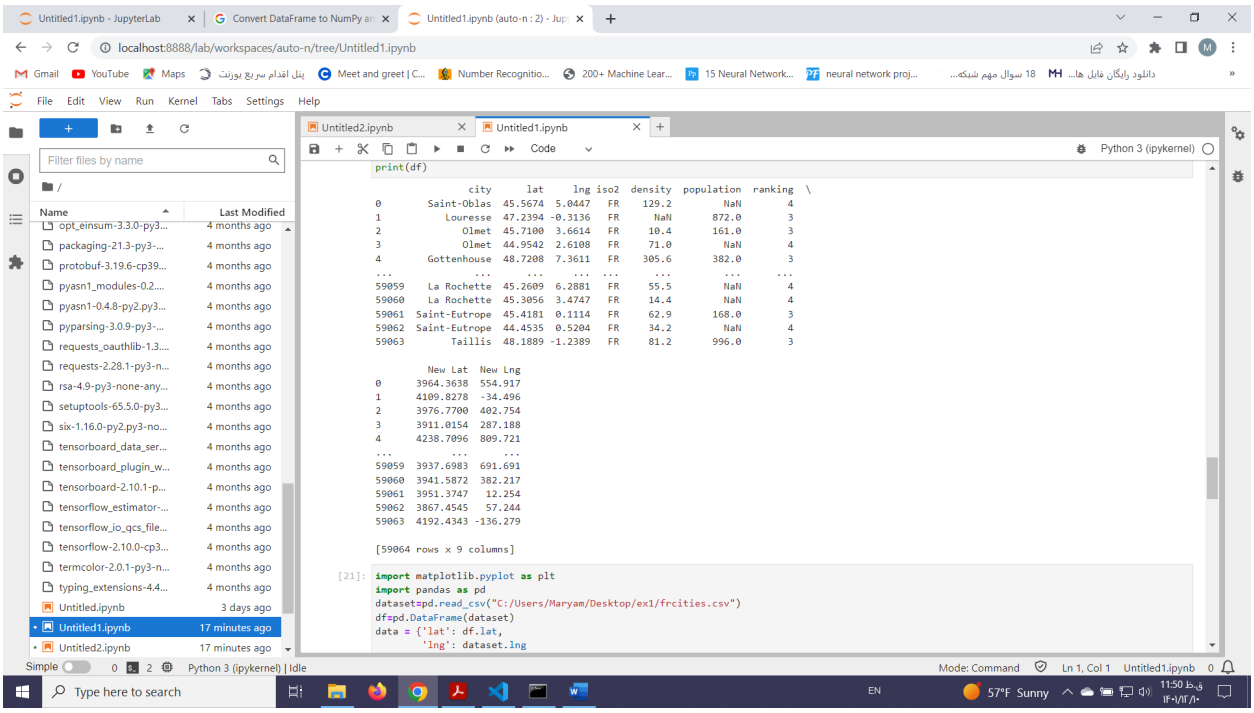
```
import matplotlib.pyplot as plt
import pandas as pd
dataset=pd.read_csv("C:/Users/Maryam/Desktop/ex1/frcities.csv")
df=pd.DataFrame(dataset)
data = {'lat': df.lat,
        'lng': dataset.lng
        }

plt.scatter(df['lat'], df['lng'], color='green')
plt.title('Cities of France country', fontsize=14)
plt.xlabel('Lat', fontsize=14)
plt.ylabel('Lng', fontsize=14)
plt.grid(True)
plt.show()
```



ایجاد دو ستون جدید برای Lat , Lng بر حسب کیلومتر:



نمایش ستونهای جدید به اضافه قبلیها:

