Introduction

This report is providing information for travelers visiting Manhattan, a borough of New York City, USA. It will support identifying the best neighborhood for finding an accommodation via Airbnb by taking into consideration nearby located restaurants and museums.

In 2008, Airbnb has started to convey accommodations. Airbnb itself is not owning any accommodation. They are acting as a broker. Hosts have the possibility to offer their accommodation to travelers via the platform of Airbnb. For travelers, Airbnb is an interesting opportunity to find a place to stay during the night.

This report gives an overview about accommodations in Manhattan showing average prices for the year 2019, the average availability and average number of reviews. Those figures will help the traveler to decide, which neighborhood is best to chose. To consider the need for having nice restaurants around, this report is furthermore having a look at good rated restaurants nearby. For travelers interested in sightseeing an overview is shown about museums in the same neighborhood as the accommodation.

Data section

To be able to provide needed information the following data will be used:

1) NYC Neighborhoods and Boroughs
   This dataset includes information about neighborhoods and boroughs in New York City including location information and is available on this website.

|	Borough	Neighborhood	Latitude	Longitude
0	Bronx	Wakefield	40.894705	-73.847201
1	Bronx	Co-op City	40.874294	-73.829939
2	Bronx	Eastchester	40.887556	-73.827806
3	Bronx	Fieldston	40.895437	-73.905643
4	Bronx	Riverdale	40.890834	-73.912585

2) Airbnb NYC 2019
   This dataset describes the listing activity and metrics in NYC, NY for 2019. The dataset is available on Kaggle (https://www.kaggle.com/dgomonov/new-york-city-airbnb-open-data). This public dataset is part of Airbnb, and the original source can be found on this website.

   The dataset provides information about hosts, neighborhood the accommodation is located, room types, prices, review information and availability.

	id	name	host_id	host_name	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price	minimum_nights	number_of_reviews	last_review	reviews_per_month	calculated_host_listings_count	availability_365
0	2539	Clean & quiet apt home by the park	2787	John	Brooklyn	Kensington	40.64749	-73.97237	Private room	149	1	9	2018-10-19	0.21	6	365
1	2595	Skylit Midtown Castle	2845	Jennifer	Manhattan	Midtown	40.75362	-73.98377	Entire home/apt	225	1	45	2019-05-21	0.38	2	355
2	3647	THE VILLAGE OF HARLEM....NEW YORK !	4632	Elisabeth	Manhattan	Harlem	40.80902	-73.94190	Private room	150	3	0	NaN	NaN	1	365
3	3831	Cozy Entire Floor of Brownstone	4869	LisaRoxanne	Brooklyn	Clinton Hill	40.68514	-73.95976	Entire home/apt	89	1	270	2019-07-05	4.64	1	194
4	5022	Entire Apt: Spacious Studio/Loft by central park	7192	Laura	Manhattan	East Harlem	40.79851	-73.94399	Entire home/apt	80	10	9	2018-11-19	0.10	1	0

3) Folium

Folium is used to visualize neighborhoods, points of interests and available accommodation on a map.
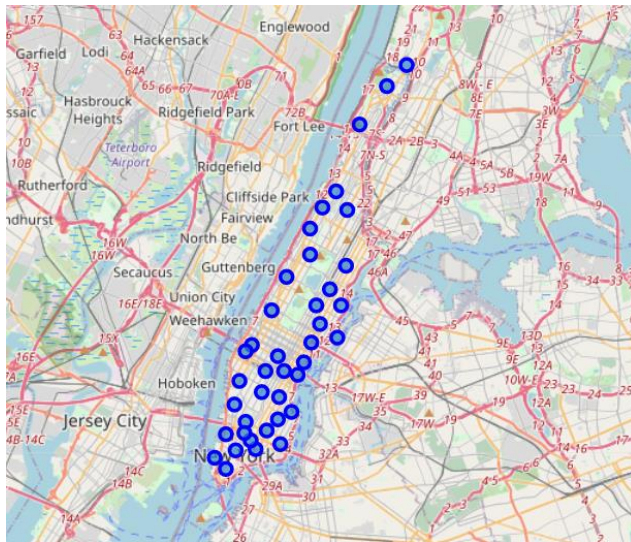
4) Foursquare API

