

# battle\_of\_neighborhoods\_part2

August 2, 2019

## 1 Capstone Project - The Battle of Neighborhoods (Week 2)

### 1.1 Introduction

New York City comprises 5 boroughs sitting where the Hudson River meets the Atlantic Ocean. At its core is Manhattan, a densely populated borough that's among the world's major commercial, financial and cultural centers. Its iconic sites include skyscrapers such as the Empire State Building and sprawling Central Park. Broadway theater is staged in neon-lit Times Square.

London, the capital of England and the United Kingdom, is a 21st-century city with history stretching back to Roman times. At its centre stand the imposing Houses of Parliament, the iconic 'Big Ben' clock tower and Westminster Abbey, site of British monarch coronations. Across the Thames River, the London Eye observation wheel provides panoramic views of the South Bank cultural complex, and the entire city.

### 1.2 1.Description of the problem

We will explore New York City and London and segmented and clustered their neighborhoods. Both cities are very diverse and are very similar. Both cities are a densely populated boroughs that's among the world's major commercial, financial and cultural centers. . We will compare the neighborhoods of the two cities and determine how similar or dissimilar they are. We will define that people like to do more in the cities, which places are often visited. Knowing this information we can think of how to use this. For example, open a new restaurant or supermarket, entertainment center or gift shop. As we can see in the next task that although there are Mexican restaurants in London, but they are not popular, entertainment is centrally located and almost



alt text

none in areas farther from the center. We may also use this information for advertising purposes, etc

### 1.3 2. Description of Data.

This project will rely on public data from Wikipedia and Foursquare.

London is the capital of and largest city in England and the United Kingdom. It is administered by the City of London and 32 London boroughs.

We will get information about the areas of London [https://en.wikipedia.org/wiki/List\\_of\\_areas\\_of\\_London](https://en.wikipedia.org/wiki/List_of_areas_of_London)

I will use dataset [https://geo.nyu.edu/catalog/nyu\\_2451\\_34572](https://geo.nyu.edu/catalog/nyu_2451_34572) for information about boroughs of NYC

```
In [1]: # library for BeautifulSoup
        from bs4 import BeautifulSoup

        import numpy as np
        import pandas as pd
        pd.set_option('display.max_columns', None)
        pd.set_option('display.max_rows', None)

        # library to handle JSON files
        import json
        print('numpy, pandas, ..., imported...')

        !pip -q install geopy
        # conda install -c conda-forge geopy --yes # uncomment this line if you haven't comple
        print('geopy installed...')
        # convert an address into latitude and longitude values
        from geopy.geocoders import Nominatim
        print('Nominatim imported...')

        # library to handle requests
        import requests
        print('requests imported...')

        # tranform JSON file into a pandas dataframe
        from pandas.io.json import json_normalize
        print('json_normalize imported...')

        # Matplotlib and associated plotting modules
        import matplotlib.cm as cm
        import matplotlib.colors as colors
        print('matplotlib imported...')

        # import k-means from clustering stage
        from sklearn.cluster import KMeans
        print('Kmeans imported...')
```

```

# install the Geocoder
!pip -q install geocoder
import geocoder

# import time
import time

# !conda install -c conda-forge folium=0.5.0 --yes # uncomment this line if you haven'
!pip -q install folium
print('folium installed...')
import folium # map rendering library
print('folium imported...')
print('...Done')

from PIL import Image # converting images into arrays

%matplotlib inline

import matplotlib as mpl
import matplotlib.pyplot as plt

mpl.style.use('ggplot') # optional: for ggplot-like style

# check for latest version of Matplotlib
print ('Matplotlib version: ', mpl.__version__) # >= 2.0.0

# install wordcloud
!conda install -c conda-forge wordcloud==1.4.1 --yes

# import package and its set of stopwords
from wordcloud import WordCloud, STOPWORDS

print ('Wordcloud is installed and imported!')

numpy, pandas, ..., imported...
geopy installed...
Nominatim imported...
requests imported...
json_normalize imported...
matplotlib imported...
Kmeans imported...
folium installed...
folium imported...
...Done
Matplotlib version: 2.2.3
Solving environment: done

```

```
==> WARNING: A newer version of conda exists. <==
current version: 4.5.12
latest version: 4.7.10
```

Please update conda by running

```
$ conda update -n base conda
```

```
# All requested packages already installed.
```

```
Wordcloud is installed and imported!
```

### 1.3.1 London

```
In [2]: # download data and parse it:
```

```
    r = requests.get('https://en.wikipedia.org/wiki/List_of_areas_of_London')
    soup = BeautifulSoup(r.text, 'html.parser')
    table=soup.find('table', attrs={'class':'wikitable sortable'})
```

```
In [3]: #get headers:
```

```
    headers=table.findAll('th')
    for i, head in enumerate(headers): headers[i]=str(headers[i]).replace("<th>", "").replace
    #headers
```

```
In [4]: #Find all items and skip first one:
```

```
    rows=table.findAll('tr')
    rows=rows[1:len(rows)]
    #rows
```

```
In [5]: # skip all meta symbols and line feeds between rows:
```

```
    for i, row in enumerate(rows): rows[i] = str(rows[i]).replace("\n</td></tr>", "").replace
    #rows
```

```
In [6]: # make dataframe, expand rows and drop the old one:
```

```
    df=pd.DataFrame(rows)
    df[headers] = df[0].str.split("</td>\n<td>", n = 7, expand = True)
    df.drop(columns=[0],inplace=True)#
```

```
    df.rename(columns={'Location': 'neighborhoods', 'London\xa0borough': 'borough', 'Post t
    df.drop(columns={'OS grid ref'},inplace=True)
    df.head(3)
```

```
Out [6]:
```

	neighborhoods	\
0	<a href="/wiki/Abbey_Wood" title="Abbey Wood">...	
1	<a href="/wiki/Acton,_London" title="Acton, Lo...	
2	<a href="/wiki/Addington,_London" title="Addin...	

		borough	posttown	postcode	\
0	Bexley, Greenwich	<sup class="reference" id="... LONDON		SE2	
1	Ealing, Hammersmith and Fulham	<sup class="refe... LONDON	W3, W4		
2	Croydon	<sup class="reference" id="cite_ref-mil... CROYDON		CRO	

  

	Dialäcode
0	020
1	020
2	020

```
In [7]: df.update(df.neighborhoods.loc[lambda x: x.str.contains('title')].str.extract('title=\\
# delete Toronto annotation from Neighbourhood:
df.update(df.neighborhoods.loc[lambda x: x.str.contains('London')].str.replace(", Lond
```

```
In [8]: for i in range(0, df.shape[0]-1):
        #print(df.borough.get_values()[i])
        c = df.borough.get_values()[i].split('<')[0]
        df.borough[i] = c
```

```
df = df.drop('borough', axis=1).join(df['borough'].str.split(',', expand=True).stack()
df = df.drop('posttown', axis=1).join(df['posttown'].str.split(',', expand=True).stack
```

```
df = df.drop('postcode', axis=1).join(df['postcode'].str.split(',', expand=True).stack
```

```
In [9]: df.head()
```

```
Out[9]:
```

	neighborhoods	Dialäcode	borough	posttown	postcode
0	Abbey Wood	020	Bexley	LONDON	SE2
0	Abbey Wood	020	Bexley	LONDON	SE2
0	Abbey Wood	020	Bexley	LONDON	SE2
0	Abbey Wood	020	Bexley	LONDON	SE2
0	Abbey Wood	020	Bexley	LONDON	SE2

```
In [10]: df.shape
```

```
Out[10]: (2856, 5)
```

```
In [11]: df.drop_duplicates(keep = False, inplace = True)
```

```
In [12]: df.head()
```

```
Out[12]:
```

	neighborhoods	Dialäcode	borough	posttown	postcode
2	Addington	020	Croydon	CROYDON	CRO
3	Addiscombe	020	Croydon	CROYDON	CRO
5	Aldborough Hatch	020	Redbridge	ILFORD	IG2
6	Aldgate	020	City	LONDON	EC3
7	Aldwych	020	Westminster	LONDON	WC2

```
In [13]: df.shape
```

```
Out[13]: (578, 5)
```

Now, only the Boroughs with London Post-town will be used for our search of location. Therefore, all the non-post-town are dropped.

```
In [14]: df_london = df
df_london = df_london[df_london['posttown'].str.contains('LONDON')]

df_london.drop_duplicates(keep = False, inplace = True)
```

```
/opt/conda/lib/python3.6/site-packages/ipykernel_launcher.py:4: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame
```

See the caveats in the documentation: <http://pandas.pydata.org/pandas-docs/stable/indexing.html> after removing the cwd from sys.path.

```
In [15]: df_london.head()
```

```
Out[15]:
```

	neighborhoods	Dialcode	borough	posttown	postcode
6	Aldgate	020	City	LONDON	EC3
7	Aldwych	020	Westminster	LONDON	WC2
9	Anerley	020	Bromley	LONDON	SE20
10	Angel	020	Islington	LONDON	EC1
10	Angel	020	Islington	LONDON	N1

**Geocoder dont read my whole data, and i divide my dataset on smaller parts**

```
In [16]: # Geocoder starts here
import geocoder # import geocoder

# Defining a function to use --> get_latlng()'''
def get_latlng(arcgis_geocoder):

    # Initialize the Location (lat. and long.) to "None"
    lat_lng_coords = None

    # While loop helps to create a continuous run until all the location coordinates are found
    while(lat_lng_coords is None):
        g = geocoder.arcgis('{}, London, United Kingdom'.format(arcgis_geocoder))
        lat_lng_coords = g.latlng
    return lat_lng_coords
# Geocoder ends here
```

```
In [17]: # New dataframe for postcodes started with "W"
df_w = df_london[df_london['postcode'].str.startswith(('W'))].reset_index(drop=True)
```

```
In [18]: df_w.head()
```

```
Out[18]:
```

	neighborhoods	Dialcode	borough	posttown	postcode
0	Aldwych	020	Westminster	LONDON	WC2
1	Bayswater	020	Westminster	LONDON	W2
2	Bedford Park	020	Ealing	LONDON	W4
3	Bloomsbury	020	Camden	LONDON	WC1
4	Charing Cross	020	Westminster	LONDON	WC2

```
In [19]: postcode = df_w['postcode']
postcode
coordinates = [get_latlng(postcode) for postcode in postcode.tolist()]
```

```
In [20]: df_with_coordinates = df_w
```

```
# The obtained coordinates (latitude and longitude) are joined with the dataframe as
df_with_coordinates = pd.DataFrame(coordinates, columns = ['Latitude', 'Longitude'])
df_w['Latitude'] = df_with_coordinates['Latitude']
df_w['Longitude'] = df_with_coordinates['Longitude']
```

```
In [21]: df_w.head()
```

```
Out[21]:
```

	neighborhoods	Dialcode	borough	posttown	postcode	Latitude	Longitude
0	Aldwych	020	Westminster	LONDON	WC2	51.51651	-0.11968
1	Bayswater	020	Westminster	LONDON	W2	51.51494	-0.18048
2	Bedford Park	020	Ealing	LONDON	W4	51.48944	-0.26194
3	Bloomsbury	020	Camden	LONDON	WC1	51.52450	-0.12273
4	Charing Cross	020	Westminster	LONDON	WC2	51.51651	-0.11968

```
In [22]: # # New dataframe for postcodes started with "S"
df_s = df_london[df_london['postcode'].str.startswith(('S'))].reset_index(drop=True)
```

```
In [23]: df_s.head()
```

```
Out[23]:
```

	neighborhoods	Dialcode	borough	posttown	postcode
0	Anerley	020	Bromley	LONDON	SE20
1	Balham	020	Wandsworth	LONDON	SW12
2	Bankside	020	Southwark	LONDON	SE1
3	Barnes	020	Richmond upon Thames	LONDON	SW13
4	Battersea	020	Wandsworth	LONDON	SW11

```
In [24]: postcode = df_s['postcode']
postcode
coordinates = [get_latlng(postcode) for postcode in postcode.tolist()]
```

```
In [25]: df_with_coordinates_s = df_s
```

```
# The obtained coordinates (latitude and longitude) are joined with the dataframe as
df_with_coordinates_s = pd.DataFrame(coordinates, columns = ['Latitude', 'Longitude'])
df_s['Latitude'] = df_with_coordinates_s['Latitude']
df_s['Longitude'] = df_with_coordinates_s['Longitude']
```

```
In [26]: df_s.head()
```

```
Out[26]:
```

	neighborhoods	Dialcode	borough	posttown	postcode	Latitude	Longitude
0	Anerley	020	Bromley	LONDON	SE20	51.41009	-0.05683
1	Balham	020	Wandsworth	LONDON	SW12	51.44822	-0.14839
2	Bankside	020	Southwark	LONDON	SE1	51.49960	-0.09613
3	Barnes	020	Richmond upon Thames	LONDON	SW13	51.47457	-0.24212
4	Battersea	020	Wandsworth	LONDON	SW11	51.46760	-0.16290

```
In [27]: # df_london_allpart = df_s and df_w
df_london_allpart = df_s.append(df_w, ignore_index=True)
```

```
In [28]: df_london_allpart.shape
```

```
Out[28]: (129, 7)
```

```
In [29]: # New dataframe for postcodes started with "E"
df_e = df_london[df_london['postcode'].str.startswith(('E'))].reset_index(drop=True)
```

```
In [30]: postcode = df_e['postcode']
postcode
coordinates = [get_latlng(postcode) for postcode in postcode.tolist()]
```

```
In [31]: f_with_coordinates_e = df_e
```

```
# The obtained coordinates (latitude and longitude) are joined with the dataframe as
df_with_coordinates_e = pd.DataFrame(coordinates, columns = ['Latitude', 'Longitude'])
df_e['Latitude'] = df_with_coordinates_e['Latitude']
df_e['Longitude'] = df_with_coordinates_e['Longitude']
```

```
In [32]: df_london_allpart = df_london_allpart.append(df_e, ignore_index=True)
```

```
In [33]: # New dataframe for postcodes started with "N"
df_n = df_london[df_london['postcode'].str.startswith(('N'))].reset_index(drop=True)
```

```
In [34]: postcode = df_n['postcode']
postcode
coordinates = [get_latlng(postcode) for postcode in postcode.tolist()]
```

```
In [35]: df_with_coordinates_s = df_n
```

```
# The obtained coordinates (latitude and longitude) are joined with the dataframe as
df_with_coordinates_n = pd.DataFrame(coordinates, columns = ['Latitude', 'Longitude'])
df_n['Latitude'] = df_with_coordinates_n['Latitude']
df_n['Longitude'] = df_with_coordinates_n['Longitude']
```



```
In [36]: df_london_allpart = df_london_allpart.append(df_n, ignore_index=True)
```

```
In [37]: df_london_allpart.head(20)
```

```
Out[37]:
```

	neighborhoods	Dialcode	borough	posttown	postcode \
0	Anerley	020	Bromley	LONDON	SE20
1	Balham	020	Wandsworth	LONDON	SW12
2	Bankside	020	Southwark	LONDON	SE1
3	Barnes	020	Richmond upon Thames	LONDON	SW13
4	Battersea	020	Wandsworth	LONDON	SW11
5	Belgravia	020	Westminster	LONDON	SW1
6	Bellingham	020	Lewisham	LONDON	SE6
7	Bermondsey	020	Southwark	LONDON	SE1
8	Blackheath	020	Lewisham	LONDON	SE3
9	Blackheath	020	Greenwich	LONDON	SE3
10	Brixton	020	Lambeth	LONDON	SW2
11	Brockley	020	Lewisham	LONDON	SE4
12	Brompton	020	Kensington and Chelsea	LONDON	SW3
13	Camberwell	020	Southwark	LONDON	SE5
14	Castelnau	020	Richmond upon Thames	LONDON	SW13
15	Catford	020	Lewisham	LONDON	SE6
16	Charlton	020	Greenwich	LONDON	SE7
17	Chelsea	020	Kensington and Chelsea	LONDON	SW3
18	Chinbrook	020	Lewisham	LONDON	SE12
19	Colliers Wood	020	Merton	LONDON	SW19

	Latitude	Longitude
0	51.41009	-0.05683
1	51.44822	-0.14839
2	51.49960	-0.09613
3	51.47457	-0.24212
4	51.46760	-0.16290
5	51.49713	-0.13829
6	51.43722	-0.01868
7	51.49960	-0.09613
8	51.47138	0.02338
9	51.47138	0.02338
10	51.45295	-0.12083
11	51.46268	-0.03558
12	51.49014	-0.16248
13	51.47480	-0.09313
14	51.47457	-0.24212
15	51.43722	-0.01868
16	51.48759	0.02912
17	51.49014	-0.16248
18	51.44759	0.01350
19	51.42170	-0.20796

```
In [38]: # New dataframe for postcodes started with "d"
```

```

df_d = df_london[df_london['postcode'].str.startswith(('D'))].reset_index(drop=True)

In [39]: postcode = df_d['postcode']
        postcode
        coordinates = [get_latlng(postcode) for postcode in postcode.tolist()]

In [40]: df_with_coordinates_s = df_d

        # The obtained coordinates (latitude and longitude) are joined with the dataframe as
df_with_coordinates_d = pd.DataFrame(coordinates, columns = ['Latitude', 'Longitude'])
df_d['Latitude'] = df_with_coordinates_d['Latitude']
df_d['Longitude'] = df_with_coordinates_d['Longitude']

In [41]: df_london_allpart = df_london_allpart.append(df_d, ignore_index=True)

In [42]: # New dataframe for postcodes started with "I" / same =E18
        df_i = df_london[df_london['postcode'].str.startswith(('I'))].reset_index(drop=True)

In [43]: postcode = df_i['postcode']
        postcode
        coordinates = [get_latlng(postcode) for postcode in postcode.tolist()]

In [44]: df_with_coordinates_s = df_i

        # The obtained coordinates (latitude and longitude) are joined with the dataframe as
df_with_coordinates_i = pd.DataFrame(coordinates, columns = ['Latitude', 'Longitude'])
df_i['Latitude'] = df_with_coordinates_i['Latitude']
df_i['Longitude'] = df_with_coordinates_i['Longitude']

In [45]: df_london_allpart = df_london_allpart.append(df_i, ignore_index=True)

In [46]: df_london_allpart.shape

Out[46]: (285, 7)

In [47]: df_london_allpart['borough'].unique()

Out[47]: array(['Bromley', 'Wandsworth', 'Southwark', 'Richmond upon Thames',
                'Westminster', 'Lewisham', 'Greenwich', 'Lambeth',
                'Kensington and Chelsea', 'Merton', 'Bexley',
                'Hammersmith and Fulham', 'Kingston upon Thames', 'Croydon',
                'Ealing', 'Camden', 'Hounslow', 'Camden and Islington', 'City',
                'Islington', 'Tower Hamlets', 'Waltham Forest', 'Newham', 'Hackney',
                'Islington & City', 'Redbridge', 'Enfield', 'Haringey',
                'Barnet', 'Brent', 'Haringey and Barnet', 'Dartford'], dtype=object)

In [49]: print('The dataframe has {} boroughs and {} neighborhoods.'.format(
        len(df_london_allpart['borough'].unique()),
        df_london_allpart.shape[0]
    )
)

```

The dataframe has 32 boroughs and 285 neighborhoods.

Use geopy library to get the latitude and longitude values of London. In order to define an instance of the geocoder, we need to define a user\_agent. We will name our agent ny\_explorer, as shown below.

```
In [50]: address = 'London, uk'

geolocator = Nominatim(user_agent="ny_explorer")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geograpical coordinate of London, uk {}, {}'.format(latitude, longitude))
```

The geograpical coordinate of London, uk 51.4893335, -0.144055084527687.

Create a map of London with borough superimposed on top.

```
In [51]: # create map of London using latitude and longitude values
map_london = folium.Map(location=[latitude, longitude], zoom_start=10)

# add markers to map
for lat, lng, label in zip(df_london_allpart['Latitude'], df_london_allpart['Longitude'], df_london_allpart['Borough']):
    label = '{}.format(borough)'.format(borough)
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=label,
        color='blue',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_london)

map_london
```

```
Out[51]: <folium.folium.Map at 0x7fe50fca8240>
```

### 1.3.2 New York

1. Download and Explore Dataset Neighborhood has a total of 5 boroughs and 306 neighborhoods. In order to segment the neighborhoods and explore them, we will essentially need a dataset that contains the 5 boroughs and the neighborhoods that exist in each borough as well as the the latitude and logitude coordinates of each neighborhood.

The link to the dataset: [https://geo.nyu.edu/catalog/nyu\\_2451\\_34572](https://geo.nyu.edu/catalog/nyu_2451_34572)

```

In [52]: # load the data
!wget -q -O 'newyork_data.json' https://cocl.us/new_york_dataset
print('Data downloaded!')

Data downloaded!

In [53]: with open('newyork_data.json') as json_data:
    newyork_data = json.load(json_data)

In [54]: neighborhoods_data = newyork_data['features']

In [55]: # define the dataframe columns
    column_names = ['Borough', 'Neighborhood', 'Latitude', 'Longitude']

    # instantiate the dataframe
    neighborhoods = pd.DataFrame(columns=column_names)

In [56]: neighborhoods
Out[56]: Empty DataFrame
Columns: [Borough, Neighborhood, Latitude, Longitude]
Index: []

In [57]: # let's loop through the data and fill the dataframe one row at a time.
for data in neighborhoods_data:
    borough = neighborhood_name = data['properties']['borough']
    neighborhood_name = data['properties']['name']

    neighborhood_latlon = data['geometry']['coordinates']
    neighborhood_lat = neighborhood_latlon[1]
    neighborhood_lon = neighborhood_latlon[0]

    neighborhoods = neighborhoods.append({'Borough': borough,
                                          'Neighborhood': neighborhood_name,
                                          'Latitude': neighborhood_lat,
                                          'Longitude': neighborhood_lon}, ignore_index=True)

In [58]: neighborhoods.head()
Out[58]:
   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 [59]: print('The dataframe has {} boroughs and {} neighborhoods.'.format(
    len(neighborhoods['Borough'].unique()),
    neighborhoods.shape[0]
))

```

The dataframe has 5 boroughs and 306 neighborhoods.

Use geopy library to get the latitude and longitude values of New York City. In order to define an instance of the geocoder, we need to define a user\_agent. We will name our agent ny\_explorer, as shown below.

```
In [60]: address = 'New York City, NY'

geolocator = Nominatim(user_agent="ny_explorer")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geograpical coordinate of New York City are {}, {}'.format(latitude, longitude))
```

The geograpical coordinate of New York City are 40.7127281, -74.0060152.

Create a map of New York with neighborhoods superimposed on top.

```
In [61]: # create map of New York using latitude and longitude values
map_newyork = folium.Map(location=[latitude, longitude], zoom_start=10)

# add markers to map
for lat, lng, borough, neighborhood in zip(neighborhoods['Latitude'], neighborhoods['Longitude'],
neighborhoods['Borough'], neighborhoods['Neighborhood']):
    label = '{} {}'.format(neighborhood, borough)
    popup = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=popup,
        color='blue',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_newyork)

map_newyork
```

```
Out[61]: <folium.folium.Map at 0x7fe50dec63c8>
```

## 2 3. Methodology

### 2.1 Data Exploration

Create a new dataframe of the borough Kensington and Chelsea.

```
In [63]: new_data = df_london_allpart[df_london_allpart['borough'] == 'Kensington and Chelsea']
new_data = new_data.drop_duplicates()
new_data.head(10)
```

```

Out [63]:      neighborhoods Dialcode      borough posttown postcode \
0      Brompton      020  Kensington and Chelsea  LONDON      SW3
1      Chelsea      020  Kensington and Chelsea  LONDON      SW3
2      Earls Court      020  Kensington and Chelsea  LONDON      SW5
3      Kensington      020  Kensington and Chelsea  LONDON      SW7
4  South Kensington      020  Kensington and Chelsea  LONDON      SW7
5      West Brompton      020  Kensington and Chelsea  LONDON      SW10
6      Holland Park      020  Kensington and Chelsea  LONDON      W8
7  North Kensington      020  Kensington and Chelsea  LONDON      W10
8      Notting Hill      020  Kensington and Chelsea  LONDON      W11

      Latitude Longitude
0  51.49014  -0.16248
1  51.49014  -0.16248
2  51.49004  -0.18971
3  51.49807  -0.17404
4  51.49807  -0.17404
5  51.48563  -0.18144
6  51.50162  -0.19173
7  51.52346  -0.21353
8  51.51244  -0.20639

```

```

In [160]: address = 'Kensington and Chelsea, uk'
          #address = 'City of London, uk'
          #address = 'Islington, uk'

          geolocator = Nominatim(user_agent="uk_explorer")
          location = geolocator.geocode(address)
          latitude = location.latitude
          longitude = location.longitude
          print('The geograpical coordinate of London, uk {}, {}'.format(latitude, longitude))

```

The geograpical coordinate of London, uk 51.4989948, -0.1991229.

```

In [162]: new_data.head()

```

```

Out [162]:      neighborhoods Dialcode      borough posttown postcode \
0      Brompton      020  Kensington and Chelsea  LONDON      SW3
1      Chelsea      020  Kensington and Chelsea  LONDON      SW3
2      Earls Court      020  Kensington and Chelsea  LONDON      SW5
3      Kensington      020  Kensington and Chelsea  LONDON      SW7
4  South Kensington      020  Kensington and Chelsea  LONDON      SW7

      Latitude Longitude Cluster Labels
0  51.49014  -0.16248              2
1  51.49014  -0.16248              2
2  51.49004  -0.18971              3

```

```

3  51.49807  -0.17404          3
4  51.49807  -0.17404          1

```

```

In [163]: #create map of North York using latitude and longitude values #new_data['neighborh
map_london_borough = folium.Map(location=[latitude, longitude], zoom_start=12)

# add markers to map
for lat, lng, label in zip(new_data['Latitude'], new_data['Longitude'], new_data['bor
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=label,
        color='blue',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_london_borough)

map_london_borough

```

```

Out[163]: <folium.folium.Map at 0x7fe50ca2f668>

```

Use geopy library to get the latitude and longitude values borough Manhattan.

```

In [164]: address = 'Manhattan, usa'

geolocator = Nominatim(user_agent="ny_explorer")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geograpical coordinate of Manhattan are {}, {}'.format(latitude, longitude)

```

The geograpical coordinate of Manhattan are 40.7900869, -73.9598295.

```

In [165]: ny_data = neighborhoods[neighborhoods['Borough'] == 'Manhattan'].reset_index(drop=True)
ny_data.head()

```

```

Out[165]:
   Borough      Neighborhood  Latitude  Longitude
0  Manhattan      Marble Hill   40.876551 -73.910660
1  Manhattan      Chinatown    40.715618 -73.994279
2  Manhattan  Washington Heights  40.851903 -73.936900
3  Manhattan           Inwood   40.867684 -73.921210
4  Manhattan  Hamilton Heights  40.823604 -73.949688

```

Let's visualizat Manhattan

```

In [166]: # create map of Manhattan using latitude and longitude values
map_nyc_m = folium.Map(location=[latitude, longitude], zoom_start=11)

# add markers to map
for lat, lng, label in zip(ny_data['Latitude'], ny_data['Longitude'], ny_data['Neighborhood']):
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=label,
        color='blue',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_nyc_m)

map_nyc_m

```

```

Out[166]: <folium.folium.Map at 0x7fe50c9df5c0>

```

Next, we are going to start utilizing the Foursquare API to explore the neighborhoods and segment them.

```

In [70]: CLIENT_ID = 'B3D1FREXU3FMFKGOXFFFWLZH1UBNQKQGVTG4XWBI3N32354V' # your Foursquare ID
CLIENT_SECRET = 'UAFKLDYGA1SQEBZY04P5DYUAS4DBRF5QA53DURWY03FTRQP3' # your Foursquare secret
VERSION = '20180604'
LIMIT = 30
print('Your credentails:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET: ' + CLIENT_SECRET)

```

Your credentails:

```

CLIENT_ID: B3D1FREXU3FMFKGOXFFFWLZH1UBNQKQGVTG4XWBI3N32354V
CLIENT_SECRET:UAFKLDYGA1SQEBZY04P5DYUAS4DBRF5QA53DURWY03FTRQP3

```

```

In [71]: address = 'Manhattan, usa'

geolocator = Nominatim(user_agent="ny_explorer")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geograpical coordinate of Manhattan, usa are {}, {}.'.format(latitude, longitude))

```

The geograpical coordinate of Manhattan, usa are 40.7900869, -73.9598295.