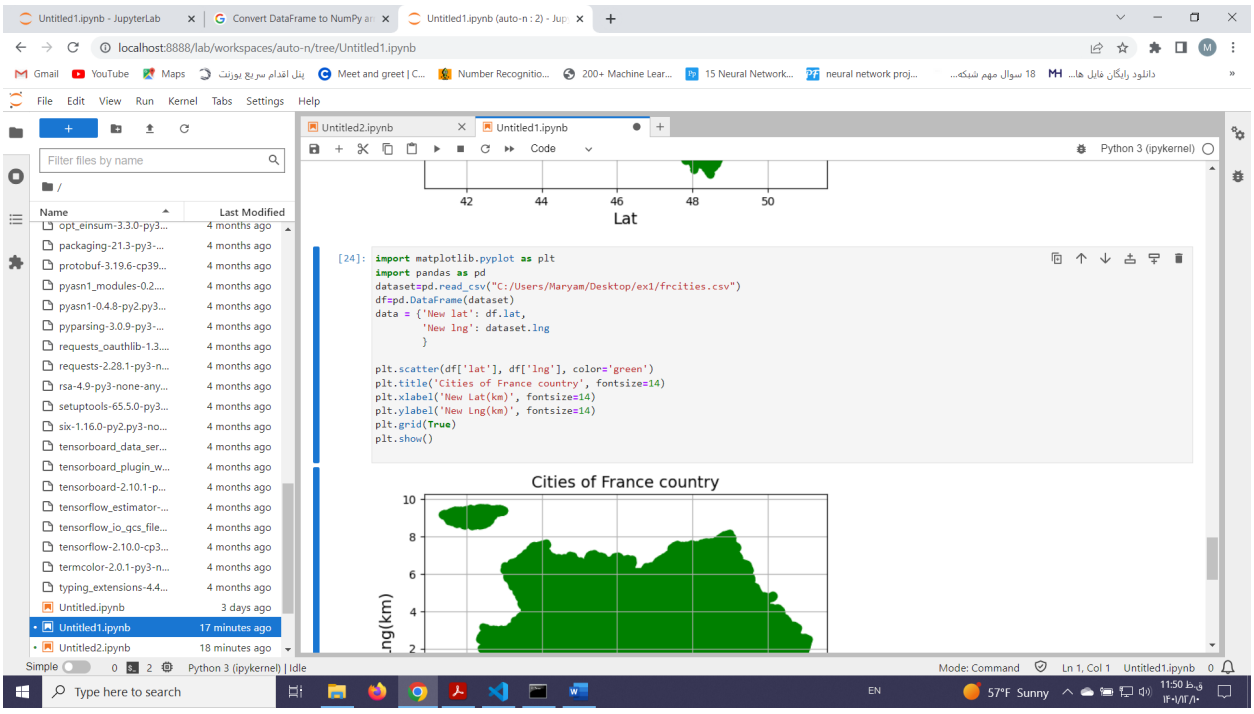


```
print(df)
```

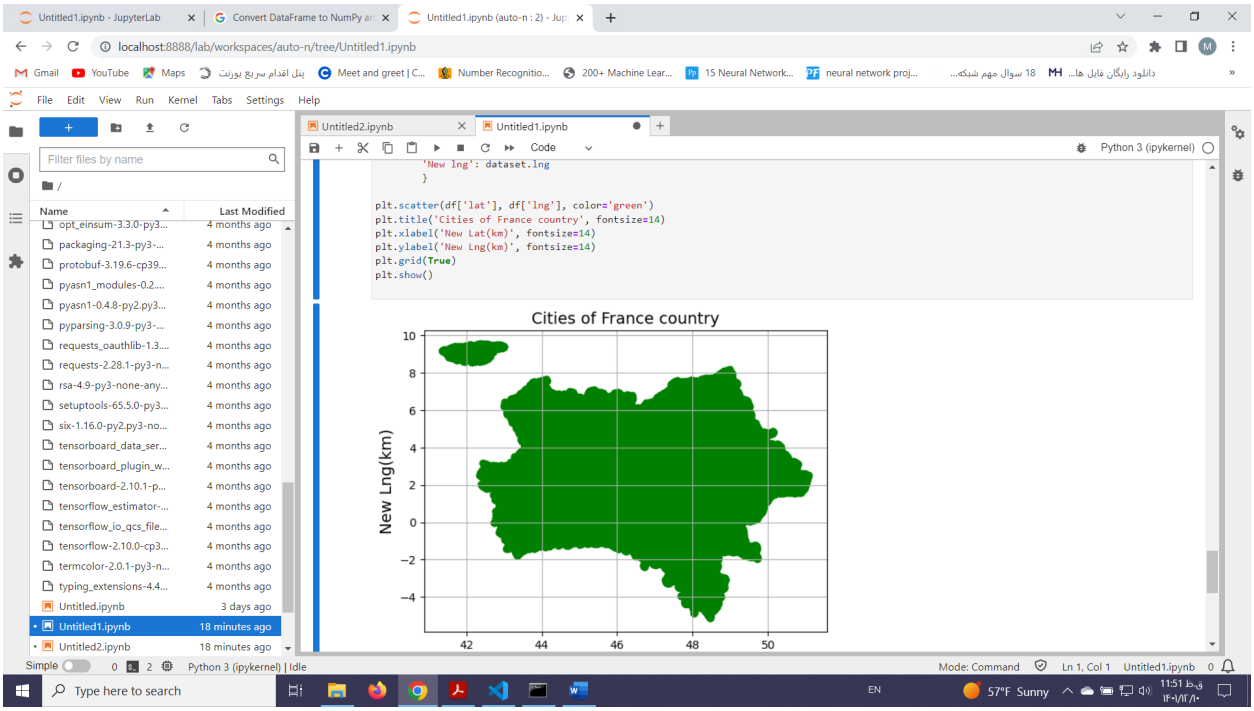
```
                city      lat     lng iso2  density  population  ranking  \
0        Saint-Oblas  45.5674  5.0447   FR    129.2         NaN        4
1          Louresse  47.2394 -0.3136   FR      NaN       872.0        3
2              Olmet  45.7100  3.6614   FR     10.4       161.0        3
3              Olmet  44.9542  2.6108   FR     71.0         NaN        4
4        Gottenhouse  48.7208  7.3611   FR    305.6       382.0        3
...              ...      ...     ...  ...      ...         ...      ...
59059    La Rochette  45.2609  6.2881   FR     55.5         NaN        4
59060    La Rochette  45.3056  3.4747   FR     14.4         NaN        4
59061  Saint-Eutrope  45.4181  0.1114   FR     62.9       168.0        3