To get information about points of interest like restaurants or museum that are nearby located to the accommodation, the Foursquare API will be used. Information pulled from the Foursquare API contain information about venues and their location

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Marble Hill	40.876551	-73.91066	Arturo's	40.874412	-73.910271	Pizza Place
1	Marble Hill	40.876551	-73.91066	Bikram Yoga	40.876844	-73.906204	Yoga Studio
2	Marble Hill	40.876551	-73.91066	Tibbett Diner	40.880404	-73.908937	Diner
3	Marble Hill	40.876551	-73.91066	Starbucks	40.877531	-73.905582	Coffee Shop
4	Marble Hill	40.876551	-73.91066	Dunkin'	40.877136	-73.906666	Donut Shop

Methodology

As a first step, I have loaded all the boroughs and their neighborhoods from New York City to get an overview about the city.

	Borough	Neighborhood	Latitude	Longitude
0	Bronx	Wakefield	40.894705	-73.847201
1	Bronx	Co-op City	40.874294	-73.829939
2	Bronx	Eastchester	40.887556	-73.827806
3	Bronx	Fieldston	40.895437	-73.905643
4	Bronx	Riverdale	40.890834	-73.912585

In total New York City has 5 boroughs and 306 neighborhoods. The 5 boroughs are Bronx, Manhattan, Brooklyn, Queens and Staten Island.

```
array(['Bronx', 'Manhattan', 'Brooklyn', 'Queens', 'Staten Island'],
      dtype=object)
```

To limit the data fur further analysis, we only look deeper into 1 borough: Manhattan.

For a better visualization, the neighborhoods of Manhattan are shown on a map created with Folium.
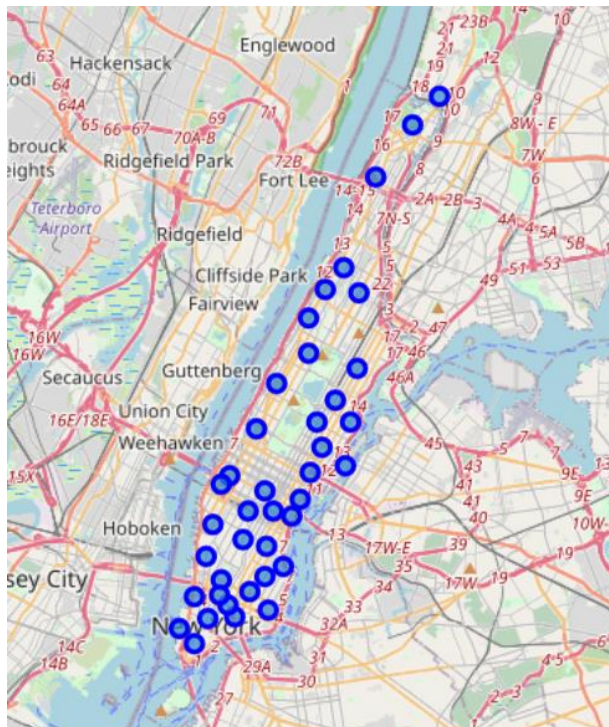
When clicking on the marks, the name of the neighborhood is shown.

Now we know where to find which neighborhood in Manhattan. This overview helps people that are not so familiar with the neighborhoods there.

As a next step, let's have a look at the Airbnb data of New York City based on the figures from 2019.