Get the neighborhood's latitude and longitude values.

Now, let's get the top 200 venues that are in Manhattan within a radius of 1000 meters. First, let's create the GET request URL. Name your URL url.



```
In [72]: LIMIT = 200 # limit of number of venues returned by Foursquare API
radius = 1000 # define radius
url = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&v=
CLIENT_ID,
CLIENT_SECRET,
VERSION,
latitude,
longitude,
radius,
LIMIT)
url # display URL
```

```
Out[72]: 'https://api.foursquare.com/v2/venues/explore?&client_id=B3D1FREXU3FMFKGOXFFFWLZH1UBN
```

Send the GET request and examine the results

```
In [73]: results = requests.get(url).json()
results
```

```
Out[73]: {'meta': {'code': 200, 'requestId': '5d43eddb4eefd00025f4a2c1'},
'response': {'suggestedFilters': {'header': 'Tap to show:',
'filters': [{'name': '$-$$$$', 'key': 'price'},
{'name': 'Open now', 'key': 'openNow'}]},
'headerLocation': 'Central Park',
'headerFullLocation': 'Central Park, New York',
'headerLocationGranularity': 'neighborhood',
'totalResults': 125,
'suggestedBounds': {'ne': {'lat': 40.79908690900001,
'lng': -73.94796434495463},
'sw': {'lat': 40.78108689099999, 'lng': -73.97169465504537}},
'groups': [{'type': 'Recommended Places',
'name': 'recommended',
'items': [{'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]}],
'venue': {'id': '4a5a4eb2f964a52021ba1fe3',
'name': 'North Meadow',
'location': {'address': 'Central Park',
'crossStreet': 'at 97th St',
'lat': 40.79202709807077,
'lng': -73.95985269664416,
'labeledLatLngs': [{'label': 'display',
'lat': 40.79202709807077,
'lng': -73.95985269664416}]},
'distance': 215,
'cc': 'US',
'neighborhood': 'Central Park',
'city': 'New York',
```

```

    'state': 'NY',
    'country': 'United States',
    'formattedAddress': ['Central Park (at 97th St)',
        'New York, NY',
        'United States']],
    'categories': [{ 'id': '4bf58dd8d48988d163941735',
        'name': 'Park',
        'pluralName': 'Parks',
        'shortName': 'Park',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_outdoors/pa',
            'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': []},
    'referralId': 'e-0-4a5a4eb2f964a52021ba1fe3-0'},
    {'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason'}]}},
    'venue': { 'id': '4a78425df964a52053e51fe3',
        'name': 'Central Park Tennis Center',
        'location': { 'address': 'Central Park West at 96th St',
            'lat': 40.78931319964619,
            'lng': -73.96186241658044,
            'labeledLatLngs': [{ 'label': 'display',
                'lat': 40.78931319964619,
                'lng': -73.96186241658044}]},
            'distance': 191,
            'postalCode': '10024',
            'cc': 'US',
            'city': 'New York',
            'state': 'NY',
            'country': 'United States',
            'formattedAddress': ['Central Park West at 96th St',
                'New York, NY 10024',
                'United States']],
            'categories': [{ 'id': '4e39a956bd410d7aed40cbc3',
                'name': 'Tennis Court',
                'pluralName': 'Tennis Courts',
                'shortName': 'Tennis Court',
                'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment',
                    'suffix': '.png'},
                'primary': True}],
            'photos': { 'count': 0, 'groups': []},
            'referralId': 'e-0-4a78425df964a52053e51fe3-1'},
            {'reasons': { 'count': 0,
                'items': [{ 'summary': 'This spot is popular',
                    'type': 'general',
                    'reasonName': 'globalInteractionReason'}]}},

```

```

'venue': {'id': '4ba233dbf964a5206fe337e3',
'name': 'East Meadow',
'location': {'address': 'Central Park',
'crossStreet': '5th Ave btwn 98th & 101st St',
'lat': 40.79015961797437,
'lng': -73.95549774169922,
'labeledLatLngs': [{'label': 'display',
'lat': 40.79015961797437,
'lng': -73.95549774169922}]},
'distance': 365,
'postalCode': '10029',
'cc': 'US',
'neighborhood': 'Central Park',
'city': 'New York',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['Central Park (5th Ave btwn 98th & 101st St)',
'New York, NY 10029',
'United States']},
'categories': [{'id': '4bf58dd8d48988d15f941735',
'name': 'Field',
'pluralName': 'Fields',
'shortName': 'Field',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_outdoors/fi',
'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []}},
'referralId': 'e-0-4ba233dbf964a5206fe337e3-2'},
'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]}},
'venue': {'id': '4b67aad0f964a520265a2be3',
'name': 'Central Park - Gate Of All Saints',
'location': {'address': 'Central Park West',
'crossStreet': '96th St',
'lat': 40.791591206824165,
'lng': -73.96479463215677,
'labeledLatLngs': [{'label': 'display',
'lat': 40.791591206824165,
'lng': -73.96479463215677}]},
'distance': 450,
'cc': 'US',
'city': 'New York',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['Central Park West (96th St)',
'New York, NY',

```

```

    'United States']],
    'categories': [{ 'id': '4bf58dd8d48988d163941735',
        'name': 'Park',
        'pluralName': 'Parks',
        'shortName': 'Park',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_outdoors/pa',
            'suffix': '.png' },
        'primary': True }],
    'photos': { 'count': 0, 'groups': [] },
    'referralId': 'e-0-4b67aad0f964a520265a2be3-3'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason' } ] },
    'venue': { 'id': '4a746fb2f964a52025de1fe3',
        'name': 'The Jewish Museum',
        'location': { 'address': '1109 5th Ave',
            'crossStreet': 'at E 92nd St',
            'lat': 40.7852755619908,
            'lng': -73.95741083193923,
            'labeledLatLngs': [ { 'label': 'display',
                'lat': 40.7852755619908,
                'lng': -73.95741083193923 } ],
            'distance': 573,
            'postalCode': '10128',
            'cc': 'US',
            'city': 'New York',
            'state': 'NY',
            'country': 'United States',
            'formattedAddress': [ '1109 5th Ave (at E 92nd St)',
                'New York, NY 10128',
                'United States' ] },
        'categories': [ { 'id': '4bf58dd8d48988d181941735',
            'name': 'Museum',
            'pluralName': 'Museums',
            'shortName': 'Museum',
            'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment',
                'suffix': '.png' },
            'primary': True } ],
        'photos': { 'count': 0, 'groups': [] },
        'venuePage': { 'id': '33720137' } },
    'referralId': 'e-0-4a746fb2f964a52025de1fe3-4'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason' } ] },
    'venue': { 'id': '5328a418498e4be839240b62',
        'name': 'Da Capo',

```

```

'location': {'address': '1392 Madison Ave',
'crossStreet': 'btwn E 96th & E 97th St',
'lat': 40.78767941353058,
'lng': -73.95389924539633,
'labeledLatLngs': [{'label': 'display',
'lat': 40.78767941353058,
'lng': -73.95389924539633}]},
'distance': 567,
'postalCode': '10029',
'cc': 'US',
'city': 'New York',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['1392 Madison Ave (btwn E 96th & E 97th St)',
'New York, NY 10029',
'United States']],
'categories': [{'id': '4bf58dd8d48988d16d941735',
'name': 'Café',
'pluralName': 'Cafés',
'shortName': 'Café',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/cafe_',
'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []}},
'referralId': 'e-0-5328a418498e4be839240b62-5'},
'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]},
'venue': {'id': '4b8adef1f964a520728632e3',
'name': 'Central Park - Wild West Playground',
'location': {'address': 'Central Park West',
'crossStreet': '93rd Street',
'lat': 40.78971453280016,
'lng': -73.96547065045945,
'labeledLatLngs': [{'label': 'display',
'lat': 40.78971453280016,
'lng': -73.96547065045945}]},
'distance': 477,
'cc': 'US',
'city': 'New York',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['Central Park West (93rd Street)',
'New York, NY',
'United States']],
'categories': [{'id': '4bf58dd8d48988d1e7941735',
'name': 'Playground',

```

```

    'pluralName': 'Playgrounds',
    'shortName': 'Playground',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_outdoors/pl',
             'suffix': '.png'},
    'primary': True}],
    'photos': {'count': 0, 'groups': []}},
    'referralId': 'e-0-4b8adef1f964a520728632e3-6'},
    {'reasons': {'count': 0,
                  'items': [{'summary': 'This spot is popular',
                             'type': 'general',
                             'reasonName': 'globalInteractionReason'}]},
                 'venue': {'id': '4b720819f964a520226b2de3',
                           'name': 'K&D Wines & Spirits',
                           'location': {'address': '1343 Madison Ave',
                                         'crossStreet': 'at 96th St',
                                         'lat': 40.787095671313054,
                                         'lng': -73.95426103745547,
                                         'labeledLatLngs': [{'label': 'display',
                                                             'lat': 40.787095671313054,
                                                             'lng': -73.95426103745547}]},
                           'distance': 575,
                           'postalCode': '10128',
                           'cc': 'US',
                           'city': 'New York',
                           'state': 'NY',
                           'country': 'United States',
                           'formattedAddress': ['1343 Madison Ave (at 96th St)',
                                                'New York, NY 10128',
                                                'United States']},
                           'categories': [{'id': '4bf58dd8d48988d119951735',
                                           'name': 'Wine Shop',
                                           'pluralName': 'Wine Shops',
                                           'shortName': 'Wine Shop',
                                           'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/food_winesh',
                                                    'suffix': '.png'},
                                           'primary': True}],
                                           'photos': {'count': 0, 'groups': []}},
                           'venuePage': {'id': '32823670'}]},
    'referralId': 'e-0-4b720819f964a520226b2de3-7'},
    {'reasons': {'count': 0,
                  'items': [{'summary': 'This spot is popular',
                             'type': 'general',
                             'reasonName': 'globalInteractionReason'}]},
                 'venue': {'id': '56cc9aa6498edc84f39f1cfd',
                           'name': 'Russ & Daughters',
                           'location': {'address': '1109 5th Ave',
                                         'crossStreet': 'at E 92nd St',
                                         'lat': 40.785332112548176,

```

```

'lng': -73.957480764814,
'labeledLatLngs': [{ 'label': 'display',
  'lat': 40.785332112548176,
  'lng': -73.957480764814}],
'distance': 565,
'postalCode': '10128',
'cc': 'US',
'city': 'New York',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['1109 5th Ave (at E 92nd St)',
  'New York, NY 10128',
  'United States']],
'categories': [{ 'id': '52e81612bcb57f1066b79fc',
  'name': 'Kosher Restaurant',
  'pluralName': 'Kosher Restaurants',
  'shortName': 'Kosher',
  'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/default_',
    'suffix': '.png'},
  'primary': True}],
'photos': { 'count': 0, 'groups': []}],
'referralId': 'e-0-56cc9aa6498edc84f39f1cfd-8'},
{'reasons': { 'count': 0,
  'items': [{ 'summary': 'This spot is popular',
    'type': 'general',
    'reasonName': 'globalInteractionReason'}]},
'venue': { 'id': '4c841c2ed8086dcb246f8652',
  'name': "Central Park - Woodman's Gate",
  'location': { 'address': '5th Ave',
    'crossStreet': 'at E 96th St',
    'lat': 40.78778566393158,
    'lng': -73.95592421293259,
    'labeledLatLngs': [{ 'label': 'display',
      'lat': 40.78778566393158,
      'lng': -73.95592421293259}],
    'distance': 417,
    'postalCode': '10009',
    'cc': 'US',
    'city': 'New York',
    'state': 'NY',
    'country': 'United States',
    'formattedAddress': ['5th Ave (at E 96th St)',
      'New York, NY 10009',
      'United States']},
  'categories': [{ 'id': '4bf58dd8d48988d163941735',
    'name': 'Park',
    'pluralName': 'Parks',
    'shortName': 'Park',

```

```

      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_outdoors/pa
        'suffix': '.png'},
        'primary': True}],
      'photos': {'count': 0, 'groups': []}},
      'referralId': 'e-0-4c841c2ed8086dcb246f8652-9'},
    {'reasons': {'count': 0,
      'items': [{'summary': 'This spot is popular',
        'type': 'general',
        'reasonName': 'globalInteractionReason'}]}},
    'venue': {'id': '4d6331414554a0934064afaa',
      'name': 'Central Park - 99th & 5th Ave',
      'location': {'crossStreet': '99th Ave & 5th Ave',
        'lat': 40.78879138916376,
        'lng': -73.95523207333972,
        'labeledLatLngs': [{'label': 'display',
          'lat': 40.78879138916376,
          'lng': -73.95523207333972}]},
        'distance': 413,
        'postalCode': '10029',
        'cc': 'US',
        'city': 'New York',
        'state': 'NY',
        'country': 'United States',
        'formattedAddress': ['99th Ave & 5th Ave',
          'New York, NY 10029',
          'United States']},
      'categories': [{'id': '4bf58dd8d48988d163941735',
        'name': 'Park',
        'pluralName': 'Parks',
        'shortName': 'Park',
        'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_outdoors/pa
          'suffix': '.png'},
          'primary': True}],
        'photos': {'count': 0, 'groups': []}},
        'referralId': 'e-0-4d6331414554a0934064afaa-10'},
      {'reasons': {'count': 0,
        'items': [{'summary': 'This spot is popular',
          'type': 'general',
          'reasonName': 'globalInteractionReason'}]}},
        'venue': {'id': '4a229fa8f964a520797d1fe3',
          'name': 'Jacqueline Kennedy Onassis Reservoir',
          'location': {'address': 'Central Park',
            'crossStreet': 'btwn 85th & 96th St',
            'lat': 40.78439292535585,
            'lng': -73.96176979235159,
            'distance': 654,
            'postalCode': '10024',
            'cc': 'US',

```



```

'neighborhood': 'Central Park',
'city': 'New York',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['Central Park (btwn 85th & 96th St)',
'New York, NY 10024',
'United States']],
'categories': [{ 'id': '56aa371be4b08b9a8d573541',
'name': 'Reservoir',
'pluralName': 'Reservoirs',
'shortName': 'Reservoir',
'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_outdoors/lake',
'suffix': '.png'},
'primary': True}],
'photos': { 'count': 0, 'groups': []},
'referralId': 'e-0-4a229fa8f964a520797d1fe3-11'},
{'reasons': { 'count': 0,
'items': [{ 'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]},
'venue': { 'id': '4a2fc4d3f964a520da981fe3',
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      {'reasons': {'count': 0,
        'items': [{'summary': 'This spot is popular',
          'type': 'general',
          'reasonName': 'globalInteractionReason'}]}},
      'venue': {'id': '5952a1870ff4f95af620c049',
        'name': 'The Rochard NYC',
        'location': {'address': '1504 Lexington Ave',
          'crossStreet': 'at 97th St',
          'lat': 40.78664133299527,
          'lng': -73.95045684702883,
          'labeledLatLngs': [{'label': 'display',
            'lat': 40.78664133299527,

```

```

        'lng': -73.95045684702883}],
        'distance': 878,
        'postalCode': '10029',
        'cc': 'US',
        'city': 'New York',
        'state': 'NY',
        'country': 'United States',
        'formattedAddress': ['1504 Lexington Ave (at 97th St)',
                              'New York, NY 10029',
                              'United States']},
        'categories': [{ 'id': '4bf58dd8d48988d116941735',
                          'name': 'Bar',
                          'pluralName': 'Bars',
                          'shortName': 'Bar',
                          'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/nightlife/pub_',
                                    'suffix': '.png'},
                          'primary': True}],
        'photos': { 'count': 0, 'groups': []}},
        'referralId': 'e-0-5952a1870ff4f95af620c049-99'}}]]]]}

```

In [74]: *# function that extracts the category of the venue*

```

def get_category_type(row):
    try:
        categories_list = row['categories']
    except:
        categories_list = row['venue.categories']

    if len(categories_list) == 0:
        return None
    else:
        return categories_list[0]['name']

```

Now we are ready to clean the json and structure it into a pandas dataframe.

In [75]: `venues = results['response']['groups'][0]['items']`

```

nearby_venues = json_normalize(venues) # flatten JSON

# filter columns
filtered_columns = ['venue.name', 'venue.categories', 'venue.location.lat', 'venue.lo
nearby_venues = nearby_venues.loc[:, filtered_columns]

# filter the category for each row
nearby_venues['venue.categories'] = nearby_venues.apply(get_category_type, axis=1)

# clean columns
nearby_venues.columns = [col.split(".")[1] for col in nearby_venues.columns]

nearby_venues.head(10)

```

```

Out [75]:
          name      categories      lat \
0      North Meadow      Park  40.792027
1      Central Park Tennis Center  Tennis Court  40.789313
2      East Meadow      Field  40.790160
3      Central Park - Gate Of All Saints      Park  40.791591
4      The Jewish Museum      Museum  40.785276
5      Da Capo      Café  40.787679
6      Central Park - Wild West Playground      Playground  40.789715
7      K&D Wines & Spirits      Wine Shop  40.787096
8      Russ & Daughters  Kosher Restaurant  40.785332
9      Central Park - Woodman's Gate      Park  40.787786

          lng
0 -73.959853
1 -73.961862
2 -73.955498
3 -73.964795
4 -73.957411
5 -73.953899
6 -73.965471
7 -73.954261
8 -73.957481
9 -73.955924

```

And how many venues were returned by Foursquare?

```

In [76]: print('{} venues were returned by Foursquare.'.format(nearby_venues.shape[0]))

100 venues were returned by Foursquare.

```

Let's create a function to repeat the same process to all the neighborhoods.

```

In [77]: def getNearbyVenues(names, latitudes, longitudes, radius=500):

    venues_list=[]
    for name, lat, lng in zip(names, latitudes, longitudes):
        print(name)

        # create the API request URL
        url = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&version={}&lat={}&lng={}&radius={}&limit={}'.format(
            CLIENT_ID,
            CLIENT_SECRET,
            VERSION,
            lat,
            lng,
            radius,
            LIMIT)

```

```

# make the GET request
results = requests.get(url).json()["response"]["groups"][0]['items']

# return only relevant information for each nearby venue
venues_list.append([
    name,
    lat,
    lng,
    v['venue']['name'],
    v['venue']['location']['lat'],
    v['venue']['location']['lng'],
    v['venue']['categories'][0]['name']) for v in results])

nearby_venues = pd.DataFrame([item for venue_list in venues_list for item in venue_list])
nearby_venues.columns = ['Neighborhood',
                        'Neighborhood Latitude',
                        'Neighborhood Longitude',
                        'Venue',
                        'Venue Latitude',
                        'Venue Longitude',
                        'Venue Category']

return(nearby_venues)

```

Create a new dataframe called ny\_venues.

```

In [78]: ny_venues = getNearbyVenues(names=ny_data['Neighborhood'],
                                     latitudes=ny_data['Latitude'],
                                     longitudes=ny_data['Longitude']
                                     )

```

```

Marble Hill
Chinatown
Washington Heights
Inwood
Hamilton Heights
Manhattanville
Central Harlem
East Harlem
Upper East Side
Yorkville
Lenox Hill
Roosevelt Island
Upper West Side
Lincoln Square
Clinton
Midtown
Murray Hill

```

Chelsea  
 Greenwich Village  
 East Village  
 Lower East Side  
 Tribeca  
 Little Italy  
 Soho  
 West Village  
 Manhattan Valley  
 Morningside Heights  
 Gramercy  
 Battery Park City  
 Financial District  
 Carnegie Hill  
 Noho  
 Civic Center  
 Midtown South  
 Sutton Place  
 Turtle Bay  
 Tudor City  
 Stuyvesant Town  
 Flatiron  
 Hudson Yards

```
In [79]: print(ny_venues.shape)
```

```
(3315, 7)
```

```
In [80]: ny_venues.head(15)
```

```
Out[80]:
```

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	\
0	Marble Hill	40.876551	-73.91066	
1	Marble Hill	40.876551	-73.91066	
2	Marble Hill	40.876551	-73.91066	
3	Marble Hill	40.876551	-73.91066	
4	Marble Hill	40.876551	-73.91066	
5	Marble Hill	40.876551	-73.91066	
6	Marble Hill	40.876551	-73.91066	
7	Marble Hill	40.876551	-73.91066	
8	Marble Hill	40.876551	-73.91066	
9	Marble Hill	40.876551	-73.91066	
10	Marble Hill	40.876551	-73.91066	
11	Marble Hill	40.876551	-73.91066	
12	Marble Hill	40.876551	-73.91066	
13	Marble Hill	40.876551	-73.91066	
14	Marble Hill	40.876551	-73.91066	

	Venue	Venue Latitude	Venue Longitude	\
0	Arturo's	40.874412	-73.910271	
1	Bikram Yoga	40.876844	-73.906204	
2	Tibbett Diner	40.880404	-73.908937	
3	Starbucks	40.877531	-73.905582	
4	Dunkin'	40.877136	-73.906666	
5	Blink Fitness Riverdale	40.877147	-73.905837	
6	TCR The Club of Riverdale	40.878628	-73.914568	
7	Land & Sea Restaurant	40.877885	-73.905873	
8	T.J. Maxx	40.877232	-73.905042	
9	Starbucks	40.873755	-73.908613	
10	Rite Aid	40.875467	-73.908906	
11	Vitamin Shoppe	40.877160	-73.905632	
12	GameStop	40.874267	-73.909342	
13	Lot Less Closeouts	40.878270	-73.905265	
14	Parrilla Latina	40.877473	-73.906073	

	Venue Category
0	Pizza Place
1	Yoga Studio
2	Diner
3	Coffee Shop
4	Donut Shop
5	Gym
6	Tennis Stadium
7	Seafood Restaurant
8	Department Store
9	Coffee Shop
10	Pharmacy
11	Supplement Shop
12	Video Game Store
13	Discount Store
14	Steakhouse

Let's check how many venues were returned for each neighborhood

```
In [81]: ny_venues.groupby('Neighborhood').count()
```

```
Out[81]:
```

Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	\
Battery Park City	99	99	99	
Carnegie Hill	100	100	100	
Central Harlem	42	42	42	
Chelsea	100	100	100	
Chinatown	100	100	100	
Civic Center	100	100	100	
Clinton	100	100	100	
East Harlem	43	43	43	

East Village	100	100	100
Financial District	100	100	100
Flatiron	100	100	100
Gramercy	100	100	100
Greenwich Village	100	100	100
Hamilton Heights	61	61	61
Hudson Yards	75	75	75
Inwood	57	57	57
Lenox Hill	100	100	100
Lincoln Square	100	100	100
Little Italy	100	100	100
Lower East Side	60	60	60
Manhattan Valley	56	56	56
Manhattanville	40	40	40
Marble Hill	26	26	26
Midtown	100	100	100
Midtown South	100	100	100
Morningside Heights	40	40	40
Murray Hill	100	100	100
Noho	100	100	100
Roosevelt Island	29	29	29
Soho	100	100	100
Stuyvesant Town	17	17	17
Sutton Place	100	100	100
Tribeca	100	100	100
Tudor City	83	83	83
Turtle Bay	100	100	100
Upper East Side	100	100	100
Upper West Side	100	100	100
Washington Heights	87	87	87
West Village	100	100	100
Yorkville	100	100	100

	Venue Latitude	Venue Longitude	Venue Category
Neighborhood			
Battery Park City	99	99	99
Carnegie Hill	100	100	100
Central Harlem	42	42	42
Chelsea	100	100	100
Chinatown	100	100	100
Civic Center	100	100	100
Clinton	100	100	100
East Harlem	43	43	43
East Village	100	100	100
Financial District	100	100	100
Flatiron	100	100	100
Gramercy	100	100	100
Greenwich Village	100	100	100



Hamilton Heights	61	61	61
Hudson Yards	75	75	75
Inwood	57	57	57
Lenox Hill	100	100	100
Lincoln Square	100	100	100
Little Italy	100	100	100
Lower East Side	60	60	60
Manhattan Valley	56	56	56
Manhattanville	40	40	40
Marble Hill	26	26	26
Midtown	100	100	100
Midtown South	100	100	100
Morningside Heights	40	40	40
Murray Hill	100	100	100
Noho	100	100	100
Roosevelt Island	29	29	29
Soho	100	100	100
Stuyvesant Town	17	17	17
Sutton Place	100	100	100
Tribeca	100	100	100
Tudor City	83	83	83
Turtle Bay	100	100	100
Upper East Side	100	100	100
Upper West Side	100	100	100
Washington Heights	87	87	87
West Village	100	100	100
Yorkville	100	100	100

Let's find out how many unique categories can be curated from all the returned venues

```
In [82]: print('There are {} uniques categories.'.format(len(ny_venues['Venue Category'].unique)))
```

There are 342 uniques categories.