59062  Saint-Eutrope  44.4535  0.5204   FR     34.2         NaN        4
59063        Taillis  48.1889 -1.2389   FR     81.2       996.0        3

        New Lat  New Lng
0     3964.3638  554.917
1     4109.8278  -34.496
2     3976.7700  402.754
3     3911.0154  287.188
4     4238.7096  809.721
...         ...      ...
59059 3937.6983  691.691
59060 3941.5872  382.217
59061 3951.3747   12.254
59062 3867.4545   57.244
59063 4192.4343 -136.279

[59064 rows x 9 columns]
```

```
[21]: import matplotlib.pyplot as plt
      import pandas as pd
      dataset=pd.read_csv("C:/Users/Maryam/Desktop/ex1/frcities.csv")
      df=pd.DataFrame(dataset)
      data = {'lat': df.lat,
              'lng': dataset.lng
```

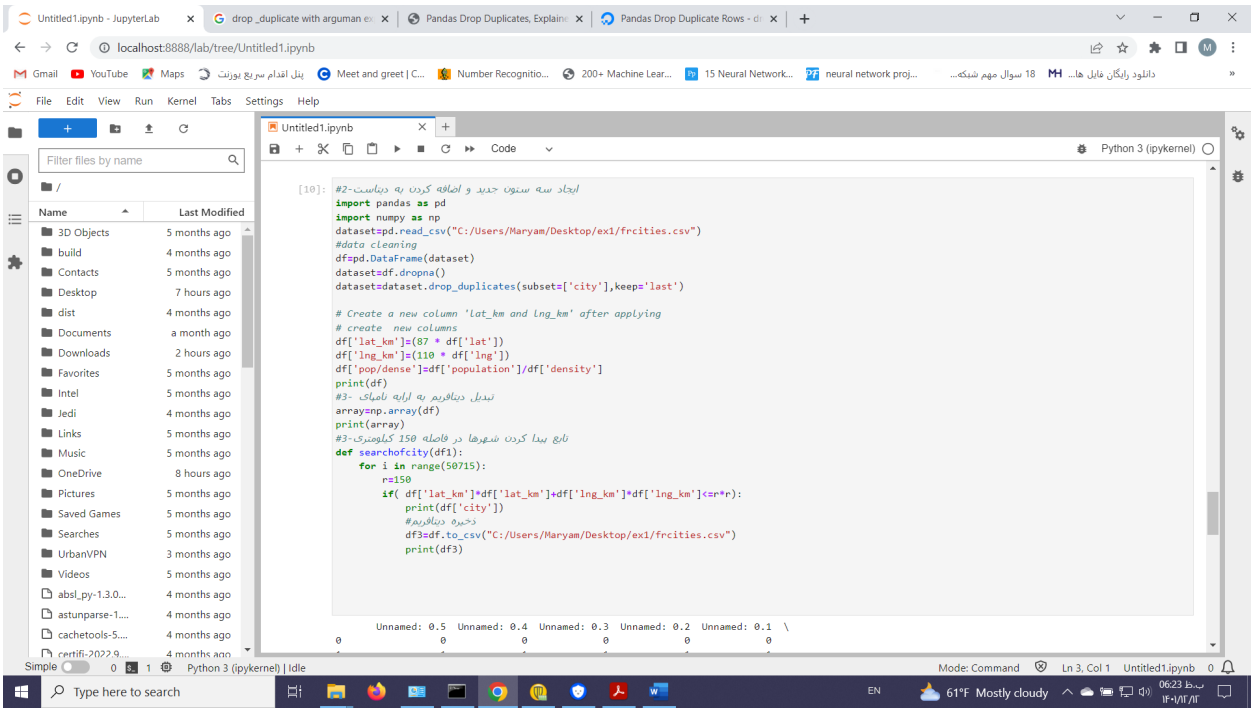
ترسیم دوباره نمودار بر اساس ستونهای جدید:



