In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

Exercise

For these exercices we are using a dataset (https://www.kaggle.com/dgomonov/new-york-city-airbnb-open-data/kernels) provided by Airbnb for a Kaggle competition. It describes its offer for New York City in 2019, including types of appartments, price, location etc.

1. Create a dataframe

Create a dataframe of a few lines with objects and their poperties (e.g fruits, their weight and colour). Calculate the mean of your Dataframe.

In [2]:

```
dict_of_list = {'fruit_name': ["apple", "pear", "watermelon"], 'weight
':[100, 94, 95], 'colour':['green', "yellow", "rosa"]}
fruits = pd.DataFrame(dict_of_list)
```

In [3]:

```
fruits.describe()
# calculates common statistical values
# and makes it only for the columns that make sense
```

Out[3]:

	weight
count	3.000000
mean	96.333333
std	3.214550
min	94.000000
25%	94.500000
50%	95.000000
75%	97.500000
max	100.000000

In [4]:

```
fruits.mean()
```

Out[4]:

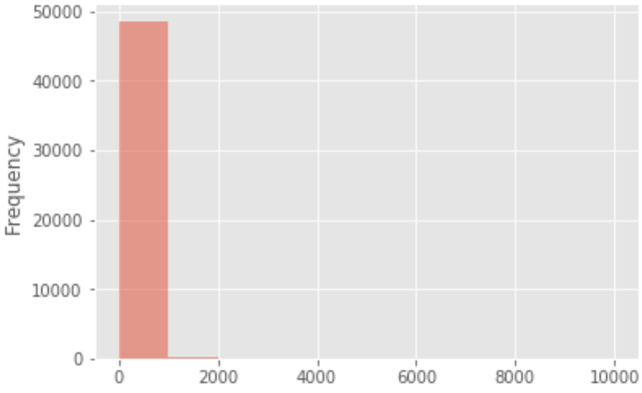
```
weight    96.333333
dtype: float64
```

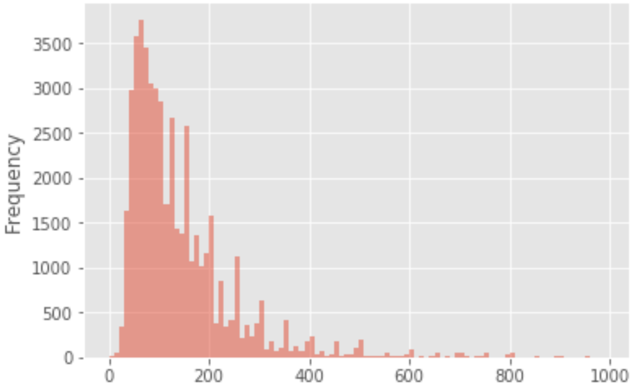
2. Import

- Import the table called `AB_NYC_2019.csv` as a dataframe. It is located in the Datasets folder. Have a look at the beginning of the table (head).
- Create a histogram of prices

```
In [5]: mydata = pd.read_csv('Datasets/AB_NYC_2019.csv')
        # mydata
```

```
In [6]: plt.style.use('ggplot')
        mydata['price'].plot.hist(alpha = 0.5)
        plt.show()
        # to have nicer plot (more bars)
        mydata['price'].plot.hist(alpha = 0.5, bins=range(0,1000,10))
        plt.show()
```





3. Operations

Create a new column in the dataframe by multiplying the "price" and "availability_365" columns to get an estimate of the maximum yearly income.

```
In [7]: mydata['max_yearly_income'] = mydata['price'] * mydata['availability_365
        ']
```

```
/usr/local/lib/python3.5/dist-packages/pandas/core/computation/check.py:1
9: UserWarning: The installed version of numexpr 2.4.3 is not supported i
n pandas and will be not be used
The minimum supported version is 2.6.1

  ver=ver, min_ver=_MIN_NUMEXPR_VERSION), UserWarning)
```

```
In [8]: # what can be done with numpy can be done
        # np.log(mydata['price'])
```

```
In [9]: # mydata
```