	id	name	host_id	host_name	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price	minimum_nights	number_of_reviews	last_review	reviews_per_month	calculated_host_listings_count	availability_365
0	2539	Clean & quiet apt home by the park	2787	John	Brooklyn	Kensington	40.64749	-73.97237	Private room	149	1	9	2018-10-19	0.21	6	365
1	2595	Skylit Midtown Castle	2845	Jennifer	Manhattan	Midtown	40.75362	-73.98377	Entire home/apt	225	1	45	2019-05-21	0.38	2	355
2	3647	THE VILLAGE OF HARLEM....NEW YORK !	4632	Elisabeth	Manhattan	Harlem	40.80902	-73.94190	Private room	150	3	0	NaN	NaN	1	365
3	3831	Cozy Entire Floor of Brownstone	4869	LisaRoxanne	Brooklyn	Clinton Hill	40.68514	-73.95976	Entire home/apt	89	1	270	2019-07-05	4.64	1	194
4	5022	Entire Apt: Spacious Studio/Loft by central park	7192	Laura	Manhattan	East Harlem	40.79851	-73.94399	Entire home/apt	80	10	9	2018-11-19	0.10	1	0

The dataset includes information about the accommodations the hosts are offering. There is information regarding location, room type and price, reviews and availability. We will limit the data to Manhattan only as we did with previous data.

Let's check how many rows are included in the dataset for Manhattan and if we have missing information in the columns that we need to cope with.

```
(21661, 16)
```

```
id
False    21661
Name: id, dtype: int64

name
False    21652
True         9
Name: name, dtype: int64

host_id
False    21661
Name: host_id, dtype: int64

host_name
False    21652
True         9
Name: host_name, dtype: int64

neighbourhood_group
False    21661
Name: neighbourhood_group, dtype: int64
```

Above picture is only showing the first columns of the result. It seems some names and host names are missing. Because we don't need the names for our further analysis, we can ignore this finding.

Let's check which data types are used.

```
id                              int64
name                           object
host_id                         int64
host_name                      object
neighbourhood_group            object
neighbourhood                  object
latitude                      float64
longitude                     float64
room_type                      object
price                           int64
minimum_nights                  int64
number_of_reviews               int64
last_review                    object
reviews_per_month             float64
calculated_host_listings_count  int64
availability_365                int64
dtype: object
```
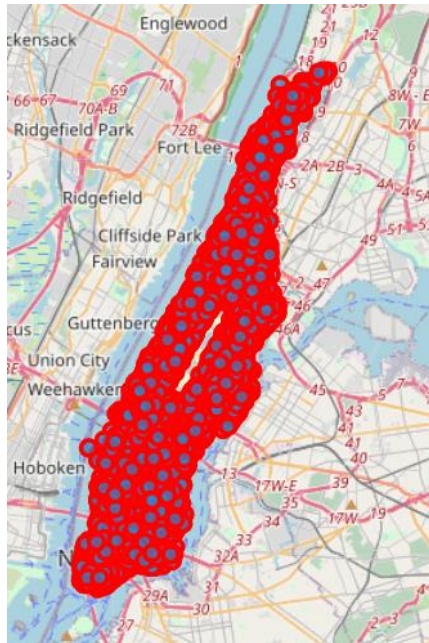
The used data types look fine and there is no need to transform any of them.

Now let's visualize the accommodations on the map of Manhattan.

As we can see, there is a huge offer of accommodations. Let's have a deeper look to find the right accommodation for our purpose.

First, let's analyze in what range the prices are.

The minimum is 0 Dollar, the maximum is 10.000 Dollar and the mean is 196.88 Dollar.

Let's check how many accommodations we have with a price equal to 0.

|	id	name	host_id	host_name	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price	minimum_nights	number_of_reviews	last_review	reviews_per_month	calculated_host_listings_count	availability_365
0	20933849	the best you can find	13709292	Qiuchi	Manhattan	Murray Hill	40.75091	-73.97597	Entire home/apt	0	3	0	NaN	NaN	1	0

It's only one accommodation having no reviews and no availability. This can be ignored.

Now let's look at the different neighborhoods in Manhattan. We focus on the average price, the average number of reviews and the average number of days the accommodation is available. We get an overview about the different figures per neighborhood.

neighbourhood	price	reviews_per_month	availability_365
Battery Park City	367.557143	0.675556	100.328571
Chelsea	249.738544	1.254698	113.995508
Chinatown	161.497283	1.369190	90.796196
Civic Center	191.942308	0.775667	68.269231
East Harlem	133.198747	1.672733	98.973142
East Village	186.083108	1.119732	74.623853
Financial District	225.490591	1.477485	191.536290
Flatiron District	341.925000	1.251207	123.050000
Gramercy	222.754438	1.120837	94.526627

Above picture is only showing a part of the result.