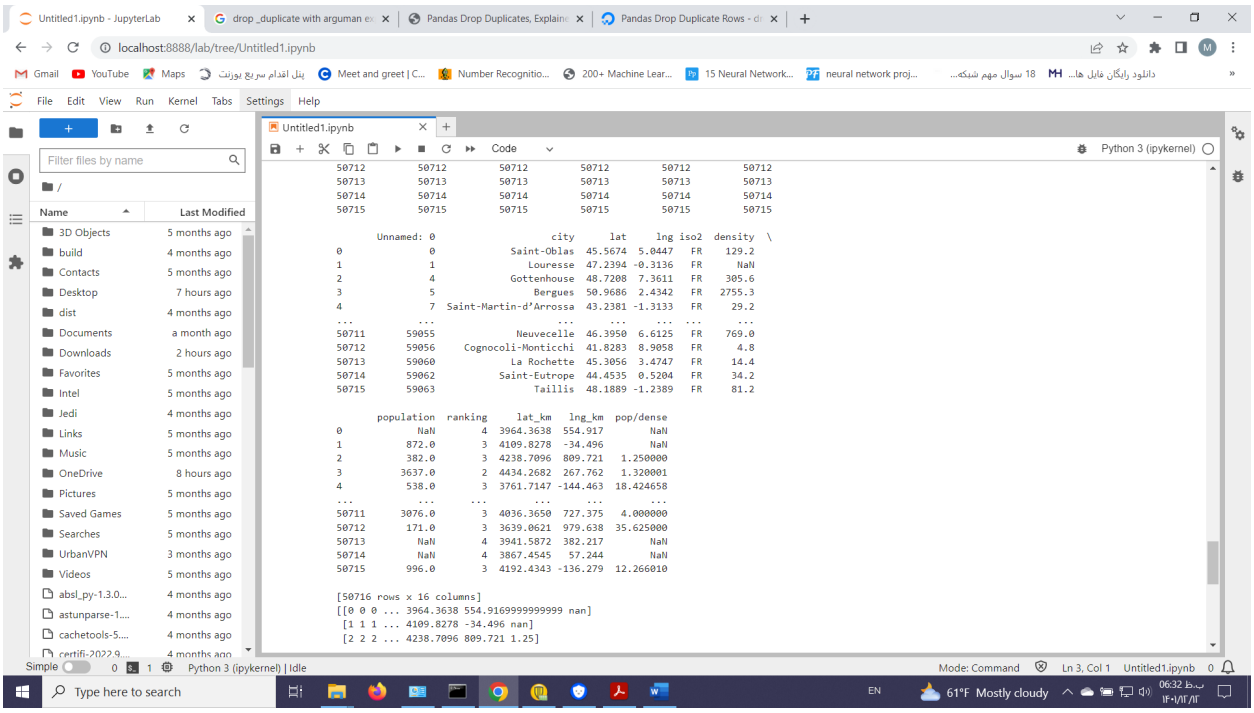
```
[24]: import matplotlib.pyplot as plt
      import pandas as pd
      dataset=pd.read_csv("C:/Users/Maryam/Desktop/ex1/frcities.csv")
      df=pd.DataFrame(dataset)
      data = {'New lat': df.lat,
              'New lng': dataset.lng
              }

      plt.scatter(df['lat'], df['lng'], color='green')
      plt.title('Cities of France country', fontsize=14)
      plt.xlabel('New Lat(km)', fontsize=14)
      plt.ylabel('New Lng(km)', fontsize=14)
      plt.grid(True)
      plt.show()
```