3b. Subselection and plotting

Create a new Dataframe by first subselecting yearly incomes between 1 and 100'000. Then make a scatter plot of yearly income versus number of reviews

In [10]:

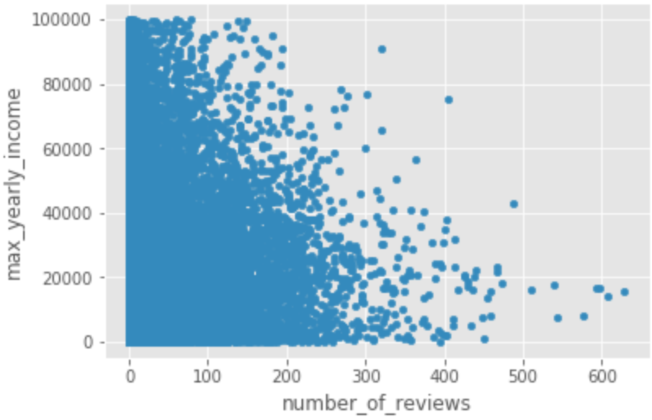
```
#mydata_sub = mydata[ (mydata['max_yearly_income'] >= 1) and (mydata['max_yearly_income'] <= 100000) ]
#mydata_sub = mydata[ (mydata.max_yearly_income >= 1) and (mydata.max_yearly_income <= 100000) ]
mydata_sub = mydata[ (mydata['max_yearly_income'] >= 1) & (mydata['max_yearly_income'] <= 100000) ].copy()
# mydata[(mydata.max_yearly_income>=1)&(mydata.max_yearly_income <= 100000)].copy()
# mydata_sub
```

In [11]:

```
mydata_sub.plot(x = 'number_of_reviews', y = 'max_yearly_income',kind = 'scatter')
max(mydata_sub['max_yearly_income'])
```

Out[11]:

```
99900
```



4. Combine

We provide below an additional table that contains the number of inhabitants of each of New York's boroughs ("neighbourhood_group" in the table). Use `merge` to add this population information to each element in the original dataframe.

In [12]:

```
borough_dt = pd.read_excel('Datasets/ny_boroughs.xlsx')
#borough_dt
```

In [13]:

```
#mydata
```

In [14]:

```
merged_dt = pd.merge(mydata, borough_dt, left_on='neighbourhood_group', right_on='borough', how='left')
#merged_dt
```

5. Groups

- Using `groupby` calculate the average price for each type of room (room_type) in each neighbourhood_group. What is the average price for an entire home in Brooklyn ?
- Unstack the multi-level Dataframe into a regular Dataframe with `unstack()` and create a bar plot with the resulting table

```
In [15]: merged_dt.groupby(['neighbourhood_group','room_type']).price.mean()
```

```
Out[15]: neighbourhood_group  room_type
         Bronx                Entire home/apt    127.506596
                              Private room        66.788344
                              Shared room         59.800000
         Brooklyn             Entire home/apt    178.327545
                              Private room        76.500099
                              Shared room         50.527845
         Manhattan            Entire home/apt    249.239109
                              Private room       116.776622
                              Shared room         88.977083
         Queens               Entire home/apt    147.050573
                              Private room        71.762456
                              Shared room         69.020202
         Staten Island        Entire home/apt    173.846591
                              Private room        62.292553
                              Shared room         57.444444
         Name: price, dtype: float64
```

