Capstone Project - Final Assignment

November 28, 2019

[1]:
```
#Download and execute all the libraries

import numpy as np # library to handle data in a vectorized manner

import pandas as pd # library for data analsysis
pd.set_option('display.max_columns', None)
pd.set_option('display.max_rows', None)

import json # library to handle JSON files

!conda install -c conda-forge geopy --yes # uncomment this line if you haven't␣
↪completed the Foursquare API lab
from geopy.geocoders import Nominatim # convert an address into latitude and␣
↪longitude values

import requests # library to handle requests
from pandas.io.json import json_normalize # tranform JSON file into a pandas␣
↪dataframe

# Matplotlib and associated plotting modules
import matplotlib.cm as cm
import matplotlib.colors as colors

# import k-means from clustering stage
from sklearn.cluster import KMeans

#!conda install -c conda-forge folium=0.5.0 --yes # uncomment this line if you␣
↪haven't completed the Foursquare API lab
import folium # map rendering library

print('Libraries imported.')
```

```
Solving environment: done


==> WARNING: A newer version of conda exists. <==
  current version: 4.5.11
```

```
  latest version: 4.7.12

Please update conda by running

    $ conda update -n base -c defaults conda



# All requested packages already installed.

Libraries imported.
```

[2]:
```
#Importing the dataset
!wget -q -O 'newyork_data.json' https://cocl.us/new_york_dataset
print('Data downloaded!')
```

```
Data downloaded!
```

[3]:
```
#Load data
with open('newyork_data.json') as json_data:
    newyork_data = json.load(json_data)
```

[4]:
```
#Define the dataframe columns
column_names = ['Borough', 'Neighborhood', 'Latitude', 'Longitude']

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

[5]:
```
#Empty dataframe
neighborhoods
```

[5]:
```
Empty DataFrame
Columns: [Borough, Neighborhood, Latitude, Longitude]
Index: []
```

[6]:
```
#Define a list of the neighborhoods
neighborhoods_data = newyork_data['features']

#Put data into the dataframe
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)
```

[7]:
```
#Examine the results
neighborhoods.head()
```

[7]:

	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

[8]:
```
print('The dataframe has {} boroughs and {} neighborhoods.'.format(
        len(neighborhoods['Borough'].unique()),
        neighborhoods.shape[0]
    )
)
```

```
The dataframe has 5 boroughs and 306 neighborhoods.
```

[9]:
```
#Use geopy library to get the latitude and longitude values of New York City.
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.
```

[10]:
```
# 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)
    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_newyork)

map_newyork
```

[10]: <folium.folium.Map at 0x7f109a60e6d8>

[11]:
```
#Filter out the neighborhoods in Manhattan.
manhattan_data = neighborhoods[neighborhoods['Borough'] == 'Manhattan'].
 ↪reset_index(drop=True)
manhattan_data.head()
```

[11]:

	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

[12]:
```
#Get the geographical coordinates of Manhattan.
address = 'Manhattan, NY'

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 40.7896239, -73.9598939.
```

[13]:
```
#Visualize Manhattan the neighborhoods
# create map of Manhattan using latitude and longitude values
map_manhattan = folium.Map(location=[latitude, longitude], zoom_start=11)

# add markers to map
for lat, lng, label in zip(manhattan_data['Latitude'],␣
 ↪manhattan_data['Longitude'], manhattan_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_manhattan)

map_manhattan
```

[13]:
```
<folium.folium.Map at 0x7f1099ff99e8>
```

[14]:
```
#Explore the neighborhoods using Foursquare API
CLIENT_ID = 'VVOKMVVYGLAFRQCX4ALWCCQJCYYGSZCMTGB2G52IBVI1H5YJ' # your␣
 ↪Foursquare ID
CLIENT_SECRET = 'JOX1HBCWQEFPLCOKOHMEF5MN4JWJ15OAL25ZGODYVSVYD5V3' # your␣
 ↪Foursquare Secret
VERSION = '20180605' # Foursquare API version

print('Your credentails:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET:' + CLIENT_SECRET)
```