بارگذاری دیتاست و DataCleaning ایجاد سه ستون جدید در دیتاست تبدیل دیتافریم به آرایه نامپای و محاسبه تراکم جمعیت و تابع پیدا کردن شهرها بر اساس فرمول دایره و فاصله نقاط از مبدا مختصات و ذخیره دیتافریم:

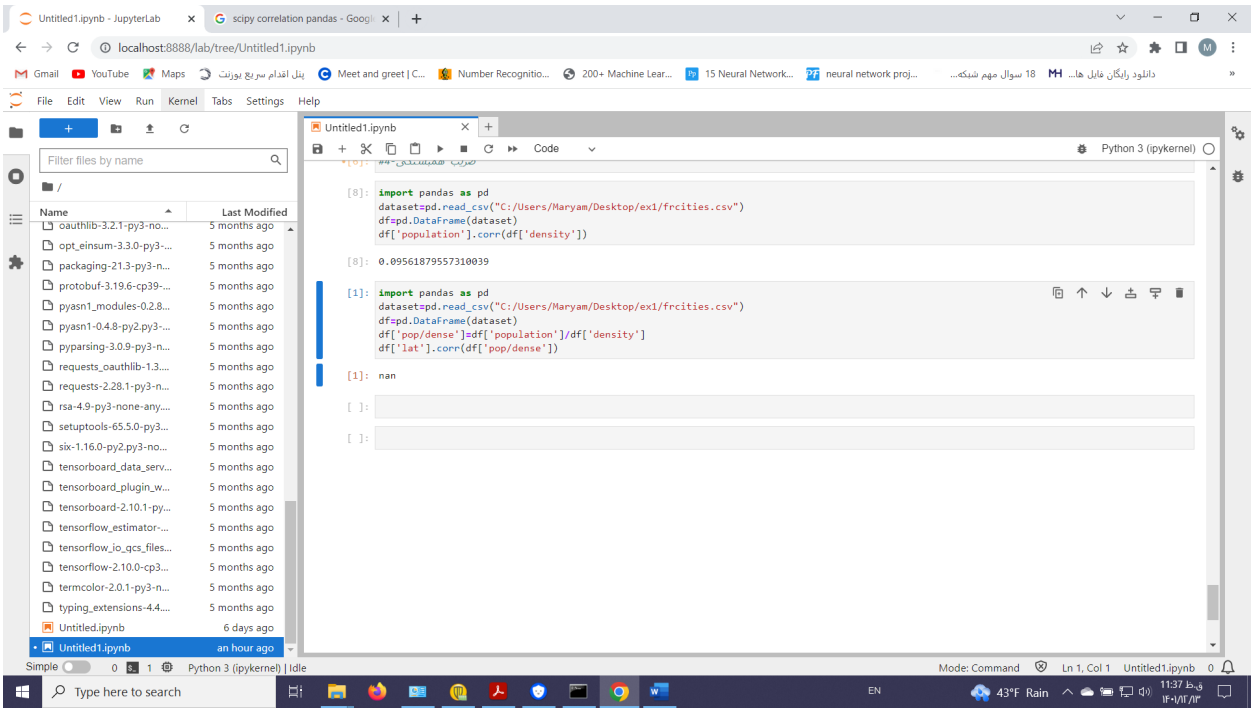


خروجی:



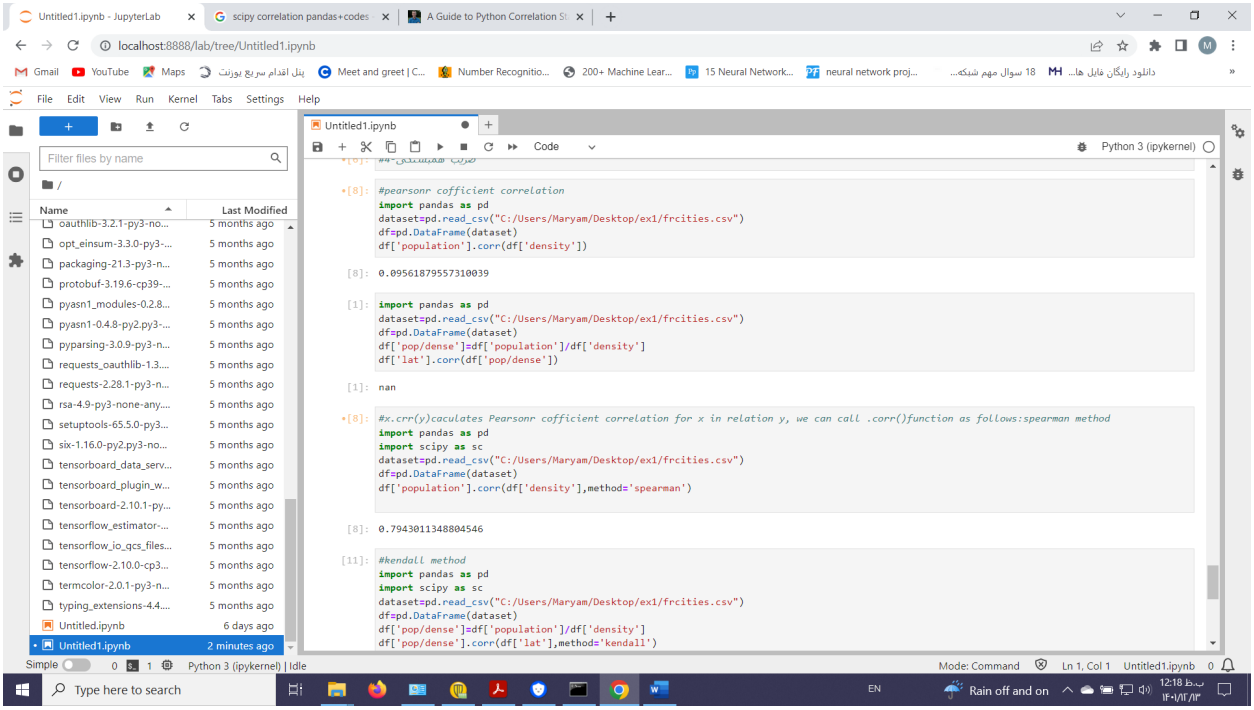
```
      50712       50712       50712       50712       50712       50712
      50713       50713       50713       50713       50713       50713
      50714       50714       50714       50714       50714       50714
      50715       50715       50715       50715       50715       50715

       Unnamed: 0                 city      lat     lng iso2  density  \
0               0            Saint-Oblas  45.5674  5.0447   FR    129.2
1               1              Louresse  47.2394 -0.3136   FR      NaN
2               4           Gottenhouse  48.7208  7.3611   FR    305.6
3               5               Bergues  50.9686  2.4342   FR   2755.3
4               7  Saint-Martin-d'Arrossa  43.2381 -1.3133   FR     29.2
...           ...                   ...      ...     ...  ...      ...
50711       59055           Neuvecelle  46.3950  6.6125   FR    769.0
50712       59056    Cognocoli-Monticchi  41.8283  8.9058   FR      4.8
50713       59060           La Rochette  45.3056  3.4747   FR     14.4
50714       59062         Saint-Eutrope  44.4535  0.5204   FR     34.2
50715       59063               Taillis  48.1889 -1.2389   FR     81.2

       population  ranking     lat_km   lng_km  pop/dense
0             NaN        4  3964.3638  554.917        NaN
1           872.0        3  4109.8278  -34.496        NaN
2           382.0        3  4238.7096  809.721   1.250000
3          3637.0        2  4434.2682  267.762   1.320001
4           538.0        3  3761.7147 -144.463  18.424658
...           ...      ...        ...      ...        ...
50711      3076.0        3  4036.3650  727.375   4.000000
50712       171.0        3  3639.0621  979.638  35.625000
50713         NaN        4  3941.5872  382.217        NaN
50714         NaN        4  3867.4545   57.244        NaN
50715       996.0        3  4192.4343 -136.279  12.266010

[50716 rows x 16 columns]
[[0 0 0 ... 3964.3638 554.9169999999999 nan]
 [1 1 1 ... 4109.8278 -34.496 nan]
 [2 2 2 ... 4238.7096 809.721 1.25]
```