Let's check the distribution of prices. Because we have only a few values above 500 Dollar, we will ignore those data for further analysis and concentrate on the accommodations having a price below 500 Dollar.
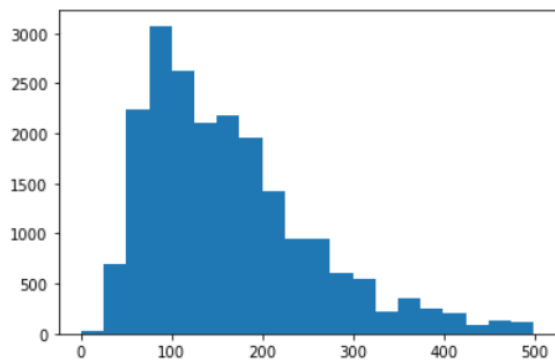
I've created 20 bins to get an overview of the distribution of the prices. We can see that most of the accommodations are between 50 and 250 Dollar.

Now that we have an overview about prices let's check what venues are nearby the accommodations. By using the Foursquare API we get information about the venues and if there are any museums located. The request to get data from Foursquare is limited to 100 venues per location and a radius of 500 meters.

When looking at the data we can see that we have found venues categorized into 327 unique categories like type of restaurant or type of museum.

```
There are 327 uniques categories.
```

Let's have a closer look at the categories.

By using the technique of One-Hot-Encoding and grouping by, we create the sum per each category over all retrieved venues for each neighborhood.

	Neighborhood	Accessories Store	Adult Boutique	Afghan Restaurant	African Restaurant	American Restaurant	Antique Shop	Arcade	Arepa Restaurant	Argentinian Restaurant	Art Gallery	Art Museum	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	Auditorium	Australian Restaurant	Austrian Restaurant	BBQ Joint	Baby Store	Bagel Shop	Bakery
0	Battery Park City	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0
1	Carnegie Hill	0	0	0	0	1	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	2
2	Central Harlem	0	0	0	3	2	0	0	0	0	1	0	0	0	0	0	0	0	1	0	1	0
3	Chelsea	0	0	0	0	4	0	0	0	0	7	0	0	0	0	0	0	0	0	0	1	2
4	Chinatown	0	0	0	0	3	0	0	0	0	0	0	0	2	0	0	0	1	0	0	0	6
5	Civic Center	0	0	0	0	3	1	0	0	0	0	0	0	1	0	0	1	0	0	1	1	1

Above picture is only showing a part of the result.

Now, let's create a top 10 list of the most common venues for each neighborhood.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Battery Park City	Park	Hotel	Coffee Shop	Memorial Site	Gym	Playground	Food Court	Gourmet Shop	Mexican Restaurant	Shopping Mall
1	Carnegie Hill	Coffee Shop	Italian Restaurant	Café	Yoga Studio	Bookstore	Wine Shop	Gym / Fitness Center	Gym	Grocery Store	Japanese Restaurant
2	Central Harlem	African Restaurant	Chinese Restaurant	Seafood Restaurant	American Restaurant	Bar	French Restaurant	Gym / Fitness Center	Café	Bookstore	Boutique
3	Chelsea	Coffee Shop	Art Gallery	American Restaurant	Ice Cream Shop	Café	French Restaurant	Italian Restaurant	Theater	Pizza Place	Market
4	Chinatown	Chinese Restaurant	Bakery	Dessert Shop	American Restaurant	Ice Cream Shop	Spa	Bar	Hotpot Restaurant	Vietnamese Restaurant	Bubble Tea Shop

And finally, we look which neighborhoods have a museum located, because when staying in Manhattan we would like to visit museums.

There are 8 neighborhoods where one or more museums are located.