```
Your credentails:
CLIENT_ID: VVOKMVVYGLAFRQCX4ALWCCQJCYYGSZCMTGB2G52IBVI1H5YJ
CLIENT_SECRET:JOX1HBCWQEFPLCOKOHMEF5MN4JWJ15OAL25ZGODYVSVYD5V3
```

[15]:
```
#Get the neighborhood's latitude and longitude values.
neighborhood_latitude = manhattan_data.loc[0, 'Latitude'] # neighborhood␣
 ↪latitude value
neighborhood_longitude = manhattan_data.loc[0, 'Longitude'] # neighborhood␣
 ↪longitude value

neighborhood_name = manhattan_data.loc[0, 'Neighborhood'] # neighborhood name

print('Latitude and longitude values of {} are {}, {}.'.
 ↪format(neighborhood_name,

                                                                 ␣
 ↪neighborhood_latitude,

                                                                 ␣
 ↪neighborhood_longitude))
```

```
Latitude and longitude values of Marble Hill are 40.87655077879964,
-73.91065965862981.
```

[22]:
```
#Get top 100 venues of each neighborhood
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={}&v={}&ll={},{}&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)
```

[23]:
```
LIMIT = 100 # limit of number of venues returned by Foursquare API
radius = 500

manhattan_venues = getNearbyVenues(names=manhattan_data['Neighborhood'],
                                   latitudes=manhattan_data['Latitude'],
                                   longitudes=manhattan_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
```

[24]:
```
print(manhattan_venues.shape)
manhattan_venues.head()
```

```
(3298, 7)
```

[24]:

	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	

	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Arturo's	40.874412	-73.910271	Pizza Place
1	Bikram Yoga	40.876844	-73.906204	Yoga Studio
2	Tibbett Diner	40.880404	-73.908937	Diner
3	Starbucks	40.877531	-73.905582	Coffee Shop
4	Blink Fitness Riverdale	40.877147	-73.905837	Gym

[25]:
```
#Check the number of venues returned to each neighborhood
manhattan_venues['Venue Category'].head()
manhattan_venues.groupby('Neighborhood').count()
```

[25]:

Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	\
Battery Park City	97	97	97	
Carnegie Hill	100	100	100	
Central Harlem	44	44	44	
Chelsea	100	100	100	
Chinatown	100	100	100	
Civic Center	100	100	100	
Clinton	100	100	100	
East Harlem	44	44	44	
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	59	59	59	
Hudson Yards	79	79	79	
Inwood	54	54	54	
Lenox Hill	100	100	100	
Lincoln Square	100	100	100	
Little Italy	100	100	100	
Lower East Side	54	54	54	
Manhattan Valley	52	52	52	
Manhattanville	38	38	38	
Marble Hill	23	23	23	
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	28	28	28
Soho	100	100	100
Stuyvesant Town	20	20	20
Sutton Place	100	100	100
Tribeca	100	100	100
Tudor City	80	80	80
Turtle Bay	100	100	100
Upper East Side	100	100	100
Upper West Side	100	100	100
Washington Heights	86	86	86
West Village	100	100	100
Yorkville	100	100	100

Neighborhood	Venue Latitude	Venue Longitude	Venue Category
Battery Park City	97	97	97
Carnegie Hill	100	100	100
Central Harlem	44	44	44
Chelsea	100	100	100
Chinatown	100	100	100
Civic Center	100	100	100
Clinton	100	100	100
East Harlem	44	44	44
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	59	59	59
Hudson Yards	79	79	79
Inwood	54	54	54
Lenox Hill	100	100	100
Lincoln Square	100	100	100
Little Italy	100	100	100
Lower East Side	54	54	54
Manhattan Valley	52	52	52
Manhattanville	38	38	38
Marble Hill	23	23	23
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	28	28	28
Soho	100	100	100
Stuyvesant Town	20	20	20

Sutton Place	100	100	100
Tribeca	100	100	100
Tudor City	80	80	80
Turtle Bay	100	100	100
Upper East Side	100	100	100
Upper West Side	100	100	100
Washington Heights	86	86	86
West Village	100	100	100
Yorkville	100	100	100

[26]:
```
#Check the number of unique categories returned
print('There are {} uniques categories.'.format(len(manhattan_venues['Venue␣
↪Category'].unique())))
```