### 2.1.1 Analyze Each Neighborhood

```
In [83]: # one hot encoding
ny_onehot = pd.get_dummies(ny_venues[['Venue Category']], prefix="", prefix_sep="")

# add neighborhood column back to dataframe
ny_onehot['Neighborhood'] = ny_venues['Neighborhood']

# move neighborhood column to the first column
fixed_columns = [ny_onehot.columns[-1]] + list(ny_onehot.columns[:-1])
ny_onehot = ny_onehot[fixed_columns]

ny_onehot.head()
```

```

Out[83]:  Neighborhood  Accessories Store  Adult Boutique  Afghan Restaurant  \
0  Marble Hill                0                0                0
1  Marble Hill                0                0                0
2  Marble Hill                0                0                0
3  Marble Hill                0                0                0
4  Marble Hill                0                0                0

    African Restaurant  American Restaurant  Antique Shop  Arcade  \
0                0                0                0        0
1                0                0                0        0
2                0                0                0        0
3                0                0                0        0
4                0                0                0        0

    Arepa Restaurant  Argentinian Restaurant  Art Gallery  Art Museum  \
0                0                0                0        0
1                0                0                0        0
2                0                0                0        0
3                0                0                0        0
4                0                0                0        0

    Arts & Crafts Store  Asian Restaurant  Athletics & Sports  Auditorium  \
0                0                0                0        0
1                0                0                0        0
2                0                0                0        0
3                0                0                0        0
4                0                0                0        0

    Australian Restaurant  Austrian Restaurant  Auto Workshop  BBQ Joint  \
0                0                0                0        0
1                0                0                0        0
2                0                0                0        0
3                0                0                0        0
4                0                0                0        0

    Baby Store  Bagel Shop  Bakery  Bank  Bar  Baseball Field  \
0                0                0        0        0        0
1                0                0        0        0        0
2                0                0        0        0        0
3                0                0        0        0        0
4                0                0        0        0        0

    Basketball Court  Bed & Breakfast  Beer Bar  Beer Garden  Beer Store  \
0                0                0        0                0
1                0                0        0                0
2                0                0        0                0
3                0                0        0                0
4                0                0        0                0

```

	Big Box Store	Bike Rental / Bike Share	Bike Shop	Bike Trail	Bistro	\
0	0		0	0	0	
1	0		0	0	0	
2	0		0	0	0	
3	0		0	0	0	
4	0		0	0	0	

	Board Shop	Boat or Ferry	Bookstore	Boutique	Boxing Gym	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Brazilian Restaurant	Breakfast Spot	Bridal Shop	Bridge	Bubble Tea Shop	\
0		0	0	0		0
1		0	0	0		0
2		0	0	0		0
3		0	0	0		0
4		0	0	0		0

	Building	Burger Joint	Burrito Place	Bus Line	Bus Station	Bus Stop	\
0	0	0	0	0	0	0	
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	0	0	0	0	0	0	
4	0	0	0	0	0	0	

	Business Service	Butcher	Cafeteria	Café	Cambodian Restaurant	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Camera Store	Candy Store	Cantonese Restaurant	Caribbean Restaurant	\
0	0	0		0	
1	0	0		0	
2	0	0		0	
3	0	0		0	
4	0	0		0	

	Caucasian Restaurant	Cheese Shop	Chinese Restaurant	Chocolate Shop	\
0		0		0	
1		0		0	
2		0		0	
3		0		0	

4		0		0		0		0
---	--	---	--	---	--	---	--	---

	Circus	Climbing Gym	Clothing Store	Club House	Cocktail Bar	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Coffee Shop	College Academic Building	College Bookstore	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	1	0	0	
4	0	0	0	

	College Cafeteria	College Theater	Comedy Club	Community Center	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Concert Hall	Convenience Store	Cosmetics Shop	Coworking Space	Creperie	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Cuban Restaurant	Cultural Center	Cupcake Shop	Cycle Studio	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Czech Restaurant	Dance Studio	Daycare	Deli / Bodega	Department Store	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Design Studio	Dessert Shop	Dim Sum Restaurant	Diner	Discount Store	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	1	0	

3	0	0	0	0	0
4	0	0	0	0	0

	Dive Bar	Doctor's Office	Dog Run	Donut Shop	Drugstore	Dry Cleaner \
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	1	0	0

	Dumpling Restaurant	Duty-free Shop	Eastern European Restaurant \
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0

	Electronics Store	Empanada Restaurant	English Restaurant \
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0

	Ethiopian Restaurant	Event Space	Exhibit	Falafel Restaurant \
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

	Farmers Market	Fast Food Restaurant	Field	Filipino Restaurant \
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

	Financial or Legal Service	Fish Market	Flea Market	Flower Shop \
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

	Food & Drink Shop	Food Court	Food Stand	Food Truck	Fountain \
0	0	0	0	0	0
1	0	0	0	0	0

2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

	French Restaurant	Fried Chicken Joint	Frozen Yogurt Shop	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	0	0	0	

	Furniture / Home Store	Gaming Cafe	Garden	Garden Center	Gas Station	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Gastropub	Gay Bar	General College & University	General Entertainment	\
0	0	0		0	0
1	0	0		0	0
2	0	0		0	0
3	0	0		0	0
4	0	0		0	0

	German Restaurant	Gift Shop	Golf Course	Gourmet Shop	Greek Restaurant	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Grocery Store	Gym	Gym / Fitness Center	Gym Pool	Gymnastics Gym	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Harbor / Marina	Hardware Store	Hawaiian Restaurant	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	0	0	0	

	Health & Beauty Service	Health Food Store	Heliport	Herbs & Spices Store	\
0	0	0	0	0	

1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

	High School	Himalayan Restaurant	Historic Site	History Museum	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Hobby Shop	Hookah Bar	Hostel	Hot Dog Joint	Hotel	Hotel Bar	\
0	0	0	0	0	0	0	
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	0	0	0	0	0	0	
4	0	0	0	0	0	0	

	Hotpot Restaurant	Ice Cream Shop	Indian Restaurant	Indie Movie Theater	\
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

	Indie Theater	Indoor Play Area	Irish Pub	Israeli Restaurant	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Italian Restaurant	Japanese Curry Restaurant	Japanese Restaurant	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	0	0	0	

	Jazz Club	Jewelry Store	Jewish Restaurant	Juice Bar	Karaoke Bar	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Kebab Restaurant	Kids Store	Korean Restaurant	Kosher Restaurant	\
--	------------------	------------	-------------------	-------------------	---

0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

	Latin American Restaurant	Laundromat	Laundry Service	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	0	0	0	

	Leather Goods Store	Lebanese Restaurant	Library	Lingerie Store	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Liquor Store	Lounge	Malay Restaurant	Market	Martial Arts Dojo	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Massage Studio	Medical Center	Mediterranean Restaurant	Memorial Site	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Men's Store	Metro Station	Mexican Restaurant	Middle Eastern Restaurant	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Mini Golf	Miscellaneous Shop	Mobile Phone Shop	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	0	0	0	



	Modern European Restaurant	Molecular Gastronomy Restaurant	\
0	0	0	
1	0	0	
2	0	0	
3	0	0	
4	0	0	

	Monument / Landmark	Moroccan Restaurant	Movie Theater	Museum	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Music School	Music Venue	Nail Salon	New American Restaurant	Newsstand	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Nightclub	Non-Profit	Noodle House	North Indian Restaurant	Office	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Opera House	Optical Shop	Organic Grocery	Other Nightlife	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Outdoor Sculpture	Outdoors & Recreation	Paella Restaurant	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	0	0	0	

	Pakistani Restaurant	Paper / Office Supplies Store	Park	Pastry Shop	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Performing Arts Venue	Persian Restaurant	Peruvian Restaurant	Pet Café \
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

	Pet Service	Pet Store	Pharmacy	Photography Studio	Piano Bar	Pie Shop \
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0

	Pilates Studio	Pizza Place	Playground	Plaza	Poke Place	Pool	Pub \
0	0	1	0	0	0	0	0
1	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0

	Public Art	Ramen Restaurant	Record Shop	Recreation Center \
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

	Rental Car Location	Residential Building (Apartment / Condo)	Resort \
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0

	Rest Area	Restaurant	River	Rock Club	Roof Deck	Russian Restaurant \
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0

	Sake Bar	Salad Place	Salon / Barbershop	Sandwich Place \
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0

4	0	0	0	0		
	Scandinavian Restaurant	Scenic Lookout	School	Sculpture Garden \		
0	0	0	0	0		
1	0	0	0	0		
2	0	0	0	0		
3	0	0	0	0		
4	0	0	0	0		
	Seafood Restaurant	Shanghai Restaurant	Shipping Store	Shoe Repair \		
0	0	0	0	0		
1	0	0	0	0		
2	0	0	0	0		
3	0	0	0	0		
4	0	0	0	0		
	Shoe Store	Shopping Mall	Skate Park	Ski Shop	Smoke Shop	Smoothie Shop \
0	0	0	0	0	0	0
1	0	0	0	0	0	0
2	0	0	0	0	0	0
3	0	0	0	0	0	0
4	0	0	0	0	0	0
	Snack Place	Soba Restaurant	Soccer Field	Social Club	Soup Place \	
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	
	South American Restaurant	South Indian Restaurant \				
0	0	0				
1	0	0				
2	0	0				
3	0	0				
4	0	0				
	Southern / Soul Food Restaurant	Spa	Spanish Restaurant	Speakeasy \		
0	0	0	0	0		
1	0	0	0	0		
2	0	0	0	0		
3	0	0	0	0		
4	0	0	0	0		
	Spiritual Center	Sporting Goods Shop	Sports Bar	Sports Club	Stables \	
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	

3	0	0	0	0	0
4	0	0	0	0	0

	Steakhouse	Street Art	Strip Club	Supermarket	Supplement Shop	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Sushi Restaurant	Swiss Restaurant	Szechuan Restaurant	Taco Place	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Tailor Shop	Taiwanese Restaurant	Tapas Restaurant	Tattoo Parlor	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Tea Room	Tech Startup	Tennis Court	Tennis Stadium	Thai Restaurant	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Theater	Theme Park Ride / Attraction	Thrift / Vintage Store	Tiki Bar	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Tourist Information Center	Toy / Game Store	Trail	Tree	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Turkish Restaurant	Udon Restaurant	Used Bookstore	\
0	0	0	0	
1	0	0	0	

2	0	0	0
3	0	0	0
4	0	0	0

  

	Vegetarian / Vegan Restaurant	Venezuelan Restaurant	Veterinarian \
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	0	0	0

  

	Video Game Store	Video Store	Vietnamese Restaurant	Volleyball Court \
0	0	0	0	0
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

  

	Watch Shop	Waterfront	Weight Loss Center	Whisky Bar	Wine Bar \
0	0	0	0	0	0
1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

  

	Wine Shop	Wings Joint	Women's Store	Yoga Studio
0	0	0	0	0
1	0	0	0	1
2	0	0	0	0
3	0	0	0	0
4	0	0	0	0

In [84]: ny\_onehot.shape

Out[84]: (3315, 343)

Next, let's group rows by neighborhood and by taking the mean of the frequency of occurrence of each category

In [85]: ny\_grouped = ny\_onehot.groupby('Neighborhood').mean().reset\_index()  
ny\_grouped.head(10)

Out[85]:

	Neighborhood	Accessories Store	Adult Boutique	Afghan Restaurant \
0	Battery Park City	0.00	0.0	0.0
1	Carnegie Hill	0.00	0.0	0.0
2	Central Harlem	0.00	0.0	0.0
3	Chelsea	0.00	0.0	0.0
4	Chinatown	0.00	0.0	0.0
5	Civic Center	0.00	0.0	0.0

6	Clinton	0.00	0.0	0.0
7	East Harlem	0.00	0.0	0.0
8	East Village	0.00	0.0	0.0
9	Financial District	0.01	0.0	0.0

	African Restaurant	American Restaurant	Antique Shop	Arcade \
0	0.000000	0.010101	0.00	0.0
1	0.000000	0.010000	0.00	0.0
2	0.071429	0.047619	0.00	0.0
3	0.000000	0.030000	0.01	0.0
4	0.000000	0.040000	0.00	0.0
5	0.000000	0.030000	0.01	0.0
6	0.000000	0.040000	0.00	0.0
7	0.000000	0.000000	0.00	0.0
8	0.000000	0.020000	0.01	0.0
9	0.000000	0.030000	0.00	0.0

	Arepa Restaurant	Argentinian Restaurant	Art Gallery	Art Museum \
0	0.00	0.00	0.00000	0.00
1	0.00	0.01	0.00000	0.01
2	0.00	0.00	0.02381	0.00
3	0.00	0.00	0.03000	0.00
4	0.00	0.00	0.00000	0.00
5	0.00	0.00	0.02000	0.00
6	0.00	0.00	0.01000	0.00
7	0.00	0.00	0.00000	0.00
8	0.02	0.01	0.01000	0.00
9	0.00	0.00	0.00000	0.00

	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	Auditorium \
0	0.00	0.00	0.010101	0.010101
1	0.00	0.00	0.000000	0.000000
2	0.00	0.00	0.000000	0.000000
3	0.00	0.01	0.000000	0.000000
4	0.00	0.02	0.000000	0.000000
5	0.00	0.01	0.000000	0.000000
6	0.00	0.00	0.000000	0.000000
7	0.00	0.00	0.000000	0.000000
8	0.01	0.00	0.000000	0.000000
9	0.00	0.00	0.000000	0.000000

	Australian Restaurant	Austrian Restaurant	Auto Workshop	BBQ Joint \
0	0.00	0.00	0.0	0.020202
1	0.00	0.00	0.0	0.000000
2	0.00	0.00	0.0	0.023810
3	0.00	0.00	0.0	0.000000
4	0.00	0.01	0.0	0.000000
5	0.01	0.00	0.0	0.000000

6	0.00	0.00	0.0	0.000000
7	0.00	0.00	0.0	0.000000
8	0.00	0.00	0.0	0.000000
9	0.00	0.00	0.0	0.000000

	Baby Store	Bagel Shop	Bakery	Bank	Bar	Baseball Field	\
0	0.00	0.00000	0.010101	0.0	0.000000	0.0	
1	0.00	0.01000	0.030000	0.0	0.040000	0.0	
2	0.00	0.02381	0.000000	0.0	0.047619	0.0	
3	0.00	0.00000	0.040000	0.0	0.010000	0.0	
4	0.00	0.00000	0.030000	0.0	0.010000	0.0	
5	0.01	0.01000	0.030000	0.0	0.010000	0.0	
6	0.00	0.00000	0.010000	0.0	0.020000	0.0	
7	0.00	0.00000	0.093023	0.0	0.000000	0.0	
8	0.00	0.02000	0.010000	0.0	0.060000	0.0	
9	0.00	0.01000	0.010000	0.0	0.030000	0.0	

	Basketball Court	Bed & Breakfast	Beer Bar	Beer Garden	Beer Store	\
0	0.0	0.0	0.000000	0.010101	0.00	
1	0.0	0.0	0.000000	0.000000	0.00	
2	0.0	0.0	0.023810	0.000000	0.00	
3	0.0	0.0	0.010000	0.000000	0.00	
4	0.0	0.0	0.000000	0.000000	0.00	
5	0.0	0.0	0.000000	0.000000	0.00	
6	0.0	0.0	0.000000	0.000000	0.00	
7	0.0	0.0	0.023256	0.000000	0.00	
8	0.0	0.0	0.000000	0.000000	0.01	
9	0.0	0.0	0.000000	0.000000	0.00	

	Big Box Store	Bike Rental / Bike Share	Bike Shop	Bike Trail	Bistro	\
0	0.0	0.0	0.00	0.0	0.010101	
1	0.0	0.0	0.00	0.0	0.000000	
2	0.0	0.0	0.00	0.0	0.000000	
3	0.0	0.0	0.00	0.0	0.000000	
4	0.0	0.0	0.01	0.0	0.000000	
5	0.0	0.0	0.00	0.0	0.000000	
6	0.0	0.0	0.00	0.0	0.000000	
7	0.0	0.0	0.00	0.0	0.000000	
8	0.0	0.0	0.00	0.0	0.000000	
9	0.0	0.0	0.00	0.0	0.000000	

	Board Shop	Boat or Ferry	Bookstore	Boutique	Boxing Gym	\
0	0.0	0.030303	0.00000	0.00000	0.00	
1	0.0	0.000000	0.03000	0.00000	0.00	
2	0.0	0.000000	0.02381	0.02381	0.00	
3	0.0	0.000000	0.02000	0.00000	0.00	
4	0.0	0.000000	0.01000	0.00000	0.00	
5	0.0	0.000000	0.01000	0.00000	0.01	

6	0.0	0.000000	0.00000	0.00000	0.00
7	0.0	0.000000	0.00000	0.00000	0.00
8	0.0	0.000000	0.00000	0.00000	0.00
9	0.0	0.000000	0.00000	0.00000	0.00

	Brazilian Restaurant	Breakfast Spot	Bridal Shop	Bridge	Bubble Tea Shop \
0	0.0	0.00	0.0	0.0	0.00
1	0.0	0.01	0.0	0.0	0.00
2	0.0	0.00	0.0	0.0	0.00
3	0.0	0.01	0.0	0.0	0.00
4	0.0	0.00	0.0	0.0	0.03
5	0.0	0.00	0.0	0.0	0.01
6	0.0	0.00	0.0	0.0	0.00
7	0.0	0.00	0.0	0.0	0.00
8	0.0	0.00	0.0	0.0	0.00
9	0.0	0.00	0.0	0.0	0.00

	Building	Burger Joint	Burrito Place	Bus Line	Bus Station	Bus Stop \
0	0.010101	0.020202	0.010101	0.0	0.0	0.0
1	0.000000	0.010000	0.000000	0.0	0.0	0.0
2	0.000000	0.000000	0.000000	0.0	0.0	0.0
3	0.000000	0.000000	0.000000	0.0	0.0	0.0
4	0.000000	0.000000	0.000000	0.0	0.0	0.0
5	0.010000	0.000000	0.010000	0.0	0.0	0.0
6	0.010000	0.010000	0.000000	0.0	0.0	0.0
7	0.000000	0.000000	0.000000	0.0	0.0	0.0
8	0.000000	0.010000	0.000000	0.0	0.0	0.0
9	0.000000	0.010000	0.000000	0.0	0.0	0.0

	Business Service	Butcher	Cafeteria	Café	Cambodian Restaurant \
0	0.0	0.00	0.00000	0.000000	0.0
1	0.0	0.00	0.00000	0.040000	0.0
2	0.0	0.00	0.02381	0.023810	0.0
3	0.0	0.01	0.00000	0.010000	0.0
4	0.0	0.00	0.00000	0.010000	0.0
5	0.0	0.00	0.00000	0.020000	0.0
6	0.0	0.00	0.00000	0.010000	0.0
7	0.0	0.00	0.00000	0.023256	0.0
8	0.0	0.00	0.00000	0.000000	0.0
9	0.0	0.00	0.00000	0.020000	0.0

	Camera Store	Candy Store	Cantonese Restaurant	Caribbean Restaurant \
0	0.0	0.0	0.00	0.00000
1	0.0	0.0	0.00	0.00000
2	0.0	0.0	0.00	0.02381
3	0.0	0.0	0.00	0.00000
4	0.0	0.0	0.01	0.00000
5	0.0	0.0	0.00	0.00000



6	0.0	0.0	0.00	0.00000
7	0.0	0.0	0.00	0.00000
8	0.0	0.0	0.00	0.01000
9	0.0	0.0	0.00	0.00000

	Caucasian Restaurant	Cheese Shop	Chinese Restaurant	Chocolate Shop \
0	0.00	0.00	0.010101	0.0
1	0.00	0.00	0.000000	0.0
2	0.00	0.00	0.047619	0.0
3	0.00	0.00	0.010000	0.0
4	0.00	0.00	0.090000	0.0
5	0.00	0.00	0.000000	0.0
6	0.01	0.00	0.010000	0.0
7	0.00	0.00	0.023256	0.0
8	0.00	0.01	0.040000	0.0
9	0.00	0.00	0.010000	0.0

	Circus	Climbing Gym	Clothing Store	Club House	Cocktail Bar \
0	0.0	0.0	0.020202	0.0	0.000000
1	0.0	0.0	0.010000	0.0	0.010000
2	0.0	0.0	0.000000	0.0	0.000000
3	0.0	0.0	0.000000	0.0	0.010000
4	0.0	0.0	0.000000	0.0	0.050000
5	0.0	0.0	0.010000	0.0	0.030000
6	0.0	0.0	0.000000	0.0	0.020000
7	0.0	0.0	0.023256	0.0	0.023256
8	0.0	0.0	0.000000	0.0	0.030000
9	0.0	0.0	0.000000	0.0	0.030000

	Coffee Shop	College Academic Building	College Bookstore \
0	0.060606	0.0	0.0
1	0.070000	0.0	0.0
2	0.000000	0.0	0.0
3	0.060000	0.0	0.0
4	0.010000	0.0	0.0
5	0.040000	0.0	0.0
6	0.030000	0.0	0.0
7	0.023256	0.0	0.0
8	0.030000	0.0	0.0
9	0.080000	0.0	0.0

	College Cafeteria	College Theater	Comedy Club	Community Center \
0	0.0	0.00	0.00	0.00
1	0.0	0.00	0.00	0.01
2	0.0	0.00	0.00	0.00
3	0.0	0.01	0.00	0.00
4	0.0	0.00	0.00	0.00
5	0.0	0.00	0.00	0.00

6	0.0	0.00	0.01	0.00
7	0.0	0.00	0.00	0.00
8	0.0	0.00	0.00	0.00
9	0.0	0.00	0.00	0.00

	Concert Hall	Convenience Store	Cosmetics Shop	Coworking Space	Creperie \
0	0.00	0.000000	0.010101	0.00	0.00
1	0.01	0.000000	0.030000	0.00	0.00
2	0.00	0.000000	0.023810	0.00	0.00
3	0.00	0.000000	0.010000	0.00	0.01
4	0.00	0.000000	0.010000	0.00	0.00
5	0.00	0.000000	0.010000	0.00	0.00
6	0.01	0.000000	0.000000	0.00	0.00
7	0.00	0.023256	0.000000	0.00	0.00
8	0.00	0.000000	0.000000	0.00	0.00
9	0.00	0.000000	0.000000	0.01	0.00

	Cuban Restaurant	Cultural Center	Cupcake Shop	Cycle Studio \
0	0.000000	0.0	0.020202	0.000000
1	0.000000	0.0	0.000000	0.000000
2	0.000000	0.0	0.000000	0.02381
3	0.000000	0.0	0.020000	0.02000
4	0.000000	0.0	0.000000	0.000000
5	0.010000	0.0	0.000000	0.000000
6	0.000000	0.0	0.000000	0.000000
7	0.023256	0.0	0.000000	0.000000
8	0.000000	0.0	0.010000	0.000000
9	0.010000	0.0	0.000000	0.01000

	Czech Restaurant	Dance Studio	Daycare	Deli / Bodega	Department Store \
0	0.0	0.000000	0.0	0.000000	0.020202
1	0.0	0.010000	0.0	0.000000	0.000000
2	0.0	0.000000	0.0	0.000000	0.000000
3	0.0	0.000000	0.0	0.000000	0.000000
4	0.0	0.000000	0.0	0.000000	0.000000
5	0.0	0.020000	0.0	0.010000	0.000000
6	0.0	0.000000	0.0	0.000000	0.000000
7	0.0	0.023256	0.0	0.069767	0.000000
8	0.0	0.000000	0.0	0.010000	0.000000
9	0.0	0.000000	0.0	0.010000	0.000000

	Design Studio	Dessert Shop	Dim Sum Restaurant	Diner	Discount Store \
0	0.0	0.000000		0.00	0.0
1	0.0	0.000000		0.00	0.0
2	0.0	0.02381		0.00	0.0
3	0.0	0.01000		0.00	0.0
4	0.0	0.000000		0.02	0.01
5	0.0	0.000000		0.00	0.01

6	0.0	0.00000	0.01	0.01	0.0
7	0.0	0.00000	0.00	0.00	0.0
8	0.0	0.02000	0.00	0.00	0.0
9	0.0	0.00000	0.00	0.00	0.0

	Dive Bar	Doctor's Office	Dog Run	Donut Shop	Drugstore	Dry Cleaner \
0	0.00	0.00	0.00	0.000000	0.0	0.0
1	0.00	0.01	0.00	0.000000	0.0	0.0
2	0.00	0.00	0.00	0.000000	0.0	0.0
3	0.00	0.00	0.00	0.000000	0.0	0.0
4	0.00	0.00	0.00	0.000000	0.0	0.0
5	0.00	0.00	0.00	0.000000	0.0	0.0
6	0.01	0.00	0.01	0.000000	0.0	0.0
7	0.00	0.00	0.00	0.023256	0.0	0.0
8	0.00	0.00	0.01	0.000000	0.0	0.0
9	0.00	0.01	0.00	0.000000	0.0	0.0

	Dumpling Restaurant	Duty-free Shop	Eastern European Restaurant \
0	0.00	0.0	0.0
1	0.00	0.0	0.0
2	0.00	0.0	0.0
3	0.00	0.0	0.0
4	0.03	0.0	0.0
5	0.00	0.0	0.0
6	0.00	0.0	0.0
7	0.00	0.0	0.0
8	0.00	0.0	0.0
9	0.00	0.0	0.0

	Electronics Store	Empanada Restaurant	English Restaurant \
0	0.010101	0.0	0.00
1	0.000000	0.0	0.00
2	0.000000	0.0	0.00
3	0.010000	0.0	0.00
4	0.000000	0.0	0.01
5	0.000000	0.0	0.00
6	0.000000	0.0	0.00
7	0.000000	0.0	0.00
8	0.000000	0.0	0.00
9	0.000000	0.0	0.00

	Ethiopian Restaurant	Event Space	Exhibit	Falafel Restaurant \
0	0.00000	0.00000	0.00	0.00
1	0.00000	0.00000	0.01	0.00
2	0.02381	0.02381	0.00	0.00
3	0.00000	0.00000	0.00	0.00
4	0.00000	0.00000	0.00	0.00
5	0.00000	0.00000	0.00	0.02

6	0.00000	0.00000	0.00	0.00
7	0.00000	0.00000	0.00	0.00
8	0.00000	0.00000	0.00	0.00
9	0.00000	0.03000	0.00	0.02

	Farmers Market	Fast Food Restaurant	Field	Filipino Restaurant	\
0	0.00	0.0	0.0	0.00	
1	0.00	0.0	0.0	0.00	
2	0.00	0.0	0.0	0.00	
3	0.00	0.0	0.0	0.00	
4	0.00	0.0	0.0	0.00	
5	0.00	0.0	0.0	0.00	
6	0.00	0.0	0.0	0.00	
7	0.00	0.0	0.0	0.00	
8	0.01	0.0	0.0	0.01	
9	0.01	0.0	0.0	0.00	

	Financial or Legal Service	Fish Market	Flea Market	Flower Shop	\
0	0.0	0.00	0.00	0.00	
1	0.0	0.00	0.00	0.00	
2	0.0	0.00	0.00	0.00	
3	0.0	0.01	0.01	0.00	
4	0.0	0.00	0.00	0.00	
5	0.0	0.00	0.00	0.00	
6	0.0	0.00	0.00	0.00	
7	0.0	0.00	0.00	0.00	
8	0.0	0.00	0.00	0.01	
9	0.0	0.00	0.00	0.00	

	Food & Drink Shop	Food Court	Food Stand	Food Truck	Fountain	\
0	0.0	0.020202	0.0	0.010101	0.0	
1	0.0	0.000000	0.0	0.010000	0.0	
2	0.0	0.000000	0.0	0.000000	0.0	
3	0.0	0.000000	0.0	0.000000	0.0	
4	0.0	0.000000	0.0	0.000000	0.0	
5	0.0	0.000000	0.0	0.000000	0.0	
6	0.0	0.020000	0.0	0.000000	0.0	
7	0.0	0.000000	0.0	0.000000	0.0	
8	0.0	0.000000	0.0	0.000000	0.0	
9	0.0	0.010000	0.0	0.020000	0.0	

	French Restaurant	Fried Chicken Joint	Frozen Yogurt Shop	\
0	0.000000	0.00000	0.0	
1	0.020000	0.00000	0.0	
2	0.047619	0.02381	0.0	
3	0.020000	0.00000	0.0	
4	0.000000	0.00000	0.0	
5	0.040000	0.00000	0.0	

6	0.010000	0.01000	0.0
7	0.023256	0.00000	0.0
8	0.010000	0.00000	0.0
9	0.010000	0.01000	0.0

	Furniture / Home Store	Gaming Cafe	Garden	Garden Center	Gas Station \
0	0.00	0.0	0.010101	0.00	0.000000
1	0.00	0.0	0.000000	0.00	0.000000
2	0.00	0.0	0.000000	0.00	0.000000
3	0.00	0.0	0.000000	0.00	0.000000
4	0.01	0.0	0.000000	0.01	0.000000
5	0.01	0.0	0.000000	0.00	0.000000
6	0.00	0.0	0.000000	0.00	0.000000
7	0.00	0.0	0.000000	0.00	0.023256
8	0.00	0.0	0.000000	0.01	0.000000
9	0.00	0.0	0.000000	0.00	0.000000

	Gastropub	Gay Bar	General College & University	General Entertainment \
0	0.010101	0.0	0.0	0.00
1	0.000000	0.0	0.0	0.00
2	0.000000	0.0	0.0	0.00
3	0.000000	0.0	0.0	0.00
4	0.000000	0.0	0.0	0.01
5	0.000000	0.0	0.0	0.01
6	0.000000	0.0	0.0	0.00
7	0.000000	0.0	0.0	0.00
8	0.000000	0.0	0.0	0.00
9	0.000000	0.0	0.0	0.00

	German Restaurant	Gift Shop	Golf Course	Gourmet Shop	Greek Restaurant \
0	0.0	0.00	0.0	0.010101	0.00
1	0.0	0.01	0.0	0.010000	0.00
2	0.0	0.00	0.0	0.000000	0.00
3	0.0	0.01	0.0	0.000000	0.00
4	0.0	0.01	0.0	0.000000	0.01
5	0.0	0.00	0.0	0.010000	0.00
6	0.0	0.01	0.0	0.000000	0.00
7	0.0	0.00	0.0	0.000000	0.00
8	0.0	0.01	0.0	0.010000	0.01
9	0.0	0.00	0.0	0.000000	0.01

	Grocery Store	Gym	Gym / Fitness Center	Gym Pool	Gymnastics Gym \
0	0.020202	0.040404	0.00000	0.0	0.0
1	0.030000	0.030000	0.02000	0.0	0.0
2	0.000000	0.023810	0.02381	0.0	0.0
3	0.010000	0.010000	0.01000	0.0	0.0
4	0.000000	0.010000	0.00000	0.0	0.0
5	0.000000	0.020000	0.05000	0.0	0.0