	Neighborhood	History Museum	Art Museum	Museum
0	Carnegie Hill	0	2	2
1	Chinatown	0	0	1
2	Financial District	0	0	1
3	Flatiron	1	0	0
4	Inwood	1	0	0
5	Murray Hill	0	0	1
6	Turtle Bay	0	0	1
7	Upper East Side	2	2	0

Results

By getting all the information provided by this project the customer is now able to choose the best neighborhood for his stay in Manhattan.

There is a price overview to see, what is the average price in all the different neighborhoods. Based in this information the customer can have a closer look at the neighborhood to chose the best accommodation.

neighbourhood	price	reviews_per_month	availability_365
Battery Park City	367.557143	0.675556	100.328571
Chelsea	249.738544	1.254698	113.995508
Chinatown	161.497283	1.369190	90.796196
Civic Center	191.942308	0.775667	68.269231
East Harlem	133.198747	1.672733	98.973142
East Village	186.083108	1.119732	74.623853
Financial District	225.490591	1.477485	191.536290
Flatiron District	341.925000	1.251207	123.050000
Gramercy	222.754438	1.120837	94.526627

By combining the Airbnb data with the Foursquare data, the customer will find an accommodation for a fair price that is surrounded by common venues.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Battery Park City	Park	Hotel	Coffee Shop	Memorial Site	Gym	Playground	Food Court	Gourmet Shop	Mexican Restaurant	Shopping Mall
1	Carnegie Hill	Coffee Shop	Italian Restaurant	Café	Bookstore	Wine Shop	Gym / Fitness Center	Gym	Grocery Store	Japanese Restaurant
2	Central Harlem	African Restaurant	Chinese Restaurant	Seafood Restaurant	American Restaurant	Bar	French Restaurant	Gym / Fitness Center	Café	Bookstore	Boutique
3	Chelsea	Coffee Shop	Art Gallery	American Restaurant	Ice Cream Shop	Café	French Restaurant	Italian Restaurant	Theater	Pizza Place	Market
4	Chinatown	Chinese Restaurant	Bakery	Dessert Shop	American Restaurant	Ice Cream Shop	Spa	Bar	Hotpot Restaurant	Vietnamese Restaurant	Bubble Tea Shop

If the customer is additionally interested in visiting a museum, the neighborhoods of Manhattan are fetched that have a museum located in the neighborhood.

	Neighborhood	History Museum	Art Museum	Museum
0	Carnegie Hill	0	2	2
1	Chinatown	0	0	1
2	Financial District	0	0	1
3	Flatiron	1	0	0
4	Inwood	1	0	0
5	Murray Hill	0	0	1
6	Turtle Bay	0	0	1
7	Upper East Side	2	2	0

Discussion

To give a recommendation for customers who want to visit an Art Musuem or a History Musuem, a good neighborhood would be Upper East Side, having 4 museums located there.

	Neighborhood	History Museum	Art Museum	Museum
0	Carnegie Hill	0	2	2
1	Chinatown	0	0	1
2	Financial District	0	0	1
3	Flatiron	1	0	0
4	Inwood	1	0	0
5	Murray Hill	0	0	1
6	Turtle Bay	0	0	1
7	Upper East Side	2	2	0

Looking at other common venues in Upper East Side there is a variety of different venues like Italian or French Restaurants, a Coffee Shop or a Gym for doing workouts.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Upper East Side	Italian Restaurant	Coffee Shop	Bakery	Juice Bar	Gym / Fitness Center	French Restaurant	Spa	Yoga Studio	Wine Shop	Salad Place

Looking at the prices of accommodation in Upper East Side it looks that prices are moderate and there is quite some availability of accommodation.

neighbourhood	price	reviews_per_month	availability_365
Theater District	248.013889	2.567027	201.871528
Tribeca	490.638418	0.834909	126.508475
Two Bridges	127.069444	2.395500	86.236111
Upper East Side	188.948276	1.084456	112.798109
Upper West Side	210.918316	1.003556	96.583460
Washington Heights	89.610679	1.215950	98.932147
West Village	267.682292	0.944508	85.459635

Conclusion

The analyzed data will help customers to find the right place for staying in Manhattan by considering common venues, prices, reviews and the availability of accommodation.