```
There are 334 uniques categories.
```

[27]:
```
manhattan_venues['Venue Category'].unique()
```

[27]:
```
array(['Pizza Place', 'Yoga Studio', 'Diner', 'Coffee Shop', 'Gym',
       'Donut Shop', 'Seafood Restaurant', 'Department Store',
       'Tennis Stadium', 'Pharmacy', 'Discount Store', 'Supplement Shop',
       'American Restaurant', 'Ice Cream Shop', 'Miscellaneous Shop',
       'Video Game Store', 'Steakhouse', 'Sandwich Place', 'Kids Store',
       'Shopping Mall', 'Deli / Bodega', 'Cocktail Bar',
       'Greek Restaurant', 'Hotel', 'Chinese Restaurant', 'Spa', 'Bakery',
       'English Restaurant', 'Museum', 'Tea Room', 'Indie Movie Theater',
       'New American Restaurant', 'Bike Shop', 'Noodle House',
       'Hotpot Restaurant', 'Roof Deck', 'Spanish Restaurant',
       'Bubble Tea Shop', 'Salon / Barbershop', 'Historic Site',
       'Garden Center', 'Asian Restaurant', 'Record Shop',
       'Korean Restaurant', 'Thai Restaurant', 'Organic Grocery',
       'Cosmetics Shop', 'Boutique', 'Sake Bar', 'Vietnamese Restaurant',
       'Malay Restaurant', 'Supermarket', 'Italian Restaurant',
       'Furniture / Home Store', 'Dim Sum Restaurant', 'Music Venue',
       'Ramen Restaurant', 'Dessert Shop', 'Snack Place',
       'Paper / Office Supplies Store', 'Optical Shop', 'Massage Studio',
       'Dumpling Restaurant', 'Gift Shop', 'Austrian Restaurant',
       'Japanese Restaurant', 'Mexican Restaurant', 'Shoe Store',
       'Karaoke Bar', 'Vegetarian / Vegan Restaurant', 'Bar',
       'Taiwanese Restaurant', 'Shanghai Restaurant', 'Café',
       'Restaurant', 'Burger Joint', 'Park', 'Market', 'Pet Café',
       'Wine Shop', 'Frozen Yogurt Shop', 'Breakfast Spot',
       'Liquor Store', 'Tapas Restaurant', 'Scenic Lookout', 'Pool',
       'Caribbean Restaurant', 'Latin American Restaurant',
       'Indian Restaurant', 'Mobile Phone Shop', 'Lounge',
       'Grocery Store', 'Pet Store', 'Gym / Fitness Center',
       'Accessories Store', 'Plaza', 'Wine Bar', 'Sushi Restaurant',
```

'Clothing Store', 'Rental Car Location', 'Arepa Restaurant',
'Bank', 'Rest Area', "Women's Store", 'Shipping Store',
'Sporting Goods Shop', 'Farmers Market', 'Bistro', 'Veterinarian',
'Playground', 'Dog Run', 'Empanada Restaurant', 'History Museum',
'Fast Food Restaurant', 'Juice Bar', 'Bus Station', 'Smoke Shop',
'Mediterranean Restaurant', 'Food Truck', 'School', 'Gastropub',
'Pub', 'Hookah Bar', 'Climbing Gym', 'BBQ Joint', 'Bike Trail',
'Japanese Curry Restaurant', 'Food & Drink Shop',
'Cuban Restaurant', 'Music School', 'Thrift / Vintage Store',
'Cycle Studio', 'French Restaurant', 'Beer Bar', 'Library',
'Ethiopian Restaurant', 'African Restaurant', 'Jazz Club',
'Bagel Shop', 'Bookstore', 'Art Gallery', 'Fried Chicken Joint',
'Cafeteria', 'Southern / Soul Food Restaurant', 'Event Space',
'Public Art', 'Dance Studio', 'Taco Place',
'Performing Arts Venue', 'Gas Station', 'Hotel Bar',
'Chocolate Shop', 'Burrito Place', 'Sculpture Garden',
'Athletics & Sports', 'Exhibit', 'Bridal Shop', 'Art Museum',
'Salad Place', 'Turkish Restaurant', 'Electronics Store',
'Gourmet Shop', 'Hobby Shop', 'Beer Store', 'Video Store',
'Monument / Landmark', 'Health & Beauty Service', 'Butcher',
'Hot Dog Joint', 'German Restaurant', 'Daycare',
'Peruvian Restaurant', 'Gymnastics Gym',
'College Academic Building', 'Health Food Store',
'Czech Restaurant', 'Middle Eastern Restaurant',
'Afghan Restaurant', 'Lingerie Store', 'Non-Profit', 'Club House',
'Toy / Game Store', 'Building', 'Pilates Studio',
'Outdoors & Recreation', 'Waterfront',
'Residential Building (Apartment / Condo)', 'Baseball Field',
'Soccer Field', 'Bus Line', 'Metro Station', 'Movie Theater',
'Trail', 'Cupcake Shop', 'Nail Salon', 'Garden', 'Flower Shop',
'Arts & Crafts Store', 'Drugstore', 'Street Art', 'Speakeasy',
'Sports Bar', 'Used Bookstore', 'Israeli Restaurant',
'Opera House', 'Theater', 'Concert Hall', 'College Arts Building',
'Fountain', 'Circus', 'High School', 'College Bookstore',
'Recreation Center', 'General Entertainment', 'Comedy Club',
'Pie Shop', 'Indie Theater', 'Food Court', 'Poke Place',
'Dive Bar', 'Caucasian Restaurant', 'Tiki Bar', 'Christmas Market',
'Skating Rink', 'Szechuan Restaurant', 'Tailor Shop',
'Hawaiian Restaurant', 'Theme Park Ride / Attraction',
'Food Stand', 'General College & University', 'Boxing Gym',
'Brazilian Restaurant', "Men's Store", 'Jewish Restaurant',
'Martial Arts Dojo', 'Resort', 'Nightclub', 'Fish Market',
'Office', 'College Theater', 'Paella Restaurant',
'Photography Studio', 'Creperie', 'Physical Therapist',
'Smoothie Shop', 'Flea Market', 'Cheese Shop', 'Udon Restaurant',
'Rock Club', 'Lebanese Restaurant', 'Gaming Cafe',
'Eastern European Restaurant', 'Moroccan Restaurant',