6	0.010000	0.020000	0.05000	0.0	0.0
7	0.023256	0.023256	0.00000	0.0	0.0
8	0.000000	0.000000	0.00000	0.0	0.0
9	0.000000	0.040000	0.03000	0.0	0.0

	Harbor / Marina	Hardware Store	Hawaiian Restaurant	\
0	0.0	0.0	0.0	
1	0.0	0.0	0.0	
2	0.0	0.0	0.0	
3	0.0	0.0	0.0	
4	0.0	0.0	0.0	
5	0.0	0.0	0.0	
6	0.0	0.0	0.0	
7	0.0	0.0	0.0	
8	0.0	0.0	0.0	
9	0.0	0.0	0.0	

	Health & Beauty Service	Health Food Store	Heliport	Herbs & Spices Store	\
0	0.00	0.00	0.0	0.0	
1	0.00	0.00	0.0	0.0	
2	0.00	0.00	0.0	0.0	
3	0.02	0.00	0.0	0.0	
4	0.00	0.00	0.0	0.0	
5	0.01	0.00	0.0	0.0	
6	0.00	0.01	0.0	0.0	
7	0.00	0.00	0.0	0.0	
8	0.00	0.00	0.0	0.0	
9	0.00	0.00	0.0	0.0	

	High School	Himalayan Restaurant	Historic Site	History Museum	\
0	0.0	0.0	0.010101	0.0	
1	0.0	0.0	0.000000	0.0	
2	0.0	0.0	0.000000	0.0	
3	0.0	0.0	0.000000	0.0	
4	0.0	0.0	0.010000	0.0	
5	0.0	0.0	0.000000	0.0	
6	0.0	0.0	0.000000	0.0	
7	0.0	0.0	0.023256	0.0	
8	0.0	0.0	0.000000	0.0	
9	0.0	0.0	0.010000	0.0	

	Hobby Shop	Hookah Bar	Hostel	Hot Dog Joint	Hotel	Hotel Bar	\
0	0.00	0.0	0.0	0.00	0.050505	0.00	
1	0.00	0.0	0.0	0.01	0.010000	0.00	
2	0.00	0.0	0.0	0.00	0.000000	0.00	
3	0.00	0.0	0.0	0.00	0.030000	0.00	
4	0.00	0.0	0.0	0.00	0.010000	0.00	
5	0.00	0.0	0.0	0.00	0.040000	0.02	

6	0.00	0.0	0.0	0.00	0.040000	0.01
7	0.00	0.0	0.0	0.00	0.000000	0.00
8	0.01	0.0	0.0	0.01	0.000000	0.00
9	0.00	0.0	0.0	0.00	0.040000	0.00

	Hotpot Restaurant	Ice Cream Shop	Indian Restaurant	Indie Movie Theater	\
0	0.00	0.020202	0.00	0.00	
1	0.00	0.010000	0.02	0.00	
2	0.00	0.000000	0.00	0.00	
3	0.00	0.050000	0.01	0.00	
4	0.02	0.030000	0.00	0.01	
5	0.00	0.000000	0.01	0.00	
6	0.00	0.010000	0.00	0.00	
7	0.00	0.000000	0.00	0.00	
8	0.00	0.040000	0.00	0.00	
9	0.00	0.010000	0.01	0.00	

	Indie Theater	Indoor Play Area	Irish Pub	Israeli Restaurant	\
0	0.00	0.0	0.0	0.00	
1	0.00	0.0	0.0	0.00	
2	0.00	0.0	0.0	0.00	
3	0.01	0.0	0.0	0.01	
4	0.00	0.0	0.0	0.00	
5	0.00	0.0	0.0	0.00	
6	0.02	0.0	0.0	0.00	
7	0.00	0.0	0.0	0.00	
8	0.00	0.0	0.0	0.00	
9	0.00	0.0	0.0	0.00	

	Italian Restaurant	Japanese Curry Restaurant	Japanese Restaurant	\
0	0.030303	0.00	0.00	
1	0.020000	0.00	0.03	
2	0.000000	0.00	0.00	
3	0.050000	0.00	0.01	
4	0.010000	0.00	0.00	
5	0.040000	0.00	0.00	
6	0.040000	0.00	0.00	
7	0.000000	0.00	0.00	
8	0.010000	0.00	0.02	
9	0.020000	0.01	0.02	

	Jazz Club	Jewelry Store	Jewish Restaurant	Juice Bar	Karaoke Bar	\
0	0.00000	0.00	0.0	0.010101	0.0	
1	0.00000	0.00	0.0	0.000000	0.0	
2	0.02381	0.00	0.0	0.023810	0.0	
3	0.00000	0.00	0.0	0.000000	0.0	
4	0.00000	0.01	0.0	0.000000	0.0	
5	0.00000	0.00	0.0	0.000000	0.0	

6	0.00000	0.00	0.0	0.000000	0.0
7	0.00000	0.00	0.0	0.000000	0.0
8	0.00000	0.00	0.0	0.010000	0.0
9	0.00000	0.02	0.0	0.020000	0.0

	Kebab Restaurant	Kids Store	Korean Restaurant	Kosher Restaurant	\
0	0.0	0.00	0.00	0.00	0.00
1	0.0	0.00	0.00	0.00	0.01
2	0.0	0.00	0.00	0.00	0.00
3	0.0	0.00	0.00	0.00	0.00
4	0.0	0.00	0.02	0.00	0.00
5	0.0	0.01	0.00	0.00	0.00
6	0.0	0.00	0.00	0.00	0.00
7	0.0	0.00	0.00	0.00	0.00
8	0.0	0.00	0.02	0.00	0.00
9	0.0	0.00	0.00	0.00	0.00

	Latin American Restaurant	Laundromat	Laundry Service	\
0	0.000000	0.0	0.00	
1	0.000000	0.0	0.00	
2	0.000000	0.0	0.00	
3	0.000000	0.0	0.00	
4	0.000000	0.0	0.00	
5	0.000000	0.0	0.01	
6	0.000000	0.0	0.00	
7	0.046512	0.0	0.00	
8	0.000000	0.0	0.00	
9	0.000000	0.0	0.00	

	Leather Goods Store	Lebanese Restaurant	Library	Lingerie Store	\
0	0.0	0.0	0.00000	0.010101	
1	0.0	0.0	0.00000	0.000000	
2	0.0	0.0	0.02381	0.000000	
3	0.0	0.0	0.00000	0.000000	
4	0.0	0.0	0.00000	0.000000	
5	0.0	0.0	0.00000	0.000000	
6	0.0	0.0	0.00000	0.000000	
7	0.0	0.0	0.00000	0.000000	
8	0.0	0.0	0.00000	0.000000	
9	0.0	0.0	0.00000	0.000000	

	Liquor Store	Lounge	Malay Restaurant	Market	Martial Arts Dojo	\
0	0.000000	0.00	0.00	0.010101	0.00	
1	0.000000	0.00	0.00	0.000000	0.01	
2	0.000000	0.00	0.00	0.000000	0.00	
3	0.000000	0.00	0.00	0.020000	0.00	
4	0.000000	0.00	0.02	0.000000	0.00	
5	0.000000	0.00	0.00	0.000000	0.01	



6	0.000000	0.02	0.00	0.000000	0.00
7	0.023256	0.00	0.00	0.000000	0.00
8	0.000000	0.00	0.00	0.000000	0.00
9	0.000000	0.00	0.00	0.010000	0.00

	Massage Studio	Medical Center	Mediterranean Restaurant	Memorial Site	\
0	0.00	0.00	0.010101	0.040404	
1	0.00	0.00	0.010000	0.000000	
2	0.00	0.00	0.000000	0.000000	
3	0.00	0.00	0.000000	0.000000	
4	0.01	0.00	0.000000	0.000000	
5	0.00	0.01	0.000000	0.000000	
6	0.00	0.00	0.020000	0.000000	
7	0.00	0.00	0.000000	0.000000	
8	0.00	0.00	0.000000	0.000000	
9	0.00	0.00	0.020000	0.000000	

	Men's Store	Metro Station	Mexican Restaurant	Middle Eastern Restaurant	\
0	0.010101	0.000000	0.010101	0.00	
1	0.000000	0.000000	0.010000	0.00	
2	0.000000	0.02381	0.000000	0.00	
3	0.010000	0.000000	0.010000	0.00	
4	0.010000	0.000000	0.010000	0.00	
5	0.000000	0.000000	0.000000	0.00	
6	0.000000	0.000000	0.000000	0.00	
7	0.000000	0.000000	0.116279	0.00	
8	0.000000	0.000000	0.040000	0.01	
9	0.000000	0.000000	0.010000	0.00	

	Mini Golf	Miscellaneous Shop	Mobile Phone Shop	\
0	0.0	0.0	0.00	
1	0.0	0.0	0.01	
2	0.0	0.0	0.00	
3	0.0	0.0	0.00	
4	0.0	0.0	0.00	
5	0.0	0.0	0.00	
6	0.0	0.0	0.00	
7	0.0	0.0	0.00	
8	0.0	0.0	0.00	
9	0.0	0.0	0.00	

	Modern European Restaurant	Molecular Gastronomy Restaurant	\
0	0.0	0.00	
1	0.0	0.00	
2	0.0	0.00	
3	0.0	0.00	
4	0.0	0.00	
5	0.0	0.01	

6	0.0	0.00
7	0.0	0.00
8	0.0	0.00
9	0.0	0.00

	Monument / Landmark	Moroccan Restaurant	Movie Theater	Museum \
0	0.010101	0.00	0.010101	0.00
1	0.000000	0.00	0.000000	0.01
2	0.000000	0.00	0.000000	0.00
3	0.000000	0.00	0.000000	0.00
4	0.000000	0.00	0.000000	0.01
5	0.010000	0.00	0.000000	0.01
6	0.000000	0.00	0.010000	0.00
7	0.000000	0.00	0.000000	0.00
8	0.000000	0.01	0.000000	0.00
9	0.020000	0.00	0.000000	0.01

	Music School	Music Venue	Nail Salon	New American Restaurant	Newsstand \
0	0.00	0.00000	0.00	0.00	0.0
1	0.00	0.00000	0.00	0.01	0.0
2	0.00	0.02381	0.00	0.00	0.0
3	0.00	0.00000	0.00	0.00	0.0
4	0.00	0.01000	0.00	0.01	0.0
5	0.00	0.00000	0.01	0.01	0.0
6	0.01	0.00000	0.00	0.02	0.0
7	0.00	0.00000	0.00	0.00	0.0
8	0.00	0.00000	0.00	0.00	0.0
9	0.00	0.00000	0.00	0.01	0.0

	Nightclub	Non-Profit	Noodle House	North Indian Restaurant	Office \
0	0.00	0.0	0.00	0.0	0.00
1	0.00	0.0	0.00	0.0	0.00
2	0.00	0.0	0.00	0.0	0.00
3	0.04	0.0	0.01	0.0	0.01
4	0.00	0.0	0.02	0.0	0.00
5	0.00	0.0	0.00	0.0	0.00
6	0.00	0.0	0.00	0.0	0.00
7	0.00	0.0	0.00	0.0	0.00
8	0.00	0.0	0.00	0.0	0.00
9	0.00	0.0	0.00	0.0	0.00

	Opera House	Optical Shop	Organic Grocery	Other Nightlife \
0	0.0	0.00	0.00	0.0
1	0.0	0.00	0.00	0.0
2	0.0	0.00	0.00	0.0
3	0.0	0.00	0.00	0.0
4	0.0	0.01	0.01	0.0
5	0.0	0.00	0.00	0.0

6	0.0	0.00	0.01	0.0
7	0.0	0.00	0.00	0.0
8	0.0	0.00	0.01	0.0
9	0.0	0.00	0.00	0.0

	Outdoor Sculpture	Outdoors & Recreation	Paella Restaurant	\
0	0.0	0.0	0.00	
1	0.0	0.0	0.00	
2	0.0	0.0	0.00	
3	0.0	0.0	0.01	
4	0.0	0.0	0.00	
5	0.0	0.0	0.00	
6	0.0	0.0	0.00	
7	0.0	0.0	0.00	
8	0.0	0.0	0.00	
9	0.0	0.0	0.00	

	Pakistani Restaurant	Paper / Office Supplies Store	Park	Pastry Shop	\
0	0.0	0.00	0.070707	0.0	
1	0.0	0.00	0.000000	0.0	
2	0.0	0.00	0.023810	0.0	
3	0.0	0.00	0.010000	0.0	
4	0.0	0.01	0.000000	0.0	
5	0.0	0.00	0.030000	0.0	
6	0.0	0.00	0.010000	0.0	
7	0.0	0.00	0.023256	0.0	
8	0.0	0.00	0.010000	0.0	
9	0.0	0.00	0.020000	0.0	

	Performing Arts Venue	Persian Restaurant	Peruvian Restaurant	Pet Café	\
0	0.010101	0.0	0.00	0.00	
1	0.000000	0.0	0.00	0.00	
2	0.000000	0.0	0.00	0.00	
3	0.000000	0.0	0.00	0.00	
4	0.000000	0.0	0.00	0.00	
5	0.000000	0.0	0.00	0.00	
6	0.000000	0.0	0.01	0.00	
7	0.023256	0.0	0.00	0.00	
8	0.000000	0.0	0.00	0.01	
9	0.010000	0.0	0.00	0.00	

	Pet Service	Pet Store	Pharmacy	Photography Studio	Piano Bar	Pie Shop	\
0	0.0	0.010101	0.000000	0.00	0.0	0.00	
1	0.0	0.010000	0.000000	0.00	0.0	0.00	
2	0.0	0.000000	0.000000	0.00	0.0	0.00	
3	0.0	0.010000	0.000000	0.01	0.0	0.00	
4	0.0	0.000000	0.010000	0.00	0.0	0.00	
5	0.0	0.000000	0.000000	0.00	0.0	0.00	

6	0.0	0.000000	0.000000	0.00	0.0	0.01
7	0.0	0.023256	0.023256	0.00	0.0	0.00
8	0.0	0.000000	0.000000	0.00	0.0	0.00
9	0.0	0.010000	0.000000	0.00	0.0	0.00

	Pilates Studio	Pizza Place	Playground	Plaza	Poke Place	Pool	\
0	0.0	0.020202	0.020202	0.020202		0.00	0.00
1	0.0	0.060000	0.010000	0.000000		0.00	0.00
2	0.0	0.023810	0.000000	0.000000		0.00	0.00
3	0.0	0.010000	0.000000	0.000000		0.01	0.01
4	0.0	0.010000	0.000000	0.000000		0.00	0.00
5	0.0	0.000000	0.010000	0.010000		0.00	0.00
6	0.0	0.010000	0.000000	0.000000		0.01	0.00
7	0.0	0.023256	0.000000	0.000000		0.00	0.00
8	0.0	0.040000	0.000000	0.000000		0.00	0.00
9	0.0	0.030000	0.000000	0.010000		0.00	0.00

	Pub	Public Art	Ramen Restaurant	Record Shop	Recreation Center	\
0	0.010101	0.000000	0.00	0.00		0.0
1	0.020000	0.000000	0.01	0.00		0.0
2	0.000000	0.047619	0.00	0.00		0.0
3	0.000000	0.000000	0.00	0.00		0.0
4	0.000000	0.000000	0.01	0.01		0.0
5	0.000000	0.000000	0.00	0.00		0.0
6	0.010000	0.000000	0.01	0.00		0.0
7	0.000000	0.000000	0.00	0.00		0.0
8	0.000000	0.000000	0.03	0.02		0.0
9	0.010000	0.000000	0.00	0.00		0.0

	Rental Car Location	Residential Building (Apartment / Condo)	Resort	\
0	0.00000		0.00	0.0
1	0.00000		0.00	0.0
2	0.02381		0.00	0.0
3	0.00000		0.00	0.0
4	0.00000		0.00	0.0
5	0.00000		0.00	0.0
6	0.00000		0.01	0.0
7	0.00000		0.00	0.0
8	0.00000		0.00	0.0
9	0.00000		0.00	0.0

	Rest Area	Restaurant	River	Rock Club	Roof Deck	Russian Restaurant	\
0	0.0	0.000000	0.0	0.0	0.00		0.0
1	0.0	0.010000	0.0	0.0	0.00		0.0
2	0.0	0.000000	0.0	0.0	0.00		0.0
3	0.0	0.000000	0.0	0.0	0.00		0.0
4	0.0	0.000000	0.0	0.0	0.01		0.0
5	0.0	0.000000	0.0	0.0	0.00		0.0

6	0.0	0.010000	0.0	0.0	0.01	0.0
7	0.0	0.023256	0.0	0.0	0.00	0.0
8	0.0	0.000000	0.0	0.0	0.00	0.0
9	0.0	0.010000	0.0	0.0	0.01	0.0

	Sake Bar	Salad Place	Salon / Barbershop	Sandwich Place \
0	0.00	0.010101	0.00	0.020202
1	0.00	0.010000	0.01	0.000000
2	0.00	0.000000	0.00	0.000000
3	0.00	0.000000	0.00	0.010000
4	0.01	0.000000	0.04	0.020000
5	0.00	0.010000	0.00	0.040000
6	0.00	0.000000	0.00	0.030000
7	0.00	0.000000	0.00	0.023256
8	0.00	0.000000	0.00	0.000000
9	0.00	0.010000	0.00	0.010000

	Scandinavian Restaurant	Scenic Lookout	School	Sculpture Garden \
0	0.00	0.010101	0.0	0.010101
1	0.00	0.000000	0.0	0.000000
2	0.00	0.000000	0.0	0.000000
3	0.00	0.010000	0.0	0.000000
4	0.00	0.000000	0.0	0.000000
5	0.00	0.000000	0.0	0.000000
6	0.00	0.000000	0.0	0.000000
7	0.00	0.000000	0.0	0.000000
8	0.01	0.000000	0.0	0.000000
9	0.00	0.000000	0.0	0.000000

	Seafood Restaurant	Shanghai Restaurant	Shipping Store	Shoe Repair \
0	0.010101	0.0	0.00	0.00
1	0.000000	0.0	0.01	0.00
2	0.047619	0.0	0.00	0.00
3	0.030000	0.0	0.00	0.01
4	0.000000	0.0	0.00	0.00
5	0.000000	0.0	0.00	0.00
6	0.010000	0.0	0.00	0.00
7	0.000000	0.0	0.00	0.00
8	0.020000	0.0	0.00	0.00
9	0.010000	0.0	0.00	0.00

	Shoe Store	Shopping Mall	Skate Park	Ski Shop	Smoke Shop	Smoothie Shop \
0	0.00	0.020202	0.0	0.0	0.010101	0.00
1	0.01	0.000000	0.0	0.0	0.000000	0.00
2	0.00	0.000000	0.0	0.0	0.000000	0.00
3	0.00	0.000000	0.0	0.0	0.000000	0.01
4	0.01	0.000000	0.0	0.0	0.000000	0.00
5	0.00	0.000000	0.0	0.0	0.000000	0.00

6	0.00	0.000000	0.0	0.0	0.000000	0.00
7	0.00	0.000000	0.0	0.0	0.000000	0.00
8	0.00	0.000000	0.0	0.0	0.000000	0.00
9	0.01	0.000000	0.0	0.0	0.010000	0.00

	Snack Place	Soba Restaurant	Soccer Field	Social Club	Soup Place	\
0	0.00	0.0	0.0	0.0	0.00	
1	0.00	0.0	0.0	0.0	0.00	
2	0.00	0.0	0.0	0.0	0.00	
3	0.00	0.0	0.0	0.0	0.00	
4	0.01	0.0	0.0	0.0	0.00	
5	0.00	0.0	0.0	0.0	0.00	
6	0.00	0.0	0.0	0.0	0.00	
7	0.00	0.0	0.0	0.0	0.00	
8	0.00	0.0	0.0	0.0	0.01	
9	0.00	0.0	0.0	0.0	0.00	

	South American Restaurant	South Indian Restaurant	\
0	0.0	0.0	
1	0.0	0.0	
2	0.0	0.0	
3	0.0	0.0	
4	0.0	0.0	
5	0.0	0.0	
6	0.0	0.0	
7	0.0	0.0	
8	0.0	0.0	
9	0.0	0.0	

	Southern / Soul Food Restaurant	Spa	Spanish Restaurant	Speakeasy	\
0	0.00000	0.000000	0.000000	0.00	
1	0.00000	0.030000	0.000000	0.00	
2	0.02381	0.023810	0.000000	0.00	
3	0.00000	0.000000	0.000000	0.01	
4	0.00000	0.030000	0.010000	0.00	
5	0.00000	0.030000	0.000000	0.00	
6	0.00000	0.030000	0.000000	0.00	
7	0.00000	0.023256	0.023256	0.00	
8	0.00000	0.010000	0.000000	0.02	
9	0.00000	0.020000	0.000000	0.00	

	Spiritual Center	Sporting Goods	Shop	Sports Bar	Sports Club	Stables	\
0	0.0		0.00	0.00	0.00	0.0	
1	0.0		0.00	0.00	0.00	0.0	
2	0.0		0.00	0.00	0.00	0.0	
3	0.0		0.01	0.00	0.00	0.0	
4	0.0		0.00	0.00	0.01	0.0	
5	0.0		0.03	0.00	0.00	0.0	

6	0.0	0.01	0.01	0.00	0.0
7	0.0	0.00	0.00	0.00	0.0
8	0.0	0.00	0.00	0.00	0.0
9	0.0	0.00	0.00	0.00	0.0

	Steakhouse	Street Art	Strip Club	Supermarket	Supplement Shop	\
0	0.010101	0.0	0.00	0.00	0.0	
1	0.000000	0.0	0.00	0.01	0.0	
2	0.000000	0.0	0.00	0.00	0.0	
3	0.000000	0.0	0.00	0.00	0.0	
4	0.000000	0.0	0.00	0.02	0.0	
5	0.000000	0.0	0.01	0.00	0.0	
6	0.010000	0.0	0.00	0.01	0.0	
7	0.023256	0.0	0.00	0.00	0.0	
8	0.000000	0.0	0.00	0.00	0.0	
9	0.040000	0.0	0.00	0.00	0.0	

	Sushi Restaurant	Swiss Restaurant	Szechuan Restaurant	Taco Place	\
0	0.020202	0.00	0.0	0.000000	
1	0.010000	0.00	0.0	0.010000	
2	0.000000	0.00	0.0	0.000000	
3	0.010000	0.00	0.0	0.010000	
4	0.000000	0.00	0.0	0.000000	
5	0.020000	0.00	0.0	0.000000	
6	0.000000	0.00	0.0	0.010000	
7	0.000000	0.00	0.0	0.023256	
8	0.000000	0.01	0.0	0.000000	
9	0.000000	0.00	0.0	0.000000	

	Tailor Shop	Taiwanese Restaurant	Tapas Restaurant	Tattoo Parlor	\
0	0.00	0.00	0.00	0.0	
1	0.00	0.00	0.00	0.0	
2	0.00	0.00	0.00	0.0	
3	0.00	0.00	0.02	0.0	
4	0.00	0.00	0.00	0.0	
5	0.00	0.00	0.00	0.0	
6	0.00	0.00	0.00	0.0	
7	0.00	0.00	0.00	0.0	
8	0.01	0.01	0.01	0.0	
9	0.00	0.00	0.00	0.0	

	Tea Room	Tech Startup	Tennis Court	Tennis Stadium	Thai Restaurant	\
0	0.00	0.0	0.0	0.0	0.000000	
1	0.00	0.0	0.0	0.0	0.000000	
2	0.00	0.0	0.0	0.0	0.000000	
3	0.00	0.0	0.0	0.0	0.000000	
4	0.01	0.0	0.0	0.0	0.010000	
5	0.00	0.0	0.0	0.0	0.000000	

6	0.00	0.0	0.0	0.0	0.010000
7	0.00	0.0	0.0	0.0	0.046512
8	0.00	0.0	0.0	0.0	0.000000
9	0.00	0.0	0.0	0.0	0.000000

	Theater	Theme Park Ride / Attraction	Thrift / Vintage Store	Tiki Bar \
0	0.00	0.0	0.00	0.0
1	0.00	0.0	0.00	0.0
2	0.00	0.0	0.00	0.0
3	0.03	0.0	0.00	0.0
4	0.00	0.0	0.00	0.0
5	0.01	0.0	0.00	0.0
6	0.12	0.0	0.00	0.0
7	0.00	0.0	0.00	0.0
8	0.00	0.0	0.02	0.0
9	0.00	0.0	0.00	0.0

	Tourist Information Center	Toy / Game Store	Trail	Tree \
0	0.0	0.00	0.00	0.010101
1	0.0	0.00	0.00	0.000000
2	0.0	0.00	0.00	0.000000
3	0.0	0.00	0.00	0.000000
4	0.0	0.00	0.00	0.000000
5	0.0	0.01	0.00	0.000000
6	0.0	0.00	0.00	0.000000
7	0.0	0.00	0.00	0.000000
8	0.0	0.00	0.00	0.000000
9	0.0	0.00	0.01	0.000000

	Turkish Restaurant	Udon Restaurant	Used Bookstore \
0	0.0	0.0	0.00
1	0.0	0.0	0.00
2	0.0	0.0	0.00
3	0.0	0.0	0.00
4	0.0	0.0	0.00
5	0.0	0.0	0.00
6	0.0	0.0	0.00
7	0.0	0.0	0.00
8	0.0	0.0	0.01
9	0.0	0.0	0.00

	Vegetarian / Vegan Restaurant	Venezuelan Restaurant	Veterinarian \
0	0.00	0.0	0.0
1	0.01	0.0	0.0
2	0.00	0.0	0.0
3	0.01	0.0	0.0
4	0.01	0.0	0.0
5	0.00	0.0	0.0



6	0.01	0.0	0.0
7	0.00	0.0	0.0
8	0.03	0.0	0.0
9	0.00	0.0	0.0

	Video Game Store	Video Store	Vietnamese Restaurant	Volleyball Court \
0	0.0	0.0	0.00	0.0
1	0.0	0.0	0.02	0.0
2	0.0	0.0	0.00	0.0
3	0.0	0.0	0.00	0.0
4	0.0	0.0	0.04	0.0
5	0.0	0.0	0.00	0.0
6	0.0	0.0	0.00	0.0
7	0.0	0.0	0.00	0.0
8	0.0	0.0	0.02	0.0
9	0.0	0.0	0.00	0.0

	Watch Shop	Waterfront	Weight Loss Center	Whisky Bar	Wine Bar \
0	0.0	0.0	0.0	0.0	0.010101
1	0.0	0.0	0.0	0.0	0.010000
2	0.0	0.0	0.0	0.0	0.000000
3	0.0	0.0	0.0	0.0	0.000000
4	0.0	0.0	0.0	0.0	0.000000
5	0.0	0.0	0.0	0.0	0.010000
6	0.0	0.0	0.0	0.0	0.020000
7	0.0	0.0	0.0	0.0	0.000000
8	0.0	0.0	0.0	0.0	0.050000
9	0.0	0.0	0.0	0.0	0.010000

	Wine Shop	Wings Joint	Women's Store	Yoga Studio
0	0.030303	0.00	0.010101	0.00
1	0.030000	0.00	0.010000	0.03
2	0.000000	0.00	0.000000	0.00
3	0.020000	0.00	0.010000	0.00
4	0.000000	0.00	0.000000	0.00
5	0.020000	0.01	0.000000	0.03
6	0.030000	0.00	0.000000	0.00
7	0.000000	0.00	0.000000	0.00
8	0.020000	0.00	0.000000	0.00
9	0.030000	0.00	0.010000	0.00

Let's confirm the new size

In [86]: `ny_grouped.shape`

Out[86]: (40, 343)