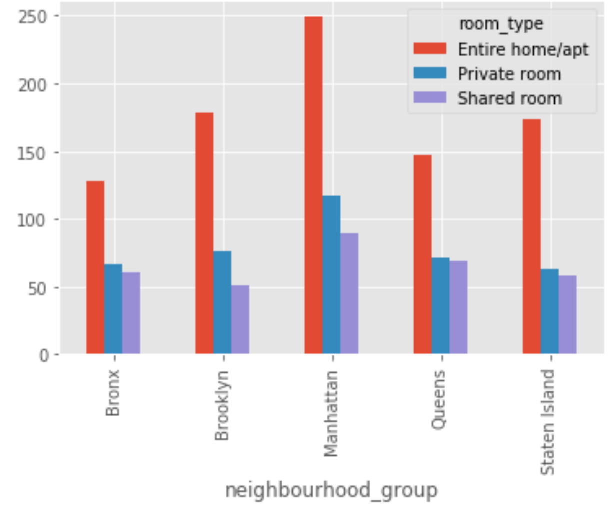
```
In [16]: merged_dt.groupby(['neighbourhood_group','room_type']).price.mean()['Bro
         oklyn']['Entire home/apt']
```

```
Out[16]: 178.32754472225128
```

```
In [17]: merged_dt.groupby(['neighbourhood_group','room_type'])['price'].mean()['
         Brooklyn']['Entire home/apt']
```

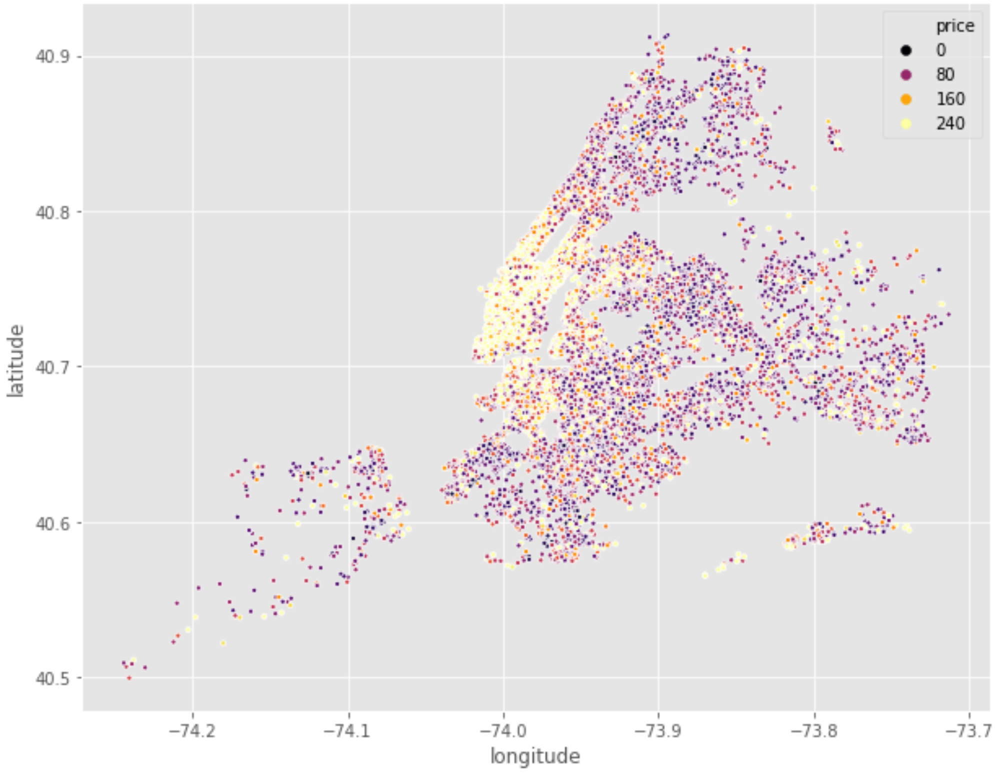
```
Out[17]: 178.32754472225128
```

```
In [18]: unstd_dt = merged_dt.groupby(['neighbourhood_group','room_type']).price.
         mean().unstack()
         unstd_dt.plot(kind = 'bar');
```



6. Advanced plotting

```
In [19]: fig, ax = plt.subplots(figsize=(10,8))
         g = sns.scatterplot(data = merged_dt, y = 'latitude', x = 'longitude', h
         ue = 'price',
                             hue_norm=(0,200), s=10, palette='inferno')
```



Using Seaborn, create a scatter plot where x and y positions are longitude and lattitude, the color reflects price and the shape of the marker the borough (neighbourhood_group). Can you recognize parts of new york ? Does the map make sense ?