```
       'Swiss Restaurant', 'Scandinavian Restaurant', 'Antique Shop',
       'Filipino Restaurant', 'Soup Place', 'Argentinian Restaurant',
       'Auto Workshop', 'Tennis Court', 'Gym Pool', 'Whisky Bar',
       'Volleyball Court', 'Mini Golf', 'Modern European Restaurant',
       'Skate Park', 'Bike Rental / Bike Share', 'Basketball Court',
       'Newsstand', 'Design Studio', 'Falafel Restaurant',
       'Jewelry Store', 'Australian Restaurant', 'Tattoo Parlor',
       'Ski Shop', 'Music Store', 'Candy Store', 'Board Shop',
       'Hardware Store', 'Piano Bar', 'Gay Bar', 'Hostel', 'Wings Joint',
       'Outdoor Sculpture', 'College Cafeteria', 'Irish Pub', 'Arcade',
       'Bed & Breakfast', 'Convenience Store', 'Social Club',
       'South Indian Restaurant', 'Cooking School', 'Memorial Site',
       'Tree', 'Auditorium', 'Boat or Ferry', 'Beer Garden',
       "Doctor's Office", 'Coworking Space', 'Community Center',
       'Kosher Restaurant', 'Himalayan Restaurant',
       'Herbs & Spices Store', 'Venezuelan Restaurant', 'Adult Boutique',
       'Molecular Gastronomy Restaurant', 'Medical Center', 'Baby Store',
       'Strip Club', 'Cajun / Creole Restaurant', 'Laundry Service',
       'Camera Store', 'Golf Course', 'Leather Goods Store',
       'Big Box Store', 'South American Restaurant',
       'Financial or Legal Service', 'Spiritual Center',
       'Persian Restaurant', 'Cambodian Restaurant',
       'Tourist Information Center', 'Duty-free Shop', 'Bridge',
       'Soba Restaurant', 'Heliport', 'Pet Service', 'Harbor / Marina',
       'Sports Club', 'Russian Restaurant', 'Kebab Restaurant',
       'Pedestrian Plaza', 'Pakistani Restaurant', 'Stables'],
      dtype=object)
```

[28]:
```
#Assign values for each category and display them in a new column named 'Values'
d = {"Doctor's Office":10, 'Medical Center':10, 'School':9, 'High School':9,␣
 ↪'General College & University':9, 'Pharmacy':8, 'Drugstore':8, 'Supermarket':
 ↪7, 'Grocery Store':7, 'Clothing Store':6, 'Bus Station':5, 'Bus Stop':5,␣
 ↪'Bus Line':5, 'Metro Station':5, 'Department Store':4, 'Discount Store':4,␣
 ↪'Shopping Mall':4, 'Convenience Store':4, 'Electronics Store':4, 'Bank':3,␣
 ↪'Gas Station':2, 'Gym':1, 'Gym / Fitness Center':1, 'Weight Loss Center':1}
manhattan_venues['Value'] = manhattan_venues['Venue Category'].map(d)
manhattan_venues.head()
```

[28]:

	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	

	Venue	Venue Latitude	Venue Longitude	Venue Category	\
0	Arturo's	40.874412	-73.910271	Pizza Place	