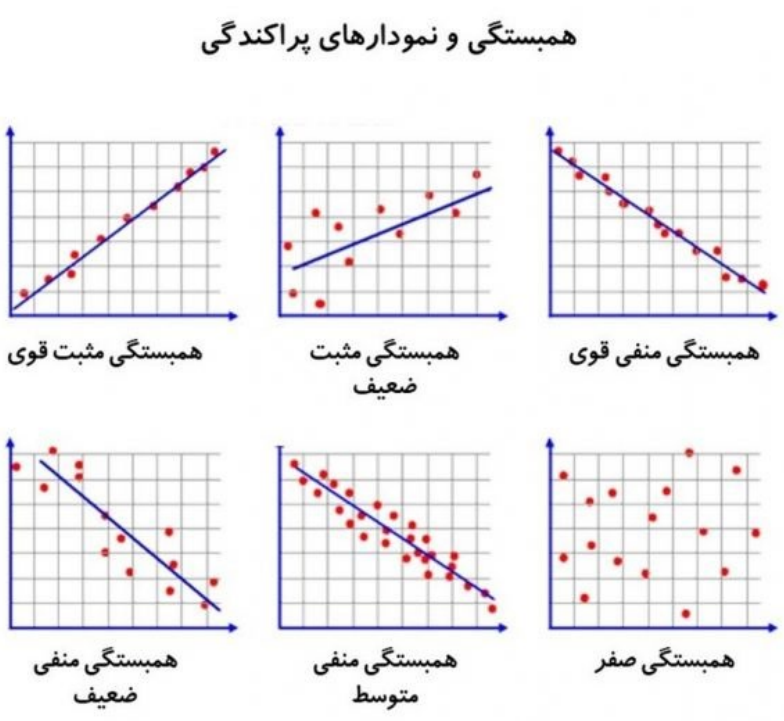
محاسبه ضریب همبستگی بین ستونهای مشخص شده دیتافریم:

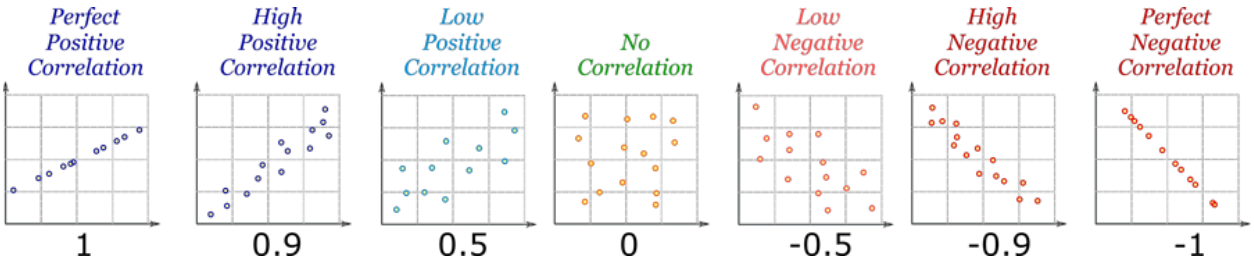


```
[8]: import pandas as pd
     dataset=pd.read_csv("C:/Users/Maryam/Desktop/ex1/frcities.csv")
     df=pd.DataFrame(dataset)
     df['population'].corr(df['density'])

[8]: 0.09561879557310039

[1]: import pandas as pd
     dataset=pd.read_csv("C:/Users/Maryam/Desktop/ex1/frcities.csv")
     df=pd.DataFrame(dataset)
     df['pop/dense']=df['population']/df['density']
     df['lat'].corr(df['pop/dense'])

[1]: nan
```

مقدار ضریب همبستگی بین دو ستون با استفاده از متدهای corr. برای Pearsonr و متدهای Spearman و Kendall محاسبه شده است:







با توجه به مقادیر محاسبه شده density و population با متد pearson همبستگی مثبت خطی دارند.میزان همبستگی در شکل بالا کاملا مشخص است.