Let's print each neighborhood along with the top 5 most common venues

```
In [87]: num_top_venues = 5
```

```
for hood in ny_grouped['Neighborhood']:
    print("----"+hood+"----")
    temp = ny_grouped[ny_grouped['Neighborhood'] == hood].T.reset_index()
    temp.columns = ['venue', 'freq']
    temp = temp.iloc[1:]
    temp['freq'] = temp['freq'].astype(float)
    temp = temp.round({'freq': 2})
    print(temp.sort_values('freq', ascending=False).reset_index(drop=True).head(num_top_venues))
    print('\n')
```

```
----Battery Park City----
```

	venue	freq
0	Park	0.07
1	Coffee Shop	0.06
2	Hotel	0.05
3	Memorial Site	0.04
4	Gym	0.04

```
----Carnegie Hill----
```

	venue	freq
0	Coffee Shop	0.07
1	Pizza Place	0.06
2	Bar	0.04
3	Café	0.04
4	Bakery	0.03

```
----Central Harlem----
```

	venue	freq
0	African Restaurant	0.07
1	American Restaurant	0.05
2	Bar	0.05
3	Public Art	0.05
4	Seafood Restaurant	0.05

```
----Chelsea----
```

	venue	freq
0	Coffee Shop	0.06
1	Italian Restaurant	0.05
2	Ice Cream Shop	0.05
3	Nightclub	0.04
4	Bakery	0.04

----Chinatown----

	venue	freq
0	Chinese Restaurant	0.09
1	Cocktail Bar	0.05
2	Vietnamese Restaurant	0.04
3	American Restaurant	0.04
4	Salon / Barbershop	0.04

----Civic Center----

	venue	freq
0	Gym / Fitness Center	0.05
1	Italian Restaurant	0.04
2	Sandwich Place	0.04
3	Hotel	0.04
4	French Restaurant	0.04

----Clinton----

	venue	freq
0	Theater	0.12
1	Gym / Fitness Center	0.05
2	Italian Restaurant	0.04
3	American Restaurant	0.04
4	Hotel	0.04

----East Harlem----

	venue	freq
0	Mexican Restaurant	0.12
1	Bakery	0.09
2	Deli / Bodega	0.07
3	Latin American Restaurant	0.05
4	Thai Restaurant	0.05

----East Village----

	venue	freq
0	Bar	0.06
1	Wine Bar	0.05
2	Chinese Restaurant	0.04
3	Pizza Place	0.04
4	Ice Cream Shop	0.04

----Financial District----

	venue	freq
0	Coffee Shop	0.08

1	Steakhouse	0.04
2	Gym	0.04
3	Hotel	0.04
4	Pizza Place	0.03

----Flatiron----

	venue	freq
0	Gym	0.05
1	Yoga Studio	0.04
2	American Restaurant	0.04
3	Japanese Restaurant	0.04
4	Gym / Fitness Center	0.04

----Gramercy----

	venue	freq
0	Bar	0.07
1	Italian Restaurant	0.04
2	American Restaurant	0.04
3	Pizza Place	0.04
4	Bagel Shop	0.04

----Greenwich Village----

	venue	freq
0	Italian Restaurant	0.13
1	Clothing Store	0.04
2	Sushi Restaurant	0.04
3	Café	0.03
4	Chinese Restaurant	0.03

----Hamilton Heights----

	venue	freq
0	Café	0.07
1	Mexican Restaurant	0.07
2	Coffee Shop	0.07
3	Pizza Place	0.07
4	Caribbean Restaurant	0.03

----Hudson Yards----

	venue	freq
0	American Restaurant	0.07
1	Italian Restaurant	0.05
2	Café	0.05
3	Gym / Fitness Center	0.05

4                      Hotel   0.04

----Inwood----

	venue	freq
0	Lounge	0.07
1	Mexican Restaurant	0.07
2	Café	0.07
3	Deli / Bodega	0.05
4	Pizza Place	0.05

----Lenox Hill----

	venue	freq
0	Coffee Shop	0.07
1	Italian Restaurant	0.05
2	Pizza Place	0.05
3	Sushi Restaurant	0.05
4	Burger Joint	0.03

----Lincoln Square----

	venue	freq
0	Gym / Fitness Center	0.06
1	Theater	0.06
2	Concert Hall	0.05
3	Plaza	0.05
4	Café	0.05

----Little Italy----

	venue	freq
0	Bakery	0.05
1	Café	0.04
2	Sandwich Place	0.03
3	Clothing Store	0.03
4	Bubble Tea Shop	0.03

----Lower East Side----

	venue	freq
0	Coffee Shop	0.07
1	Café	0.05
2	Chinese Restaurant	0.05
3	Art Gallery	0.05
4	Ramen Restaurant	0.05

----Manhattan Valley----

	venue	freq
0	Pizza Place	0.05
1	Coffee Shop	0.05
2	Indian Restaurant	0.05
3	Yoga Studio	0.04
4	Café	0.04

----Manhattanville----

	venue	freq
0	Italian Restaurant	0.05
1	Deli / Bodega	0.05
2	Seafood Restaurant	0.05
3	Coffee Shop	0.05
4	Park	0.05

----Marble Hill----

	venue	freq
0	Sandwich Place	0.12
1	Coffee Shop	0.08
2	Discount Store	0.08
3	Yoga Studio	0.04
4	Supplement Shop	0.04

----Midtown----

	venue	freq
0	Hotel	0.07
1	Clothing Store	0.04
2	Cocktail Bar	0.04
3	Coffee Shop	0.04
4	Theater	0.04

----Midtown South----

	venue	freq
0	Korean Restaurant	0.14
1	Hotel	0.07
2	Japanese Restaurant	0.04
3	Hotel Bar	0.04
4	Cosmetics Shop	0.04

----Morningside Heights----

	venue	freq
0	Bookstore	0.08

1	American Restaurant	0.08
2	Coffee Shop	0.08
3	Park	0.08
4	Sandwich Place	0.05

----Murray Hill----

	venue	freq
0	Coffee Shop	0.05
1	Japanese Restaurant	0.04
2	Sandwich Place	0.04
3	Hotel	0.04
4	Italian Restaurant	0.03

----Noho----

	venue	freq
0	Italian Restaurant	0.06
1	French Restaurant	0.05
2	Cocktail Bar	0.04
3	Sushi Restaurant	0.04
4	Art Gallery	0.03

----Roosevelt Island----

	venue	freq
0	Park	0.07
1	Coffee Shop	0.07
2	Sandwich Place	0.07
3	Playground	0.03
4	Gym / Fitness Center	0.03

----Soho----

	venue	freq
0	Clothing Store	0.09
1	Boutique	0.06
2	Women's Store	0.04
3	Shoe Store	0.04
4	Art Gallery	0.04

----Stuyvesant Town----

	venue	freq
0	Park	0.12
1	Bar	0.12
2	Playground	0.12
3	Baseball Field	0.06

4 Farmers Market 0.06

----Sutton Place----

	venue	freq
0	Gym / Fitness Center	0.06
1	Italian Restaurant	0.04
2	Indian Restaurant	0.04
3	Furniture / Home Store	0.04
4	Pizza Place	0.03

----Tribeca----

	venue	freq
0	Italian Restaurant	0.05
1	Café	0.05
2	Boutique	0.05
3	Park	0.05
4	American Restaurant	0.04

----Tudor City----

	venue	freq
0	Mexican Restaurant	0.06
1	Park	0.06
2	Pizza Place	0.05
3	Greek Restaurant	0.05
4	Café	0.05

----Turtle Bay----

	venue	freq
0	Italian Restaurant	0.06
1	Coffee Shop	0.05
2	Sushi Restaurant	0.05
3	Steakhouse	0.05
4	Ramen Restaurant	0.04

----Upper East Side----

	venue	freq
0	Italian Restaurant	0.08
1	Exhibit	0.07
2	Art Gallery	0.05
3	Bakery	0.04
4	Coffee Shop	0.04



----Upper West Side----

	venue	freq
0	Italian Restaurant	0.06
1	Wine Bar	0.04
2	Bar	0.04
3	Cosmetics Shop	0.03
4	Indian Restaurant	0.03

----Washington Heights----

	venue	freq
0	Café	0.06
1	Mobile Phone Shop	0.05
2	Bakery	0.05
3	Grocery Store	0.03
4	Wine Shop	0.02

----West Village----

	venue	freq
0	Italian Restaurant	0.09
1	Cosmetics Shop	0.05
2	New American Restaurant	0.05
3	Park	0.04
4	Wine Bar	0.04

----Yorkville----

	venue	freq
0	Italian Restaurant	0.06
1	Gym	0.06
2	Coffee Shop	0.06
3	Bar	0.05
4	Sushi Restaurant	0.04

Let's put that into a pandas dataframe

```
In [88]: #a function to sort the venues in descending order
```

```
def return_most_common_venues(row, num_top_venues):
    row_categories = row.iloc[1:]
    row_categories_sorted = row_categories.sort_values(ascending=False)

    return row_categories_sorted.index.values[0:num_top_venues]
```

```
In [89]: #create the new dataframe and display the top 10 venues for each neighborhood.
```

```

num_top_venues = 10
word_string3 = ''
indicators = ['st', 'nd', 'rd']

# create columns according to number of top venues
columns = ['Neighborhood']
for ind in np.arange(num_top_venues):
    try:
        columns.append('{}-{} Most Common Venue'.format(ind+1, indicators[ind]))
    except:
        columns.append('{}th Most Common Venue'.format(ind+1))

# create a new dataframe
neighborhoods_venues_sorted = pd.DataFrame(columns=columns)
neighborhoods_venues_sorted['Neighborhood'] = ny_grouped['Neighborhood']

for ind in np.arange(ny_grouped.shape[0]):
    neighborhoods_venues_sorted.iloc[ind, 1:] = return_most_common_venues(ny_grouped,
    word_string3 = word_string3 + neighborhoods_venues_sorted.iloc[ind, 1:] + ' '

neighborhoods_venues_sorted.head(10)

```

```

Out[89]:

```

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	\
0	Battery Park City	Park	Coffee Shop	
1	Carnegie Hill	Coffee Shop	Pizza Place	
2	Central Harlem	African Restaurant	Seafood Restaurant	
3	Chelsea	Coffee Shop	Ice Cream Shop	
4	Chinatown	Chinese Restaurant	Cocktail Bar	
5	Civic Center	Gym / Fitness Center	French Restaurant	
6	Clinton	Theater	Gym / Fitness Center	
7	East Harlem	Mexican Restaurant	Bakery	
8	East Village	Bar	Wine Bar	
9	Financial District	Coffee Shop	Steakhouse	

  

	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	\
0	Hotel	Memorial Site	Gym	
1	Café	Bar	Yoga Studio	
2	American Restaurant	French Restaurant	Public Art	
3	Italian Restaurant	Nightclub	Bakery	
4	Salon / Barbershop	American Restaurant	Vietnamese Restaurant	
5	Sandwich Place	Italian Restaurant	Hotel	
6	American Restaurant	Italian Restaurant	Hotel	
7	Deli / Bodega	Thai Restaurant	Latin American Restaurant	
8	Chinese Restaurant	Mexican Restaurant	Ice Cream Shop	
9	Hotel	Gym	Wine Shop	

  

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	\
0	Boat or Ferry	Wine Shop	Italian Restaurant	

1	Bookstore	Japanese Restaurant	Grocery Store
2	Bar	Chinese Restaurant	Dessert Shop
3	Theater	Hotel	American Restaurant
4	Ice Cream Shop	Bubble Tea Shop	Spa
5	Coffee Shop	Yoga Studio	Sporting Goods Shop
6	Coffee Shop	Wine Shop	Spa
7	Chinese Restaurant	Liquor Store	Taco Place
8	Pizza Place	Ramen Restaurant	Coffee Shop
9	Bar	American Restaurant	Event Space

	9th Most Common Venue	10th Most Common Venue
0	Sushi Restaurant	Burger Joint
1	Bakery	Gym
2	Beer Bar	Library
3	Seafood Restaurant	Art Gallery
4	Dumpling Restaurant	Bakery
5	American Restaurant	Spa
6	Sandwich Place	Mediterranean Restaurant
7	Gas Station	Steakhouse
8	Cocktail Bar	Vegetarian / Vegan Restaurant
9	Pizza Place	Cocktail Bar

### 2.1.2 Vizualization with word cloud

```
In [90]: stopwords = set(STOPWORDS)

In [91]: word_string4 = ''
         for i in range(0, num_top_venues ):
             word_string4 = word_string4 + word_string3[i]

In [92]: # create the word cloud
         wordcloud = WordCloud(background_color='white').generate(word_string4)

         print('Word cloud created!')

         # display the cloud
         fig = plt.figure()
         fig.set_figwidth(12)
         fig.set_figheight(15)

         plt.imshow(wordcloud, interpolation='bilinear')
         plt.axis('off')
         plt.show()
```

Word cloud created!



```

Out [94]:      Borough      Neighborhood  Latitude  Longitude  Cluster Labels  \
0  Manhattan      Marble Hill  40.876551  -73.910660          4
1  Manhattan      Chinatown  40.715618  -73.994279          1
2  Manhattan  Washington Heights  40.851903  -73.936900          0
3  Manhattan      Inwood  40.867684  -73.921210          0
4  Manhattan  Hamilton Heights  40.823604  -73.949688          0

      1st Most Common Venue  2nd Most Common Venue  3rd Most Common Venue  \
0      Sandwich Place      Coffee Shop      Discount Store
1      Chinese Restaurant      Cocktail Bar      Salon / Barbershop
2      Café      Bakery      Mobile Phone Shop
3      Lounge      Café      Mexican Restaurant
4      Pizza Place      Coffee Shop      Café

      4th Most Common Venue  5th Most Common Venue  6th Most Common Venue  \
0      Yoga Studio      Supplement Shop      Steakhouse
1      American Restaurant  Vietnamese Restaurant      Ice Cream Shop
2      Grocery Store      Mexican Restaurant      Supermarket
3      Deli / Bodega      Pizza Place      Chinese Restaurant
4      Mexican Restaurant      Yoga Studio      Bakery

      7th Most Common Venue  8th Most Common Venue  9th Most Common Venue  \
0      Spa      Shopping Mall      Seafood Restaurant
1      Bubble Tea Shop      Spa      Dumpling Restaurant
2      Sandwich Place      Chinese Restaurant      Tapas Restaurant
3      Wine Bar      American Restaurant      Bakery
4      Park      Cocktail Bar      Sandwich Place

      10th Most Common Venue
0      Clothing Store
1      Bakery
2      Coffee Shop
3      Park
4      School

```

Finally, let's visualize the resulting clusters

```

In [95]: # create map
map_clusters = folium.Map(location=[latitude, longitude], zoom_start=11)

# set color scheme for the clusters
x = np.arange(kclusters)
ys = [i + x + (i*x)**2 for i in range(kclusters)]
colors_array = cm.rainbow(np.linspace(0, 1, len(ys)))
rainbow = [colors.rgb2hex(i) for i in colors_array]

# add markers to the map
markers_colors = []

```

```

for lat, lon, poi, cluster in zip(ny_merged['Latitude'], ny_merged['Longitude'], ny_m
    label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse_html=True)
    folium.CircleMarker(
        [lat, lon],
        radius=5,
        popup=label,
        color=rainbow[cluster-1],
        fill=True,
        fill_color=rainbow[cluster-1],
        fill_opacity=0.7).add_to(map_clusters)

map_clusters

```

Out[95]: <folium.folium.Map at 0x7fe50d6d2cf8>

## 2.1.4 Examining the clusters

Let's try and see each cluster and the most common venue among each.

```

In [96]: # For Cluster 0
result = ny_merged.loc[ny_merged['Cluster Labels'] == 0, ny_merged.columns[[1] + list
print("For cluster {}, the distribution of venues is as:\n{}".format(0, result['1st M
result

```

For cluster 0, the distribution of venues is as:

```

Mexican Restaurant    2
Pizza Place           2
Café                  1
Coffee Shop           1
Lounge                1
Park                  1
Name: 1st Most Common Venue, dtype: int64

```

```

Out[96]:
      Neighborhood 1st Most Common Venue 2nd Most Common Venue \
2  Washington Heights          Café          Bakery
3              Inwood          Lounge          Café
4  Hamilton Heights      Pizza Place      Coffee Shop
5  Manhattanville    Mexican Restaurant          Park
7      East Harlem    Mexican Restaurant          Bakery
20  Lower East Side      Coffee Shop      Ramen Restaurant
25  Manhattan Valley      Pizza Place      Coffee Shop
36      Tudor City          Park    Mexican Restaurant

      3rd Most Common Venue 4th Most Common Venue      5th Most Common Venue \
2  Mobile Phone Shop      Grocery Store      Mexican Restaurant
3  Mexican Restaurant      Deli / Bodega          Pizza Place
4              Café    Mexican Restaurant          Yoga Studio
5      Coffee Shop      Deli / Bodega      Italian Restaurant

```

7	Deli / Bodega	Thai Restaurant	Latin American Restaurant
20	Chinese Restaurant	Café	Pizza Place
25	Indian Restaurant	Yoga Studio	Thai Restaurant
36	Café	Greek Restaurant	Pizza Place

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue \
2	Supermarket	Sandwich Place	Chinese Restaurant
3	Chinese Restaurant	Wine Bar	American Restaurant
4	Bakery	Park	Cocktail Bar
5	Seafood Restaurant	Diner	Bike Trail
7	Chinese Restaurant	Liquor Store	Taco Place
20	Art Gallery	Cocktail Bar	Sandwich Place
25	Mexican Restaurant	Café	Bar
36	Deli / Bodega	Hotel	Spa

	9th Most Common Venue	10th Most Common Venue
2	Tapas Restaurant	Coffee Shop
3	Bakery	Park
4	Sandwich Place	School
5	Lounge	Sushi Restaurant
7	Gas Station	Steakhouse
20	Bakery	Japanese Restaurant
25	Deli / Bodega	Playground
36	Restaurant	Diner

In [97]: # For Cluster 1

```
result = ny_merged.loc[ny_merged['Cluster Labels'] == 1, ny_merged.columns[[1] + list
print("For cluster {}, the distribution of venues is as:\n{}".format(1, result['1st M
result
```

For cluster 1, the distribution of venues is as:

Coffee Shop	4
Bar	2
Italian Restaurant	2
Gym	1
Chinese Restaurant	1
Gym / Fitness Center	1
Sandwich Place	1
Korean Restaurant	1
African Restaurant	1

Name: 1st Most Common Venue, dtype: int64

Out[97]:	Neighborhood	1st Most Common Venue	2nd Most Common Venue \
1	Chinatown	Chinese Restaurant	Cocktail Bar
6	Central Harlem	African Restaurant	Seafood Restaurant
9	Yorkville	Gym	Italian Restaurant
10	Lenox Hill	Coffee Shop	Pizza Place

11	Roosevelt Island	Sandwich Place	Park
12	Upper West Side	Italian Restaurant	Wine Bar
16	Murray Hill	Coffee Shop	Sandwich Place
19	East Village	Bar	Wine Bar
27	Gramercy	Bar	Italian Restaurant
29	Financial District	Coffee Shop	Steakhouse
30	Carnegie Hill	Coffee Shop	Pizza Place
33	Midtown South	Korean Restaurant	Hotel
34	Sutton Place	Gym / Fitness Center	Italian Restaurant
35	Turtle Bay	Italian Restaurant	Steakhouse

	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue \
1	Salon / Barbershop	American Restaurant	Vietnamese Restaurant
6	American Restaurant	French Restaurant	Public Art
9	Coffee Shop	Bar	Sushi Restaurant
10	Italian Restaurant	Sushi Restaurant	Sporting Goods Shop
11	Coffee Shop	Food Truck	Noodle House
12	Bar	Indian Restaurant	Mediterranean Restaurant
16	Hotel	Japanese Restaurant	Bar
19	Chinese Restaurant	Mexican Restaurant	Ice Cream Shop
27	Bagel Shop	American Restaurant	Pizza Place
29	Hotel	Gym	Wine Shop
30	Café	Bar	Yoga Studio
33	Dessert Shop	Cosmetics Shop	Hotel Bar
34	Indian Restaurant	Furniture / Home Store	American Restaurant
35	Coffee Shop	Sushi Restaurant	Ramen Restaurant

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue \
1	Ice Cream Shop	Bubble Tea Shop	Spa
6	Bar	Chinese Restaurant	Dessert Shop
9	Pizza Place	Wine Shop	Deli / Bodega
10	Gym	Gym / Fitness Center	Burger Joint
11	Greek Restaurant	Liquor Store	Metro Station
12	Bakery	Cosmetics Shop	Coffee Shop
16	Italian Restaurant	French Restaurant	Gym / Fitness Center
19	Pizza Place	Ramen Restaurant	Coffee Shop
27	Thai Restaurant	Coffee Shop	Mexican Restaurant
29	Bar	American Restaurant	Event Space
30	Bookstore	Japanese Restaurant	Grocery Store
33	Japanese Restaurant	Coffee Shop	American Restaurant
34	Gym	Juice Bar	Dessert Shop
35	Wine Bar	Indian Restaurant	Japanese Restaurant

	9th Most Common Venue	10th Most Common Venue
1	Dumpling Restaurant	Bakery
6	Beer Bar	Library
9	Mexican Restaurant	Japanese Restaurant
10	Cosmetics Shop	Deli / Bodega



11	Supermarket	Bubble Tea Shop
12	Vegetarian / Vegan Restaurant	Pet Store
16	Gym	Salon / Barbershop
19	Cocktail Bar	Vegetarian / Vegan Restaurant
27	Cocktail Bar	Thrift / Vintage Store
29	Pizza Place	Cocktail Bar
30	Bakery	Gym
33	Boutique	Bakery
34	Pizza Place	French Restaurant
35	French Restaurant	Café

In [98]: # For Cluster 2

```
result = ny_merged.loc[ny_merged['Cluster Labels'] == 2, ny_merged.columns[[1] + list
print("For cluster {}, the distribution of venues is as:\n{}".format(2, result['1st M
result
```

For cluster 2, the distribution of venues is as:

Italian Restaurant	4
Theater	2
American Restaurant	1
Bakery	1
Bookstore	1
Gym	1
Park	1
Hotel	1
Gym / Fitness Center	1
Coffee Shop	1
Boutique	1
Clothing Store	1

Name: 1st Most Common Venue, dtype: int64

Out [98]:	Neighborhood	1st Most Common Venue	2nd Most Common Venue	\
8	Upper East Side	Italian Restaurant	Exhibit	
13	Lincoln Square	Theater	Gym / Fitness Center	
14	Clinton	Theater	Gym / Fitness Center	
15	Midtown	Hotel	Cocktail Bar	
17	Chelsea	Coffee Shop	Ice Cream Shop	
18	Greenwich Village	Italian Restaurant	Clothing Store	
21	Tribeca	Boutique	Park	
22	Little Italy	Bakery	Café	
23	Soho	Clothing Store	Boutique	
24	West Village	Italian Restaurant	Cosmetics Shop	
26	Morningside Heights	Bookstore	American Restaurant	
28	Battery Park City	Park	Coffee Shop	
31	Noho	Italian Restaurant	French Restaurant	
32	Civic Center	Gym / Fitness Center	French Restaurant	
38	Flatiron	Gym	Gym / Fitness Center	

39 Hudson Yards American Restaurant Gym / Fitness Center

	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue \
8	Art Gallery	Coffee Shop	Gym / Fitness Center
13	Café	Concert Hall	Plaza
14	American Restaurant	Italian Restaurant	Hotel
15	Clothing Store	Theater	Coffee Shop
17	Italian Restaurant	Nightclub	Bakery
18	Sushi Restaurant	Indian Restaurant	Cosmetics Shop
21	Italian Restaurant	Café	Spa
22	Salon / Barbershop	Italian Restaurant	Sandwich Place
23	Art Gallery	Women's Store	Shoe Store
24	New American Restaurant	Park	Wine Bar
26	Park	Coffee Shop	Food Truck
28	Hotel	Memorial Site	Gym
31	Cocktail Bar	Sushi Restaurant	Pizza Place
32	Sandwich Place	Italian Restaurant	Hotel
38	Japanese Restaurant	Yoga Studio	American Restaurant
39	Café	Italian Restaurant	Hotel

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue \
8	Bakery	French Restaurant	Spa
13	Italian Restaurant	Performing Arts Venue	Indie Movie Theater
14	Coffee Shop	Wine Shop	Spa
15	Bakery	Spa	Japanese Restaurant
17	Theater	Hotel	American Restaurant
18	Chinese Restaurant	Seafood Restaurant	Café
21	American Restaurant	Wine Shop	Wine Bar
22	Bubble Tea Shop	Clothing Store	Mediterranean Restaurant
23	Men's Store	Italian Restaurant	Hotel
24	American Restaurant	Cocktail Bar	Bakery
26	Tennis Court	Deli / Bodega	Burger Joint
28	Boat or Ferry	Wine Shop	Italian Restaurant
31	Boutique	Coffee Shop	Rock Club
32	Coffee Shop	Yoga Studio	Sporting Goods Shop
38	Café	Salon / Barbershop	New American Restaurant
39	Spanish Restaurant	Restaurant	Theater

	9th Most Common Venue	10th Most Common Venue
8	Hotel	Juice Bar
13	Opera House	French Restaurant
14	Sandwich Place	Mediterranean Restaurant
15	Sporting Goods Shop	Steakhouse
17	Seafood Restaurant	Art Gallery
18	French Restaurant	Burger Joint
21	Gym	Coffee Shop
22	Cocktail Bar	Seafood Restaurant
23	Bakery	Sporting Goods Shop

24	Jazz Club	Speakeasy
26	Sandwich Place	New American Restaurant
28	Sushi Restaurant	Burger Joint
31	Mexican Restaurant	Bookstore
32	American Restaurant	Spa
38	Clothing Store	Cosmetics Shop
39	Coffee Shop	Thai Restaurant

In [99]: # For Cluster 3

```
result = ny_merged.loc[ny_merged['Cluster Labels'] == 3, ny_merged.columns[[1] + list(
print("For cluster {}, the distribution of venues is as:\n{}".format(3, result['1st M
result
```

For cluster 3, the distribution of venues is as:

Bar 1

Name: 1st Most Common Venue, dtype: int64

```
Out[99]:      Neighborhood 1st Most Common Venue 2nd Most Common Venue \
37  Stuyvesant Town      Bar      Park

      3rd Most Common Venue 4th Most Common Venue 5th Most Common Venue \
37      Playground      Pet Service      Gas Station

      6th Most Common Venue 7th Most Common Venue 8th Most Common Venue \
37      Boat or Ferry      Farmers Market      Basketball Court

      9th Most Common Venue 10th Most Common Venue
37      Baseball Field      Harbor / Marina
```

In [133]: #For Cluster 4

```
#result = ny_merged.loc[ny_merged['Cluster Labels'] == 4, ny_merged.columns[[1] + li
#print("For cluster {}, the distribution of venues is as:\n{}".format(4, result['1st
#result
```

## 2.1.5 Let's explore the Kensington and Chelsea, uk in our dataframe.

Get the neighborhood's name.