```
1              Bikram Yoga       40.876844       -73.906204    Yoga Studio
2            Tibbett Diner       40.880404       -73.908937          Diner
3                Starbucks       40.877531       -73.905582    Coffee Shop
4  Blink Fitness Riverdale       40.877147       -73.905837            Gym

   Value
0    NaN
1    NaN
2    NaN
3    NaN
4    1.0
```

[29]:
```
#Check the unique neighborhoods
manhattan_neighborhoods = manhattan_venues['Neighborhood'].unique()
manhattan_neighborhoods
```

[29]:
```
array(['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'], dtype=object)
```

[31]:
```
Marble_Hill = manhattan_venues[manhattan_venues.Neighborhood == 'Marble Hill']
Marble_Hill = Marble_Hill['Value'].sum()
print('Marble Hill = ',(Marble_Hill))

Chinatown = manhattan_venues[manhattan_venues.Neighborhood == 'Chinatown']
Chinatown = Chinatown['Value'].sum()
print('Chinatown = ',(Chinatown))

Washington_Heights = manhattan_venues[manhattan_venues.Neighborhood ==␣
↪'Washington Heights']
Washington_Heights = Washington_Heights['Value'].sum()
print('Washington Heights = ',(Washington_Heights))

Inwood = manhattan_venues[manhattan_venues.Neighborhood == 'Inwood']
Inwood = Inwood['Value'].sum()
print('Inwood = ',(Inwood))

Hamilton_Heights = manhattan_venues[manhattan_venues.Neighborhood == 'Hamilton␣
↪Heights']
```

```
Hamilton_Heights = Hamilton_Heights['Value'].sum()
print('Hamilton_Heights = ',(Hamilton_Heights))

Manhattanville = manhattan_venues[manhattan_venues.Neighborhood ==␣
↪'Manhattanville']
Manhattanville = Manhattanville['Value'].sum()
print('Manhattanville = ',(Manhattanville))

Central_Harlem = manhattan_venues[manhattan_venues.Neighborhood == 'Central␣
↪Harlem']
Central_Harlem = Central_Harlem['Value'].sum()
print('Central Harlem = ',(Central_Harlem))

East_Harlem = manhattan_venues[manhattan_venues.Neighborhood == 'East Harlem']
East_Harlem = East_Harlem['Value'].sum()
print('East Harlem = ',(East_Harlem))

Upper_East_Side = manhattan_venues[manhattan_venues.Neighborhood == 'Upper East␣
↪Side']
Upper_East_Side = Upper_East_Side['Value'].sum()
print('Upper East Side = ',(Upper_East_Side))

Yorkville = manhattan_venues[manhattan_venues.Neighborhood == 'Yorkville']
Yorkville = Yorkville['Value'].sum()
print('Yorkville = ',(Yorkville))

Lenox_Hill = manhattan_venues[manhattan_venues.Neighborhood == 'Lenox Hill']
Lenox_Hill = Lenox_Hill['Value'].sum()
print('Lenox Hill = ',(Lenox_Hill))

Roosevelt_Island = manhattan_venues[manhattan_venues.Neighborhood == 'Roosevelt␣
↪Island']
Roosevelt_Island = Roosevelt_Island['Value'].sum()
print('Roosevelt Island = ',(Roosevelt_Island))

Upper_West_Side = manhattan_venues[manhattan_venues.Neighborhood == 'Upper West␣
↪Side']
Upper_West_Side = Upper_West_Side['Value'].sum()
print('Upper West Side = ',(Upper_West_Side))

Lincoln_Square = manhattan_venues[manhattan_venues.Neighborhood == 'Lincoln␣
↪Square']
Lincoln_Square = Lincoln_Square['Value'].sum()
print('Lincoln_Square = ',(Lincoln_Square))

Clinton = manhattan_venues[manhattan_venues.Neighborhood == 'Clinton']
```

```
Clinton = Clinton['Value'].sum()
print('Clinton = ',(Clinton))

Midtown = manhattan_venues[manhattan_venues.Neighborhood == 'Midtown']
Midtown = Midtown['Value'].sum()
print('Midtown = ',(Midtown))

Murray_Hill = manhattan_venues[manhattan_venues.Neighborhood == 'Murray Hill']
Murray_Hill = Murray_Hill['Value'].sum()
print('Murray Hill = ',(Murray_Hill))

Chelsea = manhattan_venues[manhattan_venues.Neighborhood == 'Chelsea']
Chelsea = Chelsea['Value'].sum()
print('Chelsea = ',(Chelsea))

Greenwich_Village = manhattan_venues[manhattan_venues.Neighborhood ==␣
↪'Greenwich Village']
Greenwich_Village = Greenwich_Village['Value'].sum()
print('Greenwich Village = ',(Greenwich_Village))

East_Village = manhattan_venues[manhattan_venues.Neighborhood == 'East Village']
East_Village = East_Village['Value'].sum()
print('East Village = ',(East_Village))

Lower_East_Side = manhattan_venues[manhattan_venues.Neighborhood == 'Lower East␣
↪Side']
Lower_East_Side = Lower_East_Side['Value'].sum()
print('Lower East Side = ',(Lower_East_Side))

Tribeca = manhattan_venues[manhattan_venues.Neighborhood == 'Tribeca']
Tribeca = Tribeca['Value'].sum()
print('Tribeca = ',(Tribeca))

Little_Italy = manhattan_venues[manhattan_venues.Neighborhood == 'Little Italy']
Little_Italy = Little_Italy['Value'].sum()
print('Little Italy = ',(Little_Italy))

Soho = manhattan_venues[manhattan_venues.Neighborhood == 'Soho']
Soho = Soho['Value'].sum()
print('Soho = ',(Soho))

West_Village = manhattan_venues[manhattan_venues.Neighborhood == 'West_Village']
West_Village = West_Village['Value'].sum()
print('West Village = ',(West_Village))

Manhattan_Valley = manhattan_venues[manhattan_venues.Neighborhood ==␣
↪'Manhattan_Valley']
```

```
Manhattan_Valley = Manhattan_Valley['Value'].sum()
print('Manhattan Valley = ',(Manhattan_Valley))

Morningside_Heights = manhattan_venues[manhattan_venues.Neighborhood ==␣
↪'Morningside Heights']
Morningside_Heights = Morningside_Heights['Value'].sum()
print('Morningside Heights = ',(Morningside_Heights))