In [100]: address = 'Kensington and Chelsea, uk'

```
geolocator = Nominatim(user_agent="uk_explorer")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geograpical coordinate of Kensington and Chelsea, uk {}, {}'.format(lati
```

The geograpical coordinate of Kensington and Chelsea, uk 51.4989948, -0.1991229.

```
In [101]: LIMIT = 200 # limit of number of venues returned by Foursquare API
radius = 1500 # define radius
url = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&v=
CLIENT_ID,
CLIENT_SECRET,
VERSION,
latitude,
longitude,
radius,
LIMIT)
url # display URL
```

```
Out[101]: 'https://api.foursquare.com/v2/venues/explore?&client_id=B3D1FREXU3FMFKGOXFFFWLZH1UBI'
```

```
In [102]: results1 = requests.get(url).json()
results1
```

```
Out[102]: {'meta': {'code': 200, 'requestId': '5d43ef1cf8953d00252f7b4e'},
'response': {'suggestedFilters': {'header': 'Tap to show:',
'filters': [{'name': 'Open now', 'key': 'openNow'}]},
'headerLocation': 'Kensington and Chelsea',
'headerFullLocation': 'Kensington and Chelsea, London',
'headerLocationGranularity': 'neighborhood',
'totalResults': 243,
'suggestedBounds': {'ne': {'lat': 51.51249481350001,
'lng': -0.17747760935663817},
'sw': {'lat': 51.485494786499984, 'lng': -0.2207681906433618}},
'groups': [{'type': 'Recommended Places',
'name': 'recommended',
'items': [{'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]}],
'venue': {'id': '553e58fa498edba593d315',
'name': 'Core Collective',
'location': {'address': '45 Phillimore Walk',
'lat': 51.499588979407925,
'lng': -0.1986304181543621,
'labeledLatLngs': [{'label': 'display',
'lat': 51.499588979407925,
'lng': -0.1986304181543621}]},
'distance': 74,
'postalCode': 'W8 7RZ',
'cc': 'GB',
'city': 'London',
'state': 'Greater London',
'country': 'United Kingdom',
'formattedAddress': ['45 Phillimore Walk',
```

```

        'London',
        'Greater London',
        'W8 7RZ',
        'United Kingdom']},
    'categories': [{ 'id': '4bf58dd8d48988d175941735',
        'name': 'Gym / Fitness Center',
        'pluralName': 'Gyms or Fitness Centers',
        'shortName': 'Gym / Fitness',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/building/gym_',
            'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': []},
    'referralId': 'e-0-553e58fa498edba593d315-0'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason'}]}},
    'venue': { 'id': '57d5606a498e432cab0a7099',
        'name': 'The Design Museum',
        'location': { 'address': '224-238 Kensington High St',
            'lat': 51.49978541909211,
            'lng': -0.1996407067827977,
            'labeledLatLngs': [{ 'label': 'display',
                'lat': 51.49978541909211,
                'lng': -0.1996407067827977}],
            'distance': 95,
            'postalCode': 'W8 6AG',
            'cc': 'GB',
            'city': 'London',
            'state': 'Greater London',
            'country': 'United Kingdom',
            'formattedAddress': ['224-238 Kensington High St',
                'London',
                'Greater London',
                'W8 6AG',
                'United Kingdom']},
        'categories': [{ 'id': '4bf58dd8d48988d181941735',
            'name': 'Museum',
            'pluralName': 'Museums',
            'shortName': 'Museum',
            'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment',
                'suffix': '.png'},
            'primary': True}],
        'photos': { 'count': 0, 'groups': []},
        'referralId': 'e-0-57d5606a498e432cab0a7099-1'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',

```

```

      'reasonName': 'globalInteractionReason'}}}],
'venue': {'id': '4b1a6a68f964a5200dea23e3',
'name': 'Café Phillies',
'location': {'address': '2A Phillimore Gdns',
'lat': 51.49972550096316,
'lng': -0.19774730231827767,
'labeledLatLngs': [{'label': 'display',
'lat': 51.49972550096316,
'lng': -0.19774730231827767}]},
'distance': 125,
'postalCode': 'W8 7QB',
'cc': 'GB',
'city': 'London',
'state': 'Greater London',
'country': 'United Kingdom',
'formattedAddress': ['2A Phillimore Gdns',
'London',
'Greater London',
'W8 7QB',
'United Kingdom']},
'categories': [{'id': '4bf58dd8d48988d16d941735',
'name': 'Café',
'pluralName': 'Cafés',
'shortName': 'Café',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/cafe_',
'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []}},
'referralId': 'e-0-4b1a6a68f964a5200dea23e3-2'},
{'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}}}],
'venue': {'id': '4bb375872397b713311e38b3',
'name': 'Leighton House Museum',
'location': {'address': '12 Holland Park Rd',
'lat': 51.49859141231831,
'lng': -0.20311832427978516,
'labeledLatLngs': [{'label': 'display',
'lat': 51.49859141231831,
'lng': -0.20311832427978516}]},
'distance': 280,
'postalCode': 'W14 8LZ',
'cc': 'GB',
'city': 'London',
'state': 'Greater London',
'country': 'United Kingdom',
'formattedAddress': ['12 Holland Park Rd',

```

```

        'London',
        'Greater London',
        'W14 8LZ',
        'United Kingdom']},
    'categories': [{ 'id': '4bf58dd8d48988d190941735',
        'name': 'History Museum',
        'pluralName': 'History Museums',
        'shortName': 'History Museum',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainme
        'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': []},
    'referralId': 'e-0-4bb375872397b713311e38b3-3'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason' } ]},
    'venue': { 'id': '4b3cac45f964a520198625e3',
        'name': 'The Scarsdale Tavern',
        'location': { 'address': '23a Edwardes Square',
            'crossStreet': 'Kensington High St.',
            'lat': 51.49697498810569,
            'lng': -0.19902428481213974,
            'labeledLatLngs': [{ 'label': 'display',
                'lat': 51.49697498810569,
                'lng': -0.19902428481213974 } ]},
        'distance': 224,
        'postalCode': 'W8 6HE',
        'cc': 'GB',
        'city': 'London',
        'state': 'Greater London',
        'country': 'United Kingdom',
        'formattedAddress': [ '23a Edwardes Square (Kensington High St.)',
            'London',
            'Greater London',
            'W8 6HE',
            'United Kingdom' ]},
    'categories': [{ 'id': '4bf58dd8d48988d11b941735',
        'name': 'Pub',
        'pluralName': 'Pubs',
        'shortName': 'Pub',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/nightlife/pub_',
            'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': []},
    'referralId': 'e-0-4b3cac45f964a520198625e3-4'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',

```

```

        'type': 'general',
        'reasonName': 'globalInteractionReason']]],
'venue': {'id': '5cefe74b0d173f002cc6bb2c',
'name': 'Stanley Kubrick: The Exhibition',
'location': {'lat': 51.499809,
'lng': -0.199966,
'labeledLatLngs': [{'label': 'display',
'lat': 51.499809,
'lng': -0.199966}]},
'distance': 107,
'postalCode': 'W8 6AG',
'cc': 'GB',
'city': 'London',
'state': 'Greater London',
'country': 'United Kingdom',
'formattedAddress': ['London',
'Greater London',
'W8 6AG',
'United Kingdom']},
'categories': [{'id': '56aa371be4b08b9a8d573532',
'name': 'Exhibit',
'pluralName': 'Exhibits',
'shortName': 'Exhibit',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainme',
'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []}},
'referralId': 'e-0-5cefe74b0d173f002cc6bb2c-5'},
{'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason']]],
'venue': {'id': '4ce2a6ca41ed224bc9dff03c',
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'lng': -0.20071331187849406,
'labeledLatLngs': [{'label': 'display',
'lat': 51.498551797697786,
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'city': 'London',
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'London',

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    'Greater London',
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    'United Kingdom']},
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    'primary': True}],
  'photos': { 'count': 0, 'groups': []}},
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    'name': 'Gails Bakery',
    'location': { 'address': '240-242 High St',
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        'lng': -0.1996829409344499 } ] },
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    'cc': 'GB',
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    'state': 'Greater London',
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      'W8 6ND',
      'United Kingdom' ] },
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      'shortName': 'Bakery',
      'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/bakery_',
        'suffix': '.png'},
      'primary': True } ],
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'W8 6AP',
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'pluralName': 'Modern European Restaurants',
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'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/default_',
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'primary': True}],
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'city': 'London',
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    'Greater London',
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    'United Kingdom']},
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        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/burger_',
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        'primary': True}],
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                'cc': 'GB',
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                    'W14 8NZ',
                    'United Kingdom' ] },
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                    'pluralName': 'Cupcake Shops',
                    'shortName': 'Cupcakes',
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                    'primary': True}],
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'name': 'The Design Museum Shop',
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'cc': 'GB',
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'W8 6NQ',
'United Kingdom']},
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'cc': 'GB',
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    'primary': True}],
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      'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/italian_',
        'suffix': '.png'},
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'distance': 284,
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'cc': 'GB',
'city': 'Kensington',
'state': 'Greater London',
'country': 'United Kingdom',
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'Greater London',
'W8 6SH',
'United Kingdom']},
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'shortName': 'Burgers',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/burger_',
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'primary': True}],
'photos': {'count': 0, 'groups': []}},
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        'Kensington',
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        'United Kingdom']},
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            'lng': -0.20296812057495117,
            'labeledLatLngs': [{ 'label': 'display',
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        'city': 'London',
        'state': 'Greater London',
        'country': 'United Kingdom',
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            'Greater London',
            'W8 6NW',
            'United Kingdom' ]},
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        'pluralName': 'Persian Restaurants',
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'cc': 'GB',
'city': 'London',
'state': 'Greater London',
'country': 'United Kingdom',
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'W8 6SG',
'United Kingdom']},
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'shortName': 'Mediterranean',
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'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []},
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'distance': 428,
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'Greater London',
'W8 7RL',
'United Kingdom']],
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'United Kingdom']],
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'shortName': 'Filipino',
'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/filipino_',
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'primary': True}],
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                'state': 'Greater London',
                'country': 'United Kingdom',
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                                       'Greater London',
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                       'shortName': 'Café',
                       'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/cafe_',
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                       'primary': True } ],
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    { 'reasons': { 'count': 0,
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                                'labeledLatLngs': [ { 'label': 'display',
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                  'distance': 578,
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                  'cc': 'GB',
                  'city': 'London',
                  'state': 'Greater London',
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        'London',
        'Greater London',
        ' W14',
        'United Kingdom']},
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            'suffix': '.png'},
        'primary': True}],
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            'reasonName': 'globalInteractionReason' } ]},
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        'location': { 'address': 'Holland Park',
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            'lng': -0.20457208156585693,
            'labeledLatLngs': [{ 'label': 'display',
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        'cc': 'GB',
        'city': 'London',
        'state': 'Greater London',
        'country': 'United Kingdom',
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            'W11 4UA',
            'United Kingdom' ]},
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        'pluralName': 'Gardens',
        'shortName': 'Garden',
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'lng': -0.1929431083474267}]},
'distance': 445,
'postalCode': 'W8 5SW',
'cc': 'GB',
'city': 'Kensington',
'state': 'Greater London',
'country': 'United Kingdom',
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'Kensington',
'Greater London',
'W8 5SW',
'United Kingdom']},
'categories': [{'id': '52f2ab2ebcbc57f1066b8b37',
'name': 'Recording Studio',
'pluralName': 'Recording Studios',
'shortName': 'Recording Studio',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/building/school_r',
'suffix': '.png'},
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            'W8 6QN',
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'suffix': '.png'},
'primary': True}],
'photos': { 'count': 0, 'groups': []},
'referralId': 'e-0-4ac518faf964a52025b020e3-97',
{'reasons': { 'count': 0,
'items': [{ 'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]},
'venue': { 'id': '4eff22930e618ea765ffcla5',
'name': 'Tranquility',
'location': { 'address': '139 Kensington Church St',
'lat': 51.507632571382345,
'lng': -0.19489204113943706,
'labeledLatLngs': [{ 'label': 'display',
'lat': 51.507632571382345,
'lng': -0.19489204113943706}],
'distance': 1005,
'postalCode': 'W8 7LP',
'cc': 'GB',
'city': 'London',
'state': 'Greater London',
'country': 'United Kingdom',
'formattedAddress': ['139 Kensington Church St',
'Notting Hill',
'Greater London',
'W8 7LP',
'United Kingdom']],
'categories': [{ 'id': '54541900498ea6ccd0202697',
'name': 'Health & Beauty Service',
'pluralName': 'Health & Beauty Services',
'shortName': 'Health & Beauty',
'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/salon_barbershop',
'suffix': '.png'},
'primary': True}],
'photos': { 'count': 0, 'groups': []},

```

```

'referralId': 'e-0-4eff22930e618ea765ffc1a5-98'},
{'reasons': {'count': 0,
  'items': [{'summary': 'This spot is popular',
    'type': 'general',
    'reasonName': 'globalInteractionReason'}]},
'venue': {'id': '53108de6498e1c8d5dc70a95',
  'name': 'L'Elysee',
  'location': {'address': '93 Hammersmith Rd',
    'lat': 51.49496662542406,
    'lng': -0.2117374925961278,
    'labeledLatLngs': [{'label': 'display',
      'lat': 51.49496662542406,
      'lng': -0.2117374925961278}]},
  'distance': 982,
  'postalCode': 'W14 0QH',
  'cc': 'GB',
  'city': 'London',
  'state': 'Greater London',
  'country': 'United Kingdom',
  'formattedAddress': ['93 Hammersmith Rd',
    'London',
    'Greater London',
    'W14 0QH',
    'United Kingdom']},
'categories': [{'id': '4bf58dd8d48988d16a941735',
  'name': 'Bakery',
  'pluralName': 'Bakeries',
  'shortName': 'Bakery',
  'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/bakery_',
    'suffix': '.png'},
  'primary': True}],
'photos': {'count': 0, 'groups': []}},
'referralId': 'e-0-53108de6498e1c8d5dc70a95-99'}}]]]]}

```

In [103]: *# function that extracts the category of the venue*

```

def get_category_type(row):
    try:
        categories_list = row['categories']
    except:
        categories_list = row['venue.categories']

    if len(categories_list) == 0:
        return None
    else:
        return categories_list[0]['name']

```

In [104]: venues = results1['response']['groups'][0]['items']

```

nearby_venues = json_normalize(venues) # flatten JSON

# filter columns
filtered_columns = ['venue.name', 'venue.categories', 'venue.location.lat', 'venue.l
nearby_venues = nearby_venues.loc[:, filtered_columns]

# filter the category for each row
nearby_venues['venue.categories'] = nearby_venues.apply(get_category_type, axis=1)

# clean columns
nearby_venues.columns = [col.split(".")[0] for col in nearby_venues.columns]

nearby_venues.head(10)

```

```

Out[104]:

```

	name	categories	lat \
0	Core Collective	Gym / Fitness Center	51.499589
1	The Design Museum	Museum	51.499785
2	Café Phillies	Café	51.499726
3	Leighton House Museum	History Museum	51.498591
4	The Scarsdale Tavern	Pub	51.496975
5	Stanley Kubrick: The Exhibition	Exhibit	51.499809
6	Cafe Tarte	Café	51.498552
7	Gails Bakery	Bakery	51.498864
8	The Abingdon	Modern European Restaurant	51.497633
9	Byron	Burger Joint	51.499344

  

```

lng
0 -0.198630
1 -0.199641
2 -0.197747
3 -0.203118
4 -0.199024
5 -0.199966
6 -0.200713
7 -0.199683
8 -0.196110
9 -0.198445

```

```

In [105]: print('{} venues were returned by Foursquare.'.format(nearby_venues.shape[0]))

```

100 venues were returned by Foursquare.

```

In [106]: def getNearbyVenues(names, latitudes, longitudes, radius=1500):

```

```

    venues_list=[]
    for name, lat, lng in zip(names, latitudes, longitudes):
        print(name)

```



```

# create the API request URL
url = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&v={}&lat={}&lng={}&radius={}&limit={}'
CLIENT_ID,
CLIENT_SECRET,
VERSION,
lat,
lng,
radius,
LIMIT)

```

```

# make the GET request
results = requests.get(url).json()["response"]["groups"][0]["items"]

```

```

# return only relevant information for each nearby venue
venues_list.append([

```

```

    name,
    lat,
    lng,
    v['venue']['name'],
    v['venue']['location']['lat'],
    v['venue']['location']['lng'],
    v['venue']['categories'][0]['name']) for v in results])

```

```

nearby_venues = pd.DataFrame([item for venue_list in venues_list for item in venue_list])
nearby_venues.columns = ['Neighborhood',
                        'Neighborhood Latitude',
                        'Neighborhood Longitude',
                        'Venue',
                        'Venue Latitude',
                        'Venue Longitude',
                        'Venue Category']

```

```

return(nearby_venues)

```

```

In [107]: uk_venues = getNearbyVenues(names=new_data['neighborhoods'],
                                       latitudes=new_data['Latitude'],
                                       longitudes=new_data['Longitude'])

```

```

Brompton
Chelsea
Earls Court
Kensington
South Kensington
West Brompton
Holland Park
North Kensington
Notting Hill

```

```
In [108]: print(uk_venues.shape)
```

```
(900, 7)
```

```
In [109]: uk_venues.head()
```

```
Out[109]:
```

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	\
0	Brompton	51.49014	-0.16248	
1	Brompton	51.49014	-0.16248	
2	Brompton	51.49014	-0.16248	
3	Brompton	51.49014	-0.16248	
4	Brompton	51.49014	-0.16248	

  

		Venue Latitude	Venue Longitude	Venue Category
0		51.489239	-0.164265	Ice Cream Shop
1	Saturday Farmers' Market	51.490917	-0.160329	Farmers Market
2	Duke of York Square	51.491272	-0.159827	Plaza
3	The Five Fields	51.491770	-0.161191	Restaurant
4	Amorino	51.489455	-0.163803	Ice Cream Shop

```
In [110]: uk_venues.groupby('Neighborhood').count()
```

```
Out[110]:
```

	Neighborhood Latitude	Neighborhood Longitude	Venue	\
Neighborhood				
Brompton	100	100	100	
Chelsea	100	100	100	
Earls Court	100	100	100	
Holland Park	100	100	100	
Kensington	100	100	100	
North Kensington	100	100	100	
Notting Hill	100	100	100	
South Kensington	100	100	100	
West Brompton	100	100	100	

  

	Venue Latitude	Venue Longitude	Venue Category
Neighborhood			
Brompton	100	100	100
Chelsea	100	100	100
Earls Court	100	100	100
Holland Park	100	100	100
Kensington	100	100	100
North Kensington	100	100	100
Notting Hill	100	100	100
South Kensington	100	100	100
West Brompton	100	100	100

```
In [111]: print('There are {} unique categories.'.format(len(uk_venues['Venue Category'].unique())))
```

There are 135 unique categories.

```
In [112]: # one hot encoding
uk_onehot = pd.get_dummies(uk_venues[['Venue Category']], prefix="", prefix_sep="")

# add neighborhood column back to dataframe
uk_onehot['Neighborhood'] = uk_venues['Neighborhood']

# move neighborhood column to the first column
fixed_columns = [uk_onehot.columns[-1]] + list(uk_onehot.columns[:-1])
uk_onehot = uk_onehot[fixed_columns]

uk_onehot.head()
```

```
Out[112]:
```

	Neighborhood	American Restaurant	Antique Shop	Argentinian Restaurant	\
0	Brompton	0	0	0	
1	Brompton	0	0	0	
2	Brompton	0	0	0	
3	Brompton	0	0	0	
4	Brompton	0	0	0	

  

	Art Gallery	Art Museum	Asian Restaurant	Australian Restaurant	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

  

	Bagel Shop	Bakery	Bar	Bookstore	Boutique	Boxing Gym	Breakfast Spot	\
0	0	0	0	0	0	0	0	
1	0	0	0	0	0	0	0	
2	0	0	0	0	0	0	0	
3	0	0	0	0	0	0	0	
4	0	0	0	0	0	0	0	

  

	Burger Joint	Butcher	Café	Candy Store	Cheese Shop	Chinese Restaurant	\
0	0	0	0	0	0	0	
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	0	0	0	0	0	0	
4	0	0	0	0	0	0	

  

	Chocolate Shop	Clothing Store	Cocktail Bar	Coffee Shop	College Quad	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	

4	0	0	0	0	0
---	---	---	---	---	---

	Concert Hall	Cosmetics Shop	Creperie	Cupcake Shop	Dance Studio	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Deli / Bodega	Department Store	Design Studio	Dessert Shop	Diner	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Discount Store	Donut Shop	English Restaurant	Ethiopian Restaurant	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Exhibit	Farmers Market	Fast Food Restaurant	Filipino Restaurant	\
0	0	0	0	0	
1	0	1	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Fish & Chips Shop	Fountain	French Restaurant	Furniture / Home Store	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Garden	Garden Center	Gastropub	Gift Shop	Gourmet Shop	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Greek Restaurant	Grilled Meat Restaurant	Grocery Store	Gym	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	

3	0	0	0	0
4	0	0	0	0

	Gym / Fitness Center	Health & Beauty Service	Herbs & Spices Store	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	0	0	0	

	Historic Site	History Museum	Hotel	Ice Cream Shop	Indian Restaurant	\
0	0	0	0	1	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	1	0	

	Indie Movie Theater	Indie Theater	Italian Restaurant	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	0	0	0	

	Japanese Restaurant	Jazz Club	Jewelry Store	Juice Bar	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Latin American Restaurant	Lebanese Restaurant	Lounge	Malay Restaurant	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Market	Massage Studio	Mediterranean Restaurant	Mexican Restaurant	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Middle Eastern Restaurant	Modern European Restaurant	Monument / Landmark	\
0	0	0	0	
1	0	0	0	

2	0	0	0
3	0	0	0
4	0	0	0

	Moroccan Restaurant	Movie Theater	Museum	Music Venue	Opera House	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Palace	Park	Pastry Shop	Perfume Shop	Persian Restaurant	Pharmacy	\
0	0	0	0	0	0	0	
1	0	0	0	0	0	0	
2	0	0	0	0	0	0	
3	0	0	0	0	0	0	
4	0	0	0	0	0	0	

	Piano Bar	Pilates Studio	Pizza Place	Playground	Plaza	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	1	
3	0	0	0	0	0	
4	0	0	0	0	0	

	Polish Restaurant	Portuguese Restaurant	Pub	Ramen Restaurant	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Record Shop	Recording Studio	Restaurant	Road	Rock Climbing Spot	\
0	0	0	0	0	0	
1	0	0	0	0	0	
2	0	0	0	0	0	
3	0	0	1	0	0	
4	0	0	0	0	0	

	Russian Restaurant	Sandwich Place	Science Museum	Seafood Restaurant	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	

	Shopping Plaza	Skate Park	Soccer Stadium	Social Club	Speakeasy	\
0	0	0	0	0	0	

1	0	0	0	0	0
2	0	0	0	0	0
3	0	0	0	0	0
4	0	0	0	0	0

	Sporting Goods Shop	Sports Bar	Steakhouse	Street Food Gathering	\
0	0	0	0		0
1	0	0	0		0
2	0	0	0		0
3	0	0	0		0
4	0	0	0		0

	Supermarket	Sushi Restaurant	Tapas Restaurant	Tea Room	Thai Restaurant	\
0	0	0		0	0	0
1	0	0		0	0	0
2	0	0		0	0	0
3	0	0		0	0	0
4	0	0		0	0	0

	Theater	Thrift / Vintage Store	Toy / Game Store	Turkish Restaurant	\
0	0	0		0	0
1	0	0		0	0
2	0	0		0	0
3	0	0		0	0
4	0	0		0	0

	University	Vietnamese Restaurant	Wine Bar	Wine Shop	Women's Store	\
0	0	0	0	0		0
1	0	0	0	0		0
2	0	0	0	0		0
3	0	0	0	0		0
4	0	0	0	0		0

	Yoga Studio
0	0
1	0
2	0
3	0
4	0

In [113]: uk\_onehot.shape

Out[113]: (900, 136)

In [114]: uk\_grouped = uk\_onehot.groupby('Neighborhood').mean().reset\_index()  
uk\_grouped

Out[114]:

	Neighborhood	American Restaurant	Antique Shop	\
0	Brompton	0.01	0.00	

1	Chelsea	0.01	0.00
2	Earls Court	0.00	0.00
3	Holland Park	0.00	0.00
4	Kensington	0.00	0.00
5	North Kensington	0.00	0.00
6	Notting Hill	0.00	0.01
7	South Kensington	0.00	0.00
8	West Brompton	0.01	0.00

	Argentinian Restaurant	Art Gallery	Art Museum	Asian Restaurant	\
0	0.01	0.02	0.01	0.00	
1	0.01	0.02	0.01	0.00	
2	0.00	0.00	0.00	0.00	
3	0.00	0.01	0.00	0.00	
4	0.01	0.02	0.01	0.00	
5	0.00	0.00	0.00	0.01	
6	0.00	0.02	0.00	0.01	
7	0.01	0.02	0.01	0.00	
8	0.00	0.00	0.00	0.01	

	Australian Restaurant	Bagel Shop	Bakery	Bar	Bookstore	Boutique	\
0	0.00	0.00	0.04	0.00	0.02	0.03	
1	0.00	0.00	0.04	0.00	0.02	0.03	
2	0.00	0.01	0.03	0.00	0.01	0.00	
3	0.00	0.00	0.04	0.00	0.01	0.00	
4	0.00	0.00	0.02	0.00	0.01	0.01	
5	0.00	0.00	0.05	0.03	0.01	0.01	
6	0.01	0.00	0.04	0.00	0.02	0.00	
7	0.00	0.00	0.02	0.00	0.01	0.01	
8	0.00	0.01	0.05	0.00	0.02	0.00	

	Boxing Gym	Breakfast Spot	Burger Joint	Butcher	Café	Candy Store	\
0	0.01	0.01	0.01	0.00	0.07	0.00	
1	0.01	0.01	0.01	0.00	0.07	0.00	
2	0.00	0.00	0.02	0.00	0.03	0.00	
3	0.00	0.01	0.03	0.00	0.04	0.00	
4	0.00	0.00	0.03	0.00	0.07	0.00	
5	0.00	0.02	0.01	0.00	0.04	0.01	
6	0.01	0.03	0.02	0.01	0.03	0.00	
7	0.00	0.00	0.03	0.00	0.07	0.00	
8	0.00	0.00	0.02	0.00	0.06	0.00	

	Cheese Shop	Chinese Restaurant	Chocolate Shop	Clothing Store	\
0	0.01	0.00	0.01	0.01	
1	0.01	0.00	0.01	0.01	
2	0.01	0.01	0.00	0.00	
3	0.00	0.02	0.00	0.01	
4	0.01	0.00	0.01	0.00	



5	0.00	0.00	0.00	0.01
6	0.01	0.00	0.00	0.02
7	0.01	0.00	0.01	0.00
8	0.01	0.00	0.00	0.00

	Cocktail Bar	Coffee Shop	College Quad	Concert Hall	Cosmetics Shop \
0	0.03	0.03	0.00	0.01	0.01
1	0.03	0.03	0.00	0.01	0.01
2	0.00	0.01	0.00	0.00	0.01
3	0.00	0.00	0.00	0.01	0.00
4	0.02	0.02	0.01	0.01	0.00
5	0.04	0.02	0.00	0.00	0.00
6	0.03	0.02	0.00	0.00	0.00
7	0.02	0.02	0.01	0.01	0.00
8	0.00	0.02	0.00	0.00	0.01

	Creperie	Cupcake Shop	Dance Studio	Deli / Bodega	Department Store \
0	0.01	0.01	0.00	0.01	0.02
1	0.01	0.01	0.00	0.01	0.02
2	0.00	0.02	0.00	0.00	0.00
3	0.00	0.02	0.01	0.00	0.00
4	0.00	0.01	0.00	0.00	0.01
5	0.00	0.01	0.00	0.01	0.00
6	0.00	0.01	0.00	0.01	0.00
7	0.00	0.01	0.00	0.00	0.01
8	0.01	0.02	0.00	0.00	0.00

	Design Studio	Dessert Shop	Diner	Discount Store	Donut Shop \
0	0.01	0.00	0.00	0.00	0.00
1	0.01	0.00	0.00	0.00	0.00
2	0.00	0.02	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00	0.00
4	0.01	0.02	0.00	0.00	0.00
5	0.00	0.00	0.01	0.01	0.01
6	0.00	0.00	0.01	0.00	0.01
7	0.01	0.02	0.00	0.00	0.00
8	0.00	0.02	0.01	0.00	0.00

	English Restaurant	Ethiopian Restaurant	Exhibit	Farmers Market \
0	0.02	0.00	0.00	0.01
1	0.02	0.00	0.00	0.01
2	0.00	0.00	0.01	0.01
3	0.03	0.00	0.02	0.00
4	0.01	0.00	0.03	0.00
5	0.00	0.01	0.00	0.00
6	0.01	0.00	0.00	0.00
7	0.01	0.00	0.03	0.00
8	0.01	0.00	0.00	0.01

	Fast Food Restaurant	Filipino Restaurant	Fish & Chips Shop	Fountain \
0	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.01	0.01	0.00	0.00
4	0.00	0.00	0.00	0.01
5	0.00	0.00	0.02	0.00
6	0.00	0.00	0.02	0.00
7	0.00	0.00	0.00	0.01
8	0.00	0.00	0.00	0.00

	French Restaurant	Furniture / Home Store	Garden	Garden Center \
0	0.05	0.00	0.02	0.01
1	0.05	0.00	0.02	0.01
2	0.03	0.00	0.02	0.00
3	0.03	0.00	0.03	0.00
4	0.01	0.00	0.03	0.00
5	0.01	0.00	0.00	0.00
6	0.01	0.00	0.01	0.00
7	0.01	0.00	0.03	0.00
8	0.03	0.01	0.02	0.01

	Gastropub	Gift Shop	Gourmet Shop	Greek Restaurant \
0	0.03	0.01	0.01	0.00
1	0.03	0.01	0.01	0.00
2	0.02	0.00	0.00	0.00
3	0.01	0.01	0.00	0.01
4	0.01	0.02	0.01	0.00
5	0.01	0.00	0.01	0.01
6	0.01	0.00	0.01	0.01
7	0.01	0.02	0.01	0.00
8	0.02	0.00	0.00	0.00

	Grilled Meat Restaurant	Grocery Store	Gym	Gym / Fitness Center \
0	0.00	0.01	0.00	0.02
1	0.00	0.01	0.00	0.02
2	0.01	0.00	0.00	0.04
3	0.00	0.01	0.01	0.03
4	0.00	0.00	0.00	0.01
5	0.00	0.01	0.02	0.05
6	0.00	0.02	0.01	0.05
7	0.00	0.00	0.00	0.01
8	0.00	0.00	0.00	0.02

	Health & Beauty Service	Herbs & Spices Store	Historic Site \
0	0.01	0.00	0.00
1	0.01	0.00	0.00

2	0.00	0.00	0.01
3	0.01	0.00	0.01
4	0.00	0.00	0.00
5	0.00	0.00	0.00
6	0.01	0.01	0.00
7	0.00	0.00	0.00
8	0.00	0.00	0.00

	History Museum	Hotel	Ice Cream Shop	Indian Restaurant \
0	0.00	0.03	0.04	0.01
1	0.00	0.03	0.04	0.01
2	0.00	0.08	0.02	0.02
3	0.01	0.04	0.00	0.02
4	0.00	0.06	0.02	0.01
5	0.00	0.00	0.01	0.00
6	0.00	0.01	0.01	0.01
7	0.00	0.06	0.02	0.01
8	0.00	0.04	0.01	0.01

	Indie Movie Theater	Indie Theater	Italian Restaurant \
0	0.00	0.00	0.03
1	0.00	0.00	0.03
2	0.01	0.01	0.05
3	0.00	0.00	0.04
4	0.01	0.00	0.07
5	0.00	0.00	0.05
6	0.00	0.00	0.06
7	0.01	0.00	0.07
8	0.01	0.01	0.07

	Japanese Restaurant	Jazz Club	Jewelry Store	Juice Bar \
0	0.03	0.00	0.00	0.02
1	0.03	0.00	0.00	0.02
2	0.02	0.00	0.00	0.01
3	0.01	0.00	0.00	0.02
4	0.04	0.00	0.02	0.00
5	0.01	0.00	0.00	0.02
6	0.00	0.00	0.00	0.02
7	0.04	0.00	0.02	0.00
8	0.02	0.01	0.00	0.02

	Latin American Restaurant	Lebanese Restaurant	Lounge	Malay Restaurant \
0	0.00	0.00	0.00	0.00
1	0.00	0.00	0.00	0.00
2	0.00	0.00	0.00	0.00
3	0.00	0.00	0.00	0.00
4	0.00	0.01	0.00	0.00
5	0.01	0.00	0.01	0.01

6		0.01		0.00	0.01	0.00
7		0.00		0.01	0.00	0.00
8		0.00		0.00	0.01	0.00

	Market	Massage Studio	Mediterranean Restaurant	Mexican Restaurant	\
0	0.00		0.00	0.00	0.00
1	0.00		0.00	0.00	0.00
2	0.00		0.00	0.01	0.00
3	0.00		0.00	0.02	0.00
4	0.00		0.00	0.01	0.00
5	0.01		0.00	0.00	0.00
6	0.01		0.01	0.00	0.01
7	0.00		0.00	0.01	0.00
8	0.00		0.00	0.00	0.00

	Middle Eastern Restaurant	Modern European Restaurant	Monument / Landmark	\
0		0.00	0.00	0.01
1		0.00	0.00	0.01
2		0.02	0.01	0.00
3		0.01	0.01	0.01
4		0.01	0.00	0.01
5		0.01	0.01	0.00
6		0.01	0.00	0.00
7		0.01	0.00	0.01
8		0.00	0.01	0.00

	Moroccan Restaurant	Movie Theater	Museum	Music Venue	Opera House	\
0		0.00	0.00	0.00	0.00	0.00
1		0.00	0.00	0.00	0.00	0.00
2		0.00	0.00	0.01	0.00	0.00
3		0.00	0.01	0.01	0.00	0.01
4		0.00	0.01	0.00	0.00	0.00
5		0.01	0.01	0.01	0.01	0.00
6		0.00	0.02	0.01	0.01	0.00
7		0.00	0.01	0.00	0.00	0.00
8		0.00	0.00	0.01	0.01	0.00

	Palace	Park	Pastry Shop	Perfume Shop	Persian Restaurant	Pharmacy	\
0	0.00	0.01	0.01	0.01		0.00	0.00
1	0.00	0.01	0.01	0.01		0.00	0.00
2	0.00	0.02	0.00	0.00		0.01	0.01
3	0.01	0.02	0.00	0.00		0.01	0.01
4	0.00	0.00	0.01	0.01		0.00	0.01
5	0.00	0.03	0.00	0.00		0.00	0.00
6	0.00	0.03	0.00	0.00		0.00	0.00
7	0.00	0.00	0.01	0.01		0.00	0.01
8	0.00	0.02	0.00	0.00		0.00	0.00

	Piano Bar	Pilates Studio	Pizza Place	Playground	Plaza \
0	0.00	0.00	0.01	0.00	0.02
1	0.00	0.00	0.01	0.00	0.02
2	0.00	0.01	0.05	0.00	0.00
3	0.01	0.00	0.01	0.01	0.00
4	0.00	0.00	0.01	0.00	0.00
5	0.00	0.00	0.04	0.00	0.00
6	0.00	0.00	0.03	0.00	0.00
7	0.00	0.00	0.01	0.00	0.00
8	0.00	0.00	0.04	0.00	0.00

	Polish Restaurant	Portuguese Restaurant	Pub	Ramen Restaurant \
0	0.00	0.00	0.02	0.00
1	0.00	0.00	0.02	0.00
2	0.00	0.01	0.04	0.00
3	0.00	0.01	0.07	0.00
4	0.01	0.00	0.01	0.00
5	0.00	0.00	0.10	0.01
6	0.00	0.00	0.08	0.01
7	0.01	0.00	0.01	0.00
8	0.00	0.00	0.03	0.00

	Record Shop	Recording Studio	Restaurant	Road	Rock Climbing Spot \
0	0.00	0.00	0.02	0.00	0.00
1	0.00	0.00	0.02	0.00	0.00
2	0.00	0.00	0.02	0.00	0.00
3	0.00	0.01	0.04	0.00	0.00
4	0.00	0.00	0.02	0.00	0.00
5	0.02	0.00	0.03	0.01	0.00
6	0.02	0.00	0.02	0.01	0.00
7	0.00	0.00	0.02	0.00	0.00
8	0.00	0.00	0.03	0.00	0.01

	Russian Restaurant	Sandwich Place	Science Museum	Seafood Restaurant \
0	0.00	0.02	0.00	0.00
1	0.00	0.02	0.00	0.00
2	0.00	0.01	0.02	0.01
3	0.00	0.01	0.01	0.00
4	0.01	0.02	0.04	0.01
5	0.00	0.00	0.00	0.00
6	0.00	0.00	0.00	0.00
7	0.01	0.02	0.04	0.01
8	0.00	0.02	0.00	0.01

	Shopping Plaza	Skate Park	Soccer Stadium	Social Club	Speakeasy \
0	0.01	0.00	0.00	0.00	0.01
1	0.01	0.00	0.00	0.00	0.01
2	0.00	0.00	0.02	0.01	0.01

3	0.00	0.00	0.00	0.00	0.00
4	0.00	0.00	0.00	0.01	0.01
5	0.00	0.01	0.00	0.00	0.00
6	0.00	0.01	0.00	0.00	0.00
7	0.00	0.00	0.00	0.01	0.01
8	0.01	0.00	0.02	0.01	0.01

	Sporting Goods Shop	Sports Bar	Steakhouse	Street Food Gathering	\
0	0.00	0.00	0.01		0.00
1	0.00	0.00	0.01		0.00
2	0.01	0.00	0.01		0.00
3	0.00	0.00	0.00		0.00
4	0.00	0.00	0.02		0.00
5	0.00	0.00	0.01		0.01
6	0.00	0.00	0.00		0.01
7	0.00	0.00	0.02		0.00
8	0.01	0.01	0.01		0.00

	Supermarket	Sushi Restaurant	Tapas Restaurant	Tea Room	Thai Restaurant	\
0	0.01	0.00	0.00	0.01		0.00
1	0.01	0.00	0.00	0.01		0.00
2	0.02	0.01	0.02	0.00		0.03
3	0.02	0.01	0.00	0.01		0.02
4	0.01	0.01	0.00	0.00		0.00
5	0.00	0.00	0.00	0.01		0.01
6	0.00	0.00	0.00	0.01		0.00
7	0.01	0.01	0.00	0.00		0.00
8	0.02	0.01	0.02	0.00		0.00

	Theater	Thrift / Vintage Store	Toy / Game Store	Turkish Restaurant	\
0	0.01	0.00	0.00		0.00
1	0.01	0.00	0.00		0.00
2	0.00	0.00	0.00		0.00
3	0.00	0.00	0.00		0.00
4	0.00	0.00	0.01		0.00
5	0.00	0.01	0.00		0.01
6	0.00	0.01	0.00		0.01
7	0.00	0.00	0.01		0.00
8	0.00	0.00	0.00		0.00

	University	Vietnamese Restaurant	Wine Bar	Wine Shop	Women's Store	\
0	0.00	0.02	0.00	0.00		0.02
1	0.00	0.02	0.00	0.00		0.02
2	0.00	0.01	0.00	0.02		0.00
3	0.01	0.00	0.01	0.00		0.01
4	0.01	0.01	0.00	0.01		0.00
5	0.00	0.00	0.01	0.01		0.00
6	0.00	0.00	0.01	0.00		0.00

7	0.01	0.01	0.00	0.01	0.00
8	0.00	0.02	0.00	0.01	0.01

Yoga Studio	
0	0.00
1	0.00
2	0.02
3	0.02
4	0.01
5	0.02
6	0.02
7	0.01
8	0.02

```
In [115]: num_top_venues = 5
```

```
for hood in uk_grouped['Neighborhood']:
    print("----"+hood+"----")
    temp = uk_grouped[uk_grouped['Neighborhood'] == hood].T.reset_index()
    temp.columns = ['venue', 'freq']
    temp = temp.iloc[1:]
    temp['freq'] = temp['freq'].astype(float)
    temp = temp.round({'freq': 2})
    print(temp.sort_values('freq', ascending=False).reset_index(drop=True).head(num_top_venues))
    print('\n')
```

```
----Brompton----
```

	venue	freq
0	Café	0.07
1	French Restaurant	0.05
2	Ice Cream Shop	0.04
3	Bakery	0.04
4	Hotel	0.03

```
----Chelsea----
```

	venue	freq
0	Café	0.07
1	French Restaurant	0.05
2	Ice Cream Shop	0.04
3	Bakery	0.04
4	Hotel	0.03

```
----Earls Court----
```

	venue	freq
0	Hotel	0.08
1	Italian Restaurant	0.05

2	Pizza Place	0.05
3	Gym / Fitness Center	0.04
4	Pub	0.04

----Holland Park----

	venue	freq
0	Pub	0.07
1	Café	0.04
2	Hotel	0.04
3	Bakery	0.04
4	Italian Restaurant	0.04

----Kensington----

	venue	freq
0	Italian Restaurant	0.07
1	Café	0.07
2	Hotel	0.06
3	Japanese Restaurant	0.04
4	Science Museum	0.04

----North Kensington----

	venue	freq
0	Pub	0.10
1	Gym / Fitness Center	0.05
2	Italian Restaurant	0.05
3	Bakery	0.05
4	Cocktail Bar	0.04

----Notting Hill----

	venue	freq
0	Pub	0.08
1	Italian Restaurant	0.06
2	Gym / Fitness Center	0.05
3	Bakery	0.04
4	Café	0.03

----South Kensington----

	venue	freq
0	Italian Restaurant	0.07
1	Café	0.07
2	Hotel	0.06
3	Japanese Restaurant	0.04
4	Science Museum	0.04



```

----West Brompton----
      venue  freq
0  Italian Restaurant  0.07
1           Café  0.06
2           Bakery  0.05
3     Pizza Place  0.04
4           Hotel  0.04

```

```
In [116]: #a function to sort the venues in descending order
```

```

def return_most_common_venues(row, num_top_venues):
    row_categories = row.iloc[1:]
    row_categories_sorted = row_categories.sort_values(ascending=False)

    return row_categories_sorted.index.values[0:num_top_venues]

```

```
In [117]: #create the new dataframe and display the top 10 venues for each neighborhood.
```

```

num_top_venues = 10
word_string1 = ''
indicators = ['st', 'nd', 'rd']

# create columns according to number of top venues
columns = ['Neighborhood']
for ind in np.arange(num_top_venues):
    try:
        columns.append('{}{} Most Common Venue'.format(ind+1, indicators[ind]))
    except:
        columns.append('{}th Most Common Venue'.format(ind+1))

# create a new dataframe
neighborhoods_venues_sorted_uk = pd.DataFrame(columns=columns)
neighborhoods_venues_sorted_uk['Neighborhood'] = uk_grouped['Neighborhood']

for ind in np.arange(uk_grouped.shape[0]):
    neighborhoods_venues_sorted_uk.iloc[ind, 1:] = return_most_common_venues(uk_grouped.iloc[ind, 1:], num_top_venues)
    word_string1 = word_string1 + neighborhoods_venues_sorted_uk.iloc[ind, 1:] + ' '

neighborhoods_venues_sorted_uk

```

```

Out[117]:      Neighborhood 1st Most Common Venue 2nd Most Common Venue \
0      Brompton           Café      French Restaurant
1      Chelsea           Café      French Restaurant
2  Earls Court           Hotel      Pizza Place

```

3	Holland Park	Pub	Restaurant
4	Kensington	Italian Restaurant	Café
5	North Kensington	Pub	Italian Restaurant
6	Notting Hill	Pub	Italian Restaurant
7	South Kensington	Italian Restaurant	Café
8	West Brompton	Italian Restaurant	Café

	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	\
0	Ice Cream Shop	Bakery	Japanese Restaurant	
1	Ice Cream Shop	Bakery	Japanese Restaurant	
2	Italian Restaurant	Pub	Gym / Fitness Center	
3	Hotel	Bakery	Café	
4	Hotel	Japanese Restaurant	Science Museum	
5	Bakery	Gym / Fitness Center	Café	
6	Gym / Fitness Center	Bakery	Park	
7	Hotel	Japanese Restaurant	Science Museum	
8	Bakery	Pizza Place	Hotel	

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	\
0	Coffee Shop	Italian Restaurant	Hotel	
1	Coffee Shop	Italian Restaurant	Hotel	
2	Thai Restaurant	Bakery	Café	
3	Italian Restaurant	Gym / Fitness Center	Burger Joint	
4	Burger Joint	Garden	Exhibit	
5	Pizza Place	Cocktail Bar	Bar	
6	Café	Breakfast Spot	Cocktail Bar	
7	Burger Joint	Garden	Exhibit	
8	Restaurant	Pub	French Restaurant	

	9th Most Common Venue	10th Most Common Venue
0	Cocktail Bar	Boutique
1	Cocktail Bar	Boutique
2	French Restaurant	Ice Cream Shop
3	Garden	French Restaurant
4	Sandwich Place	Steakhouse
5	Restaurant	Park
6	Pizza Place	Fish & Chips Shop
7	Sandwich Place	Steakhouse
8	Yoga Studio	Gym / Fitness Center

```
In [118]: #word_string1[0]
```

```
In [119]: word_string2 = ''
          for i in range(0, num_top_venues ):
              word_string2 = word_string2 + word_string1[i]
          #print (word_string2)
```

```
In [120]: # display the generated text
          #word_string
```

```

# create the word cloud
wordcloud = WordCloud(background_color='white').generate(word_string2)

print('Word cloud created!')

# display the cloud
fig = plt.figure()
fig.set_figwidth(14)
fig.set_figheight(18)

plt.imshow(wordcloud, interpolation='bilinear')
plt.axis('off')
plt.show()

```

Word cloud created!



```

In [121]: # set number of clusters
kclusters = 4

uk_grouped_clustering = uk_grouped.drop('Neighborhood', 1)

# run k-means clustering
kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(uk_grouped_clustering)

# check cluster labels generated for each row in the dataframe
kmeans.labels_[0:10]

```

```
Out[121]: array([2, 2, 3, 3, 1, 0, 0, 1, 3], dtype=int32)
```

```
In [122]: uk_merged = new_data
          # add clustering labels
          uk_merged['Cluster Labels'] = kmeans.labels_

          uk_merged = uk_merged.join(neighborhoods_venues_sorted_uk.set_index('Neighborhood'),

          uk_merged.head() # check the last columns!
```

```
Out[122]:
```

	neighborhoods	Dialcode	borough	posttown	postcode	\
0	Brompton	020	Kensington and Chelsea	LONDON	SW3	
1	Chelsea	020	Kensington and Chelsea	LONDON	SW3	
2	Earls Court	020	Kensington and Chelsea	LONDON	SW5	
3	Kensington	020	Kensington and Chelsea	LONDON	SW7	
4	South Kensington	020	Kensington and Chelsea	LONDON	SW7	

  

	Latitude	Longitude	Cluster Labels	1st Most Common Venue	\
0	51.49014	-0.16248	2	Café	
1	51.49014	-0.16248	2	Café	
2	51.49004	-0.18971	3	Hotel	
3	51.49807	-0.17404	3	Italian Restaurant	
4	51.49807	-0.17404	1	Italian Restaurant	

  

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	\
0	French Restaurant	Ice Cream Shop	Bakery	
1	French Restaurant	Ice Cream Shop	Bakery	
2	Pizza Place	Italian Restaurant	Pub	
3	Café	Hotel	Japanese Restaurant	
4	Café	Hotel	Japanese Restaurant	

  

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	\
0	Japanese Restaurant	Coffee Shop	Italian Restaurant	
1	Japanese Restaurant	Coffee Shop	Italian Restaurant	
2	Gym / Fitness Center	Thai Restaurant	Bakery	
3	Science Museum	Burger Joint	Garden	
4	Science Museum	Burger Joint	Garden	

  

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue	\
0	Hotel	Cocktail Bar	Boutique	
1	Hotel	Cocktail Bar	Boutique	
2	Café	French Restaurant	Ice Cream Shop	
3	Exhibit	Sandwich Place	Steakhouse	
4	Exhibit	Sandwich Place	Steakhouse	

```
In [123]: # create map
          map_clusters = folium.Map(location=[latitude, longitude], zoom_start=11)
```

```

# set color scheme for the clusters
x = np.arange(kclusters)
ys = [i + x + (i*x)**2 for i in range(kclusters)]
colors_array = cm.rainbow(np.linspace(0, 1, len(ys)))
rainbow = [colors.rgb2hex(i) for i in colors_array]

# add markers to the map
markers_colors = []
for lat, lon, poi, cluster in zip(uk_merged['Latitude'], uk_merged['Longitude'], uk_merged['poi'], uk_merged['cluster']):
    label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse_html=True)
    folium.CircleMarker(
        [lat, lon],
        radius=5,
        popup=label,
        color=rainbow[cluster-1],
        fill=True,
        fill_color=rainbow[cluster-1],
        fill_opacity=0.7).add_to(map_clusters)

map_clusters

```

Out[123]: <folium.folium.Map at 0x7fe50cc6c5f8>

```

In [124]: # For Cluster 0
result = uk_merged.loc[uk_merged['Cluster Labels'] == 0, uk_merged.columns[[1] + list(uk_merged.columns[2:].index(uk_merged['1st Most Common Venue']) + 1)]]
print("For cluster {}, the distribution of venues is as:\n{}".format(0, result['1st Most Common Venue']))
result

```

For cluster 0, the distribution of venues is as:

Italian Restaurant 1

Pub 1

Name: 1st Most Common Venue, dtype: int64

```

Out[124]:
   Dialcode  Latitude  Longitude  Cluster Labels  1st Most Common Venue \
5         020  51.48563   -0.18144             0    Italian Restaurant
6         020  51.50162   -0.19173             0                      Pub

   2nd Most Common Venue  3rd Most Common Venue  4th Most Common Venue \
5                Café                Bakery                Pizza Place
6            Restaurant                Hotel                Bakery

   5th Most Common Venue  6th Most Common Venue  7th Most Common Venue \
5                Hotel                Restaurant                Pub
6                Café    Italian Restaurant  Gym / Fitness Center

   8th Most Common Venue  9th Most Common Venue  10th Most Common Venue
5    French Restaurant                Yoga Studio  Gym / Fitness Center
6        Burger Joint                Garden    French Restaurant

```

```
In [129]: # For Cluster 1
```

```
result = uk_merged.loc[uk_merged['Cluster Labels'] == 1, uk_merged.columns[[1] + list(
print("For cluster {}, the distribution of venues is as:\n{}".format(1, result['1st Most Common Venue'])
result
```

For cluster 1, the distribution of venues is as:

Italian Restaurant 1

Pub 1

Name: 1st Most Common Venue, dtype: int64

```
Out[129]:
```

	Dialcode	Latitude	Longitude	Cluster Labels	1st Most Common Venue	\
4	020	51.49807	-0.17404	1	Italian Restaurant	
7	020	51.52346	-0.21353	1	Pub	

  

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	\
4	Café	Hotel	Japanese Restaurant	
7	Italian Restaurant	Bakery	Gym / Fitness Center	

  

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	\
4	Science Museum	Burger Joint	Garden	
7	Café	Pizza Place	Cocktail Bar	

  

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue	\
4	Exhibit	Sandwich Place	Steakhouse	
7	Bar	Restaurant	Park	

```
In [130]: # For Cluster 2
```

```
result = uk_merged.loc[uk_merged['Cluster Labels'] == 2, uk_merged.columns[[1] + list(
print("For cluster {}, the distribution of venues is as:\n{}".format(2, result['1st Most Common Venue'])
result
```

For cluster 2, the distribution of venues is as:

Café 2

Name: 1st Most Common Venue, dtype: int64

```
Out[130]:
```

	Dialcode	Latitude	Longitude	Cluster Labels	1st Most Common Venue	\
0	020	51.49014	-0.16248	2	Café	
1	020	51.49014	-0.16248	2	Café	

  

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	\
0	French Restaurant	Ice Cream Shop	Bakery	
1	French Restaurant	Ice Cream Shop	Bakery	

  

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	\
0	Japanese Restaurant	Coffee Shop	Italian Restaurant	
1	Japanese Restaurant	Coffee Shop	Italian Restaurant	

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Hotel	Cocktail Bar	Boutique
1	Hotel	Cocktail Bar	Boutique

```
In [131]: # For Cluster 3
result = uk_merged.loc[uk_merged['Cluster Labels'] == 3, uk_merged.columns[[1] + list(
print("For cluster {}, the distribution of venues is as:\n{}".format(3, result['1st Most Common Venue'])
result
```

For cluster 3, the distribution of venues is as:

Hotel	1
Italian Restaurant	1
Pub	1

Name: 1st Most Common Venue, dtype: int64

```
Out[131]:
```

	Dialcode	Latitude	Longitude	Cluster Labels	1st Most Common Venue	\
2	020	51.49004	-0.18971	3	Hotel	
3	020	51.49807	-0.17404	3	Italian Restaurant	
8	020	51.51244	-0.20639	3	Pub	

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	\
2	Pizza Place	Italian Restaurant	Pub	
3	Café	Hotel	Japanese Restaurant	
8	Italian Restaurant	Gym / Fitness Center	Bakery	

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	\
2	Gym / Fitness Center	Thai Restaurant	Bakery	
3	Science Museum	Burger Joint	Garden	
8	Park	Café	Breakfast Spot	

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
2	Café	French Restaurant	Ice Cream Shop
3	Exhibit	Sandwich Place	Steakhouse
8	Cocktail Bar	Pizza Place	Fish & Chips Shop

## Entertainment in NYC

```
In [134]: #address = '102 North End Ave, New York, NY'
address = '575 5th Ave, New York'
```

```
geolocator = Nominatim(user_agent="foursquare_agent")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print(latitude, longitude)
```

40.7563907 -73.9782057

```
In [135]: #let's define a query to search for entertainment that is within 2000 metres in nyc.
search_query = 'Escape Games'
radius = 2000
print(search_query + ' .... OK!')

# Define the corresponding URL
url = 'https://api.foursquare.com/v2/venues/search?client_id={} & client_secret={} & ll='
url
```

Escape Games ... OK!

```
Out[135]: 'https://api.foursquare.com/v2/venues/search?client_id=B3D1FREXU3FMFKGOXFFFWLZH1UBNQ'
```

```
In [136]: # Send the GET Request and examine the results
results = requests.get(url).json()
results
```

```
Out[136]: {'meta': {'code': 200, 'requestId': '5d43f6b28fbe780023c68d9a'},
  'response': {'venues': [{'id': '5bf0c411364d970034315383',
    'name': 'Mission Escape Games',
    'location': {'address': '265 W 37th St',
      'lat': 40.754016,
      'lng': -73.991748,
      'labeledLatLngs': [{'label': 'display',
        'lat': 40.754016,
        'lng': -73.991748}],
      'distance': 1172,
      'postalCode': '10018',
      'cc': 'US',
      'city': 'New York',
      'state': 'NY',
      'country': 'United States',
      'formattedAddress': ['265 W 37th St',
        'New York, NY 10018',
        'United States']},
    'categories': [{'id': '4bf58dd8d48988d1f1931735',
      'name': 'General Entertainment',
      'pluralName': 'General Entertainment',
      'shortName': 'Entertainment',
      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/',
        'suffix': '.png'},
      'primary': True}],
    'referralId': 'v-1564735154',
    'hasPerk': False},
    {'id': '56abc458498ee6c0b6ad7f0a',
      'name': 'Riddle Me Out Escape Games NYC',
      'location': {'address': '435 5th Avenue, 4th Floor',
        'lat': 40.75139156486494,
```



```

'lng': -73.98232852966323,
'labeledLatLngs': [{'label': 'display',
  'lat': 40.75139156486494,
  'lng': -73.98232852966323}],
'distance': 656,
'postalCode': '10016',
'cc': 'US',
'neighborhood': 'Garment District',
'city': 'New York',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['435 5th Avenue, 4th Floor',
  'New York, NY 10016',
  'United States']],
'categories': [{'id': '4bf58dd8d48988d1f1931735',
  'name': 'General Entertainment',
  'pluralName': 'General Entertainment',
  'shortName': 'Entertainment',
  'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/',
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  'primary': True}],
'venuePage': {'id': '152966516'},
'referralId': 'v-1564735154',
'hasPerk': False},
{'id': '4bc93a3b3740b713cc825e65',
  'name': 'Escape Day Spa & Skin Care',
  'location': {'address': '101 W 55th St',
  'crossStreet': '6th Ave, NW corner',
  'lat': 40.76327188497643,
  'lng': -73.97874731064687,
  'labeledLatLngs': [{'label': 'display',
    'lat': 40.76327188497643,
    'lng': -73.97874731064687}],
  'distance': 767,
  'postalCode': '10019',
  'cc': 'US',
  'city': 'New York',
  'state': 'NY',
  'country': 'United States',
  'formattedAddress': ['101 W 55th St (6th Ave, NW corner)',
    'New York, NY 10019',
    'United States']],
  'categories': [{'id': '4bf58dd8d48988d1ed941735',
    'name': 'Spa',
    'pluralName': 'Spas',
    'shortName': 'Spa',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/spa_',
    'suffix': '.png'},

```

```

    'primary': True}],
    'referralId': 'v-1564735154',
    'hasPerk': False},
  {'id': '59c4073de1f2282d14b2cc69',
    'name': 'Exit Escape Room NYC',
    'location': {'address': '246 W 38th St Fl 7',
      'lat': 40.75409,
      'lng': -73.99039,
      'labeledLatLngs': [{'label': 'display',
        'lat': 40.75409,
        'lng': -73.99039}],
      'distance': 1058,
      'postalCode': '10018',
      'cc': 'US',
      'city': 'New York',
      'state': 'NY',
      'country': 'United States',
      'formattedAddress': ['246 W 38th St Fl 7',
        'New York, NY 10018',
        'United States']},
    'categories': [{'id': '4bf58dd8d48988d1f1931735',
      'name': 'General Entertainment',
      'pluralName': 'General Entertainment',
      'shortName': 'Entertainment',
      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/',
        'suffix': '.png'},
      'primary': True}],
    'venuePage': {'id': '453995455'},
    'referralId': 'v-1564735154',
    'hasPerk': False},
  {'id': '5577e333498ed6ee66399419',
    'name': 'Escape Models VIP',
    'location': {'address': '50 Central Park S',
      'lat': 40.76525,
      'lng': -73.97604,
      'labeledLatLngs': [{'label': 'display',
        'lat': 40.76525,
        'lng': -73.97604}],
      'distance': 1002,
      'postalCode': '10019',
      'cc': 'US',
      'city': 'New York',
      'state': 'NY',
      'country': 'United States',
      'formattedAddress': ['50 Central Park S',
        'New York, NY 10019',
        'United States']},
    'categories': [],

```

```

    'referralId': 'v-1564735154',
    'hasPerk': False},
  {'id': '4b9685d3f964a520fad134e3',
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      'crossStreet': 'W 51st St',
      'lat': 40.75864,
      'lng': -73.980547,
      'labeledLatLngs': [{'label': 'display',
        'lat': 40.75864,
        'lng': -73.980547}],
      'distance': 318,
      'postalCode': '10019',
      'cc': 'US',
      'city': 'New York',
      'state': 'NY',
      'country': 'United States',
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        'New York, NY 10019',
        'United States']},
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      'name': 'Office',
      'pluralName': 'Offices',
      'shortName': 'Office',
      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/building/default_',
        'suffix': '.png'},
      'primary': True}],
    'referralId': 'v-1564735154',
    'hasPerk': False},
  {'id': '57c8909f498e982da0a32e9d',
    'name': 'Escape Room Madness',
    'location': {'address': '38 West 32nd Street, 5th Floor, Ste 500',
      'crossStreet': '32nd street & Broadway',
      'lat': 40.748030543940544,
      'lng': -73.98742839491177,
      'labeledLatLngs': [{'label': 'display',
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      'cc': 'US',
      'city': 'New York',
      'state': 'NY',
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        'New York, NY 10001',
        'United States']},
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```

```

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      'shortName': 'Entertainment',
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      'primary': True}],
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    'referralId': 'v-1564735154',
    'hasPerk': False},
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      'name': 'Escape Entertainment',
      'location': {'address': '4th Floor, 39 W 32nd St',
        'lat': 40.74810986880671,
        'lng': -73.98758160205018,
        'labeledLatLngs': [{'label': 'display',
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        'cc': 'US',
        'city': 'New York',
        'state': 'NY',
        'country': 'United States',
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          'New York, NY 10001',
          'United States']}},
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        'pluralName': 'General Entertainment',
        'shortName': 'Entertainment',
        'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/',
          'suffix': '.png'},
        'primary': True}],
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      'hasPerk': False},
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      'name': 'Escape Virtuality',
      'location': {'address': '130 W 29th St',
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        'lng': -73.99143,
        'labeledLatLngs': [{'label': 'display',
          'lat': 40.747119,
          'lng': -73.99143}],
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        'postalCode': '10001',
        'cc': 'US',
        'city': 'New York',
        'state': 'NY',

```

```

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        'pluralName': 'General Entertainment',
        'shortName': 'Entertainment',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/',
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        'primary': True }],
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    'hasPerk': False },
{ 'id': '57389314498e8763653e4fe6',
    'name': 'Escape Entertainment NYC',
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        'lng': -73.98455142974854,
        'labeledLatLngs': [ { 'label': 'display',
            'lat': 40.74722445029308,
            'lng': -73.98455142974854 } ] ],
        'distance': 1152,
        'postalCode': '10001',
        'cc': 'US',
        'city': 'New York',
        'state': 'NY',
        'country': 'United States',
        'formattedAddress': ['39 W 32nd St Fl 4',
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            'United States'] ],
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            'name': 'Miscellaneous Shop',
            'pluralName': 'Miscellaneous Shops',
            'shortName': 'Shop',
            'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/default_',
                'suffix': '.png' },
            'primary': True } ],
        'referralId': 'v-1564735154',
        'hasPerk': False },
{ 'id': '5c2af9535bc27d00257ff07e',
    'name': 'Escape the Room NYC',
    'location': { 'address': '24 W 25th St Fl 8',
        'lat': 40.743062717636114,
        'lng': -73.99072051048279,
        'labeledLatLngs': [ { 'label': 'display',
            'lat': 40.743062717636114,
            'lng': -73.99072051048279 } ] ],
        'distance': 1820,

```

```

    'postalCode': '10010',
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    'city': 'New York',
    'state': 'NY',
    'country': 'United States',
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        'New York, NY 10010',
        'United States']],
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        'pluralName': 'Theme Parks',
        'shortName': 'Theme Park',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/',
            'suffix': '.png' },
        'primary': True }],
    'referralId': 'v-1564735154',
    'hasPerk': False },
{ 'id': '59dbaae7fc9e9416f1d0be47',
    'name': 'Escape Rooms',
    'location': { 'address': '575 5th Ave',
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        'lng': -73.99173706769943,
        'labeledLatLngs': [ { 'label': 'display',
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            'lng': -73.99173706769943 } ] ],
        'distance': 1886,
        'postalCode': '10017',
        'cc': 'US',
        'city': 'New York',
        'state': 'NY',
        'country': 'United States',
        'formattedAddress': ['575 5th Ave',
            'New York, NY 10017',
            'United States']],
        'categories': [ { 'id': '52f2ab2ebcbcb57f1066b8b1e',
            'name': 'Locksmith',
            'pluralName': 'Locksmiths',
            'shortName': 'Locksmith',
            'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/default_',
                'suffix': '.png' },
            'primary': True } ],
        'referralId': 'v-1564735154',
        'hasPerk': False },
{ 'id': '4f5ab0dde4b0838066b720bb',
    'name': 'Wine Escape',
    'location': { 'address': '405 W 44th St',
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        'lat': 40.759914853622604,

```

```

'lng': -73.99219335633057,
'labeledLatLngs': [{'label': 'display',
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  'lng': -73.99219335633057}],
'distance': 1242,
'postalCode': '10036',
'cc': 'US',
'city': 'New York',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['405 W 44th St (btwn 9th & 10th)',
  'New York, NY 10036',
  'United States']],
'categories': [{'id': '4bf58dd8d48988d123941735',
  'name': 'Wine Bar',
  'pluralName': 'Wine Bars',
  'shortName': 'Wine Bar',
  'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/winery_',
    'suffix': '.png'},
  'primary': True}],
'referralId': 'v-1564735154',
'hasPerk': False},
{'id': '4dff561b1495f70219360130',
'name': 'Game Show Network',
'location': {'address': '1065 Avenue of the Americas',
  'crossStreet': '(40th St)',
  'lat': 40.75380111082082,
  'lng': -73.9800099465656,
  'labeledLatLngs': [{'label': 'display',
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    'lng': -73.9800099465656}],
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  'cc': 'US',
  'city': 'New York',
  'state': 'NY',
  'country': 'United States',
  'formattedAddress': ['1065 Avenue of the Americas ((40th St))',
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    'United States']],
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    'name': 'Office',
    'pluralName': 'Offices',
    'shortName': 'Office',
    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/building/default_',
      'suffix': '.png'},
    'primary': True}],
  'referralId': 'v-1564735154',

```

```

    'hasPerk': False},
  {'id': '532b2bc3498e48fedfcae780',
   'name': 'Kuma Games',
   'location': {'address': '130 W 42nd St',
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                 'lng': -73.985671,
                 'labeledLatLngs': [{'label': 'display',
                                     'lat': 40.754795,
                                     'lng': -73.985671}],
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                 'postalCode': '10036',
                 'cc': 'US',
                 'city': 'New York',
                 'state': 'NY',
                 'country': 'United States',
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                                     'New York, NY 10036',
                                     'United States']}},
   'categories': [{'id': '4bf58dd8d48988d124941735',
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                    'pluralName': 'Offices',
                    'shortName': 'Office',
                    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/building/default_',
                             'suffix': '.png'},
                    'primary': True}],
   'referralId': 'v-1564735154',
   'hasPerk': False},
  {'id': '52d97b56498e67d41a7ec95d',
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   'location': {'lat': 40.757622,
                 'lng': -73.985795,
                 'labeledLatLngs': [{'label': 'display',
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                 'distance': 654,
                 'cc': 'US',
                 'city': 'New York',
                 'state': 'NY',
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                    'shortName': 'Electronics',
                    'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/technology_',
                             'suffix': '.png'},
                    'primary': True}],
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```



```

    'hasPerk': False},
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      'state': 'New York',
      'country': 'United States',
      'formattedAddress': ['New York', 'United States']}},
    'categories': [],
    'referralId': 'v-1564735154',
    'hasPerk': False},
  {'id': '569d4b2f498e3c118fb97cbc',
    'name': 'EscapeSeat',
    'location': {'address': '131 74th st',
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      'lng': -73.98785591125488,
      'labeledLatLngs': [{'label': 'display',
        'lat': 40.73831542339314,
        'lng': -73.98785591125488}],
      'distance': 2170,
      'postalCode': '10017',
      'cc': 'US',
      'city': 'New York',
      'state': 'NY',
      'country': 'United States',
      'formattedAddress': ['131 74th st',
        'New York, NY 10017',
        'United States']}},
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      'pluralName': 'General Travel',
      'shortName': 'Travel',
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        'suffix': '.png'},
      'primary': True}],
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    'hasPerk': False},
  {'id': '5a27103647f8763f7ae1f393',
    'name': 'Exodus Escape Room NYC',
    'location': {'address': '38 W 32nd St Ste 606',
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      'lng': -73.98734360933304,
      'labeledLatLngs': [{'label': 'display',

```

```

        'lat': 40.74781556589118,
        'lng': -73.98734360933304]],
    'distance': 1226,
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    'cc': 'US',
    'city': 'New York',
    'state': 'NY',
    'country': 'United States',
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        'New York, NY 10001',
        'United States']],
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        'pluralName': 'General Entertainment',
        'shortName': 'Entertainment',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/',
            'suffix': '.png' },
        'primary': True }],
    'referralId': 'v-1564735154',
    'hasPerk': False},
{ 'id': '51758b32e4b010617a7b4f02',
    'name': 'National Geographic Brain Games',
    'location': { 'lat': 40.752105228571594,
        'lng': -73.98736176637732,
        'labeledLatLngs': [{ 'label': 'display',
            'lat': 40.752105228571594,
            'lng': -73.98736176637732 } ] ],
    'distance': 907,
    'cc': 'US',
    'city': 'New York',
    'state': 'NY',
    'country': 'United States',
    'formattedAddress': ['New York, NY', 'United States'] ],
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        'pluralName': 'General Entertainment',
        'shortName': 'Entertainment',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/',
            'suffix': '.png' },
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```

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    'lng': -73.987668}],
    'distance': 993,
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    'cc': 'US',
    'city': 'New York',
    'state': 'NY',
    'country': 'United States',
    'formattedAddress': ['New York, NY 10018', 'United States']],
    'categories': [{ 'id': '4bf58dd8d48988d125941735',
        'name': 'Tech Startup',
        'pluralName': 'Tech Startups',
        'shortName': 'Tech Startup',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/technology_',
            'suffix': '.png' },
        'primary': True } ],
    'referralId': 'v-1564735154',
    'hasPerk': False },
{ 'id': '53cc5f17498e11624ecd2821',
    'name': 'Room Escape Adventures - With a Zombie',
    'location': { 'address': '23 W 36th St',
        'lat': 40.7484743024699,
        'lng': -73.99233578877792,
        'labeledLatLngs': [ { 'label': 'display',
            'lat': 40.7484743024699,
            'lng': -73.99233578877792 } ] ],
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        'postalCode': '10018',
        'cc': 'US',
        'city': 'New York',
        'state': 'NY',
        'country': 'United States',
        'formattedAddress': ['23 W 36th St',
            'New York, NY 10018',
            'United States' ] ],
        'categories': [ { 'id': '5267e4d9e4b0ec79466e48c8',
            'name': 'Other Event',
            'pluralName': 'Other Events',
            'shortName': 'Other Event',
            'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/event/default_',
                'suffix': '.png' },
            'primary': True } ],
        'referralId': 'v-1564735154',
        'hasPerk': False },
{ 'id': '4dc94ca7b3ada60bb0f4b3d6',
    'name': "The People's Games",
    'location': { 'address': 'Union Square North Plaza',
        'crossStreet': 'btwn Park Avenue South & Broadway',
        'lat': 40.736711033333336,

```

```

'lng': -73.990035,
'labeledLatLngs': [{'label': 'display',
  'lat': 40.736711033333336,
  'lng': -73.990035}],
'distance': 2407,
'postalCode': '10003',
'cc': 'US',
'city': 'New York',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['Union Square North Plaza (btwn Park Avenue South & Broadway)',
  'New York, NY 10003',
  'United States']],
'categories': [{'id': '4bf58dd8d48988d184941735',
  'name': 'Stadium',
  'pluralName': 'Stadiums',
  'shortName': 'Stadium',
  'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/',
    'suffix': '.png'},
  'primary': True}],
'referralId': 'v-1564735154',
'hasPerk': False},
{'id': '529265a8498e21244e4641be',
'name': 'Escape The Room NYC',
'location': {'address': '24 W 25th St Fl 8',
  'crossStreet': '5th Ave.',
  'lat': 40.74353417699336,
  'lng': -73.99038791656494,
  'labeledLatLngs': [{'label': 'display',
    'lat': 40.74353417699336,
    'lng': -73.99038791656494}],
  'distance': 1761,
  'postalCode': '10010',
  'cc': 'US',
  'neighborhood': 'Chelsea',
  'city': 'New York',
  'state': 'NY',
  'country': 'United States',
  'formattedAddress': ['24 W 25th St Fl 8 (5th Ave.)',
    'New York, NY 10010',
    'United States']],
'categories': [{'id': '4bf58dd8d48988d1f1931735',
  'name': 'General Entertainment',
  'pluralName': 'General Entertainment',
  'shortName': 'Entertainment',
  'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/',
    'suffix': '.png'},
  'primary': True}],

```



```

'venuePage': {'id': '76083027'},
'referralId': 'v-1564735154',
'hasPerk': False},
{'id': '5911c4a51acf113e0d884a72',
'name': 'Secret Escapes (USA)',
'location': {'address': '138 W 25th St',
'crossStreet': 'Between 5th & 6th',
'lat': 40.744819,
'lng': -73.993617,
'labeledLatLngs': [{'label': 'display',
'lat': 40.744819,
'lng': -73.993617}]},
'distance': 1829,
'postalCode': '10001',
'cc': 'US',
'city': 'New York',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['138 W 25th St (Between 5th & 6th)',
'New York, NY 10001',
'United States']},
'categories': [{'id': '4bf58dd8d48988d125941735',
'name': 'Tech Startup',
'pluralName': 'Tech Startups',
'shortName': 'Tech Startup',
'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/technology_',
'suffix': '.png'},
'primary': True}],
'referralId': 'v-1564735154',
'hasPerk': False},
{'id': '4b74a68ff964a52034ea2de3',
'name': 'GameStop',
'location': {'address': '682 Avenue of the Americas',
'crossStreet': 'at W 22nd St.',
'lat': 40.741879843228304,
'lng': -73.99349617486975,
'labeledLatLngs': [{'label': 'display',
'lat': 40.741879843228304,
'lng': -73.99349617486975}]},
'distance': 2066,
'postalCode': '10010',
'cc': 'US',
'city': 'New York',
'state': 'NY',
'country': 'United States',
'formattedAddress': ['682 Avenue of the Americas (at W 22nd St.)',
'New York, NY 10010',
'United States']},

```

```

'categories': [{ 'id': '4bf58dd8d48988d10b951735',
  'name': 'Video Game Store',
  'pluralName': 'Video Game Stores',
  'shortName': 'Video Games',
  'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/videogames_',
    'suffix': '.png' },
  'primary': True }],
'referralId': 'v-1564735154',
'hasPerk': False },
{ 'id': '4f8c1d66121d29fd943c5222',
  'name': 'High 5 Games',
  'location': { 'address': '50 W 23rd St',
    'crossStreet': 'at 6th Ave',
    'lat': 40.74246065714606,
    'lng': -73.99176134667466,
    'labeledLatLngs': [ { 'label': 'display',
      'lat': 40.74246065714606,
      'lng': -73.99176134667466 } ],
    'distance': 1926,
    'postalCode': '10010',
    'cc': 'US',
    'city': 'New York',
    'state': 'NY',
    'country': 'United States',
    'formattedAddress': [ '50 W 23rd St (at 6th Ave)',
      'New York, NY 10010',
      'United States' ] },
  'categories': [ { 'id': '4bf58dd8d48988d125941735',
    'name': 'Tech Startup',
    'pluralName': 'Tech Startups',
    'shortName': 'Tech Startup',
    'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/technology_',
      'suffix': '.png' },
    'primary': True } ],
  'referralId': 'v-1564735154',
  'hasPerk': False } ] }

```

```

In [137]: # assign relevant part of JSON to venues
venues = results['response']['venues']

```

```

# transform venues into a dataframe
dataframe = json_normalize(venues)
dataframe.head()

```

```

Out[137]:

```

		categories	hasPerk	\
0	[{ 'id': '4bf58dd8d48988d1f1931735', 'name': 'G...		False	
1	[{ 'id': '4bf58dd8d48988d1f1931735', 'name': 'G...		False	
2	[{ 'id': '4bf58dd8d48988d1ed941735', 'name': 'S...		False	

```

3  [{'id': '4bf58dd8d48988d1f1931735', 'name': 'G...   False
4                                     []      False

```

```

          id          location.address location.cc \
0  5bf0c411364d970034315383          265 W 37th St      US
1  56abc458498ee6c0b6ad7f0a  435 5th Avenue, 4th Floor      US
2  4bc93a3b3740b713cc825e65          101 W 55th St      US
3  59c4073de1f2282d14b2cc69          246 W 38th St Fl 7      US
4  5577e333498ed6ee66399419          50 Central Park S      US

```

```

location.city location.country location.crossStreet location.distance \
0      New York      United States          NaN          1172
1      New York      United States          NaN          656
2      New York      United States    6th Ave, NW corner          767
3      New York      United States          NaN          1058
4      New York      United States          NaN          1002

```

```

          location.formattedAddress \
0  [265 W 37th St, New York, NY 10018, United Sta...
1  [435 5th Avenue, 4th Floor, New York, NY 10016...
2  [101 W 55th St (6th Ave, NW corner), New York,...
3  [246 W 38th St Fl 7, New York, NY 10018, Unite...
4  [50 Central Park S, New York, NY 10019, United...

```

```

          location.labeledLatLngs location.lat \
0  [{'label': 'display', 'lat': 40.754016, 'lng':... 40.754016
1  [{'label': 'display', 'lat': 40.75139156486494... 40.751392
2  [{'label': 'display', 'lat': 40.76327188497643... 40.763272
3  [{'label': 'display', 'lat': 40.75409, 'lng': ... 40.754090
4  [{'label': 'display', 'lat': 40.76525, 'lng': ... 40.765250

```

```

location.lng location.neighborhood location.postalCode location.state \
0      -73.991748          NaN          10018          NY
1      -73.982329      Garment District          10016          NY
2      -73.978747          NaN          10019          NY
3      -73.990390          NaN          10018          NY
4      -73.976040          NaN          10019          NY

```

```

          name          referralId venuePage.id
0      Mission Escape Games  v-1564735154          NaN
1  Riddle Me Out Escape Games NYC  v-1564735154    152966516
2      Escape Day Spa & Skin Care  v-1564735154          NaN
3      Exit Escape Room NYC      v-1564735154    453995455
4      Escape Models VIP        v-1564735154          NaN

```

```

In [138]: # keep only columns that include venue name, and anything that is associated with lo
filtered_columns = ['name', 'categories'] + [col for col in dataframe.columns if col
dataframe_filtered = dataframe.loc[:, filtered_columns]

```

```

# function that extracts the category of the venue
def get_category_type(row):
    try:
        categories_list = row['categories']
    except:
        categories_list = row['venue.categories']

    if len(categories_list) == 0:
        return None
    else:
        return categories_list[0]['name']

# filter the category for each row
dataframe_filtered['categories'] = dataframe_filtered.apply(get_category_type, axis=1)

# clean column names by keeping only last term
dataframe_filtered.columns = [column.split('.')[0] for column in dataframe_filtered.columns]

dataframe_filtered.head()

```

Out[138]:

	name	categories
0	Mission Escape Games	General Entertainment
1	Riddle Me Out Escape Games NYC	General Entertainment
2	Escape Day Spa & Skin Care	Spa
3	Exit Escape Room NYC	General Entertainment
4	Escape Models VIP	None

  

	address	cc	city	country	crossStreet
0	265 W 37th St	US	New York	United States	NaN
1	435 5th Avenue, 4th Floor	US	New York	United States	NaN
2	101 W 55th St	US	New York	United States	6th Ave, NW corner
3	246 W 38th St Fl 7	US	New York	United States	NaN
4	50 Central Park S	US	New York	United States	NaN

  

	distance	formattedAddress
0	1172	[265 W 37th St, New York, NY 10018, United Sta...
1	656	[435 5th Avenue, 4th Floor, New York, NY 10016...
2	767	[101 W 55th St (6th Ave, NW corner), New York,...
3	1058	[246 W 38th St Fl 7, New York, NY 10018, Unite...
4	1002	[50 Central Park S, New York, NY 10019, United...

  

	labeledLatLngs	lat	lng
0	[{'label': 'display', 'lat': 40.754016, 'lng': ...	40.754016	-73.991748
1	[{'label': 'display', 'lat': 40.75139156486494...	40.751392	-73.982329
2	[{'label': 'display', 'lat': 40.76327188497643...	40.763272	-73.978747
3	[{'label': 'display', 'lat': 40.75409, 'lng': ...	40.754090	-73.990390
4	[{'label': 'display', 'lat': 40.76525, 'lng': ...	40.765250	-73.976040

	neighborhood	postalCode	state
0	NaN	10018	NY
1	Garment District	10016	NY
2	NaN	10019	NY
3	NaN	10018	NY
4	NaN	10019	NY

```
In [139]: dataframe_filtered1 = dataframe_filtered[dataframe_filtered.categories == 'General Entertainment']
dataframe_filtered1.head()
```

```
Out[139]:
```

	name	categories	\
0	Mission Escape Games	General Entertainment	
1	Riddle Me Out Escape Games NYC	General Entertainment	
3	Exit Escape Room NYC	General Entertainment	
6	Escape Room Madness	General Entertainment	
7	Escape Entertainment	General Entertainment	

  

	address	cc	city	country	\
0	265 W 37th St	US	New York	United States	
1	435 5th Avenue, 4th Floor	US	New York	United States	
3	246 W 38th St Fl 7	US	New York	United States	
6	38 West 32nd Street, 5th Floor, Ste 500	US	New York	United States	
7	4th Floor, 39 W 32nd St	US	New York	United States	

  

	crossStreet	distance	\
0	NaN	1172	
1	NaN	656	
3	NaN	1058	
6	32nd street & Broadway	1212	
7	NaN	1214	

  

	formattedAddress	\
0	[265 W 37th St, New York, NY 10018, United Sta...	
1	[435 5th Avenue, 4th Floor, New York, NY 10016...	
3	[246 W 38th St Fl 7, New York, NY 10018, Unite...	
6	[38 West 32nd Street, 5th Floor, Ste 500 (32nd...	
7	[4th Floor, 39 W 32nd St, New York, NY 10001, ...	

  

	labeledLatLngs	lat	lng	\
0	[{'label': 'display', 'lat': 40.754016, 'lng': ...	40.754016	-73.991748	
1	[{'label': 'display', 'lat': 40.75139156486494...	40.751392	-73.982329	
3	[{'label': 'display', 'lat': 40.75409, 'lng': ...	40.754090	-73.990390	
6	[{'label': 'display', 'lat': 40.74803054394054...	40.748031	-73.987428	
7	[{'label': 'display', 'lat': 40.74810986880671...	40.748110	-73.987582	

  

	neighborhood	postalCode	state
0	NaN	10018	NY

1	Garment District	10016	NY
3	NaN	10018	NY
6	NaN	10001	NY
7	NaN	10001	NY

```
In [140]: venues_ett_map = folium.Map(location=[latitude, longitude], zoom_start=13) # generate map

# add the Italian restaurants as blue circle markers
for lat, lng, label in zip(dataframe_filtered.lat, dataframe_filtered.lng, dataframe_filtered.label):
    folium.features.CircleMarker(
        [lat, lng],
        radius=3,
        color='green',
        popup=label,
        fill = True,
        fill_color='green',
        fill_opacity=0.6
    ).add_to(venues_ett_map)

# add the Italian restaurants as blue circle markers
for lat, lng, label in zip(dataframe_filtered1.lat, dataframe_filtered1.lng, dataframe_filtered1.label):
    folium.features.CircleMarker(
        [lat, lng],
        radius=3,
        color='red',
        popup=label,
        fill = True,
        fill_color='red',
        fill_opacity=0.6
    ).add_to(venues_ett_map)

# display map
venues_ett_map
```

```
Out[140]: <folium.folium.Map at 0x7fe50d76e898>
```

## 2.2 Results

Analyzing the results we can see that people in different borough of London and NYC often visit identical places, such as Italian Restaurant, Coffee Shop, Park, Pizza Place, Hotel, Gym, Fitness Center, But there are also differences in preferences, such as French Restaurant, Pub, Japanese Restaurant, Cocktail Bar, Boutique for borough of London and for borough of NYC - American Restaurant, Wine Shop, Chinese Restaurant, Sushi Restaurant, Taco Place. Also using Foursquare API and visualization we can easily see the information that we need, for example, the placement of Escape room. They are popular now, and how we can see on map there are only a few in Manhattan.

## 2.3 Discussion

Based on our result, we can conclude that there are few Escape rooms and if we want to open a Escape room then the best place in Manhattan is near the center and above. If to analyze Brooklyn we can see only 2 of them. That is a good decision and we are not occupied with a place at this moment.

Also analyzing area of London and New York, we see that the British prefer French Restaurant, Pub, Japanese Restaurant while the American prefer Mexican Restaurant, Chinese Restaurant, Sushi Restaurant, Taco Place.

## 2.4 Conclusion

Using Foursquare API, we can captured data of common places all around the world. Using it, we refer back to our main objectives, which is to determine;

the similarity or dissimilarirty of both cities classification of area located inside the city whether it is residential, tourism places, or others In conclusion, both borough cities London and NYC