Gramercy = manhattan_venues[manhattan_venues.Neighborhood == 'Gramercy']
Gramercy = Gramercy['Value'].sum()
print('Gramercy = ',(Gramercy))

Battery_Park_City = manhattan_venues[manhattan_venues.Neighborhood == 'Battery␣
↪Park City']
Battery_Park_City = Battery_Park_City['Value'].sum()
print('Battery Park City = ',(Battery_Park_City))

Financial_District = manhattan_venues[manhattan_venues.Neighborhood ==␣
↪'Financial District']
Financial_District = Financial_District['Value'].sum()
print('Financial District = ',(Financial_District))

Carnegie_Hill = manhattan_venues[manhattan_venues.Neighborhood == 'Carnegie␣
↪Hill']
Carnegie_Hill = Carnegie_Hill['Value'].sum()
print('Carnegie Hill = ',(Carnegie_Hill))

Noho = manhattan_venues[manhattan_venues.Neighborhood == 'Noho']
Noho = Noho['Value'].sum()
print('Noho = ',(Noho))

Civic_Center = manhattan_venues[manhattan_venues.Neighborhood == 'Civic Center']
Civic_Center = Civic_Center['Value'].sum()
print('Civic Center = ',(Civic_Center))

Midtown_South = manhattan_venues[manhattan_venues.Neighborhood == 'Midtown␣
↪South']
Midtown_South = Midtown_South['Value'].sum()
print('Midtown South = ',(Midtown_South))

Sutton_Place = manhattan_venues[manhattan_venues.Neighborhood == 'Sutton Place']
Sutton_Place = Sutton_Place['Value'].sum()
print('Sutton Place = ',(Sutton_Place))

Turtle_Bay = manhattan_venues[manhattan_venues.Neighborhood == 'Turtle Bay']
Turtle_Bay = Turtle_Bay['Value'].sum()
print('Turtle Bay = ',(Turtle_Bay))
```

```
Tudor_City = manhattan_venues[manhattan_venues.Neighborhood == 'Tudor City']
Tudor_City = Tudor_City['Value'].sum()
print('Tudor City = ',(Tudor_City))

Stuyvesant_Town = manhattan_venues[manhattan_venues.Neighborhood == 'Stuyvesant␣
↪Town']
Stuyvesant_Town = Stuyvesant_Town['Value'].sum()
print('Stuyvesant Town = ',(Stuyvesant_Town))

Flatiron = manhattan_venues[manhattan_venues.Neighborhood == 'Flatiron']
Flatiron = Flatiron['Value'].sum()
print('Flatiron = ',(Flatiron))

Hudson_Yards = manhattan_venues[manhattan_venues.Neighborhood == 'Hudson Yards']
Hudson_Yards = Hudson_Yards['Value'].sum()
print('Hudson Yards = ',(Hudson_Yards))
```

```
Marble Hill =  21.0
Chinatown =  16.0
Washington Heights =  65.0
Inwood =  27.0
Hamilton_Heights =  21.0
Manhattanville =  15.0
Central Harlem =  2.0
East Harlem =  18.0
Upper East Side =  27.0
Yorkville =  18.0
Lenox Hill =  13.0
Roosevelt Island =  27.0
Upper West Side =  20.0
Lincoln_Square =  38.0
Clinton =  21.0
Midtown =  46.0
Murray Hill =  13.0
Chelsea =  13.0
Greenwich Village =  36.0
East Village =  0.0
Lower East Side =  14.0
Tribeca =  18.0
Little Italy =  26.0
Soho =  65.0
West Village =  0.0
Manhattan Valley =  0.0
Morningside Heights =  22.0
Gramercy =  33.0
Battery Park City =  46.0
```

```
Financial District =  27.0
Carnegie Hill =  40.0
Noho =  15.0
Civic Center =  23.0
Midtown South =  35.0
Sutton Place =  34.0
Turtle Bay =  9.0
Tudor City =  10.0
Stuyvesant Town =  3.0
Flatiron =  39.0
Hudson Yards =  32.0
```

[ ]: