

# WK2\_Capstone

February 21, 2021

## 1 Introduction

New York has always been the vibrant city. It is often selected as the best city for college students who seek professional success, as New York is full of job opportunities. Therefore, through completing this capstone project, I would like to find the best place to live in New York for college students. Specifically, I will start with the area (Manhattan, Brooklyn) nearby New York University that has 50,000+ students. It starts with the assumption that college students like places nearby sports facilities such as gyms and yoga studios.

## 2 Data to Use

I will use the “newyork\_data.json” data that we used for the practice in the earlier module and Foursquare data to find clusters of sports facilities in New York. This will give the recommendation of places to live for young people moving in New York.

## 3 Methodology

I will mainly use K means clustering to recommend five different clusters of sports facilities nearby New York University. As a result, I will help NYU students moving into town to settle down easily where they prefer.

```
[61]: import numpy as np # library to handle data in a vectorized manner

import pandas as pd # library for data analysis
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 # transform 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
!pip install bs4
import folium # map rendering library
import pandas as pd
import requests
from bs4 import BeautifulSoup

print('Libraries imported.')

```

Collecting package metadata (current\_repodata.json): done  
Solving environment: done

# All requested packages already installed.

Collecting package metadata (current\_repodata.json): done  
Solving environment: done

# All requested packages already installed.

Requirement already satisfied: bs4 in  
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (0.0.1)  
Requirement already satisfied: beautifulsoup4 in  
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from bs4)  
(4.9.3)  
Requirement already satisfied: soupsieve>1.2; python\_version >= "3.0" in  
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from  
beautifulsoup4->bs4) (2.2)  
Libraries imported.

```

[99]: # get newyork_data.json
!wget -q -O 'newyork_data.json' https://cf-courses-data.s3.us.
↳cloud-object-storage.appdomain.cloud/
↳IBMDeveloperSkillsNetwork-DS0701EN-SkillsNetwork/labs/newyork_data.json
with open('newyork_data.json') as json_data:
    newyork_data = json.load(json_data)

# transform the data

```

```

neighborhoods_data = newyork_data['features']

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

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

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)

```

```

[128]: # Create the map of NY
address = '70 Washington Square South, New York, NY'

geolocator = Nominatim(user_agent="nyu_explorer")
location = geolocator.geocode(address)
nyu_latitude = location.latitude
nyu_longitude = location.longitude
print('The geographical coordinate of NYU are {}, {}'.format(nyu_latitude,
    nyu_longitude))

# create map of Austin using latitude and longitude values
map_nyu = folium.Map(location=[nyu_latitude, nyu_longitude], zoom_start=10)

# add markers to map
for lat, lng, label in zip(neighborhoods['Latitude'],
    neighborhoods['Longitude'], neighborhoods['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_nyu)
```

map\_nyu

The geographical coordinate of NYU are 40.72942865, -73.99721780456252.

[128]: <folium.folium.Map at 0x7fb46572d208>

```
[101]: # Settings
CLIENT_ID = 'XHQFSSGIEVYUKMDKSTXQY3JYRNWOYAFPRQLQJH20ICIU2EZW' # your_
↳Foursquare ID
CLIENT_SECRET = 'NN0TAMKCPQK404GVYCJXL5513ULXFLNUW3TOEBU1BMZ3ESV4' # your_
↳Foursquare Secret
ACCESS_TOKEN = 'STOVZFQICF4C3VN35C441UMUFLHEJPF1XNNYGYJXNCHQLPXI' # your_
↳FourSquare Access Token
VERSION = '20180604'
LIMIT = 100

# Get nearbyvenues
def getNearbyVenues(names, latitudes, longitudes, radius=5000):

    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)

```

```

[102]: # As most buildings of NYU are located at Manhattan and Brooklyn, we'll start
    ↪with those two boroughs
nyu_data1 = neighborhoods[neighborhoods['Borough'] == 'Manhattan'].
    ↪reset_index(drop=True)
nyu_data2 = neighborhoods[neighborhoods['Borough'] == 'Brooklyn'].
    ↪reset_index(drop=True)
nyu_data = nyu_data1.merge(nyu_data2, how = 'outer')

nyu_venues =
    ↪getNearbyVenues(names=nyu_data['Neighborhood'],latitudes=nyu_data['Latitude'],
                    longitudes=nyu_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  
Bay Ridge  
Bensonhurst  
Sunset Park  
Greenpoint  
Gravesend  
Brighton Beach  
Sheepshead Bay  
Manhattan Terrace  
Flatbush  
Crown Heights  
East Flatbush  
Kensington  
Windsor Terrace  
Prospect Heights  
Brownsville  
Williamsburg  
Bushwick  
Bedford Stuyvesant  
Brooklyn Heights  
Cobble Hill  
Carroll Gardens  
Red Hook  
Gowanus  
Fort Greene  
Park Slope  
Cypress Hills  
East New York

Starrett City  
Canarsie  
Flatlands  
Mill Island  
Manhattan Beach  
Coney Island  
Bath Beach  
Borough Park  
Dyker Heights  
Gerritsen Beach  
Marine Park  
Clinton Hill  
Sea Gate  
Downtown  
Boerum Hill  
Prospect Lefferts Gardens  
Ocean Hill  
City Line  
Bergen Beach  
Midwood  
Prospect Park South  
Georgetown  
East Williamsburg  
North Side  
South Side  
Ocean Parkway  
Fort Hamilton  
Ditmas Park  
Wingate  
Rugby  
Remsen Village  
New Lots  
Paerdegat Basin  
Mill Basin  
Fulton Ferry  
Vinegar Hill  
Weeksville  
Broadway Junction  
Dumbo  
Homecrest  
Highland Park  
Madison  
Erasmus

```
[103]: nyu_venues.groupby('Neighborhood').count()  
print('There are {} unique categories.'.format(len(nyu_venues['Venue_  
→Category'].unique())))
```

```

# one hot encoding
nyu_onehot = pd.get_dummies(nyu_venues[['Venue Category']], prefix="",
    ↪ prefix_sep="")

# add neighborhood column back to dataframe
nyu_onehot['Neighborhood'] = nyu_venues['Neighborhood']

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

nyu_grouped = nyu_onehot.groupby('Neighborhood').mean().reset_index()
nyu_grouped.head()

```

There are 259 unique categories.

```

[103]:
      Neighborhood  Yoga Studio  Adult Boutique  African Restaurant \
0      Bath Beach           0.00             0.0             0.0
1  Battery Park City           0.00             0.0             0.0
2      Bay Ridge            0.01             0.0             0.0
3  Bedford Stuyvesant           0.01             0.0             0.0
4      Bensonhurst           0.00             0.0             0.0

      American Restaurant  Animal Shelter  Aquarium  Arepa Restaurant \
0              0.01              0.0         0.01             0.00
1              0.01              0.0         0.00             0.00
2              0.03              0.0         0.00             0.00
3              0.01              0.0         0.00             0.01
4              0.03              0.0         0.00             0.00

      Art Gallery  Art Museum  Arts & Crafts Store  Asian Restaurant \
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             0.01             0.00
4              0.0         0.00             0.00             0.00

      Athletics & Sports  Automotive Shop  BBQ Joint  Bagel Shop  Bakery  Bank \
0              0.0              0.0         0.0         0.02      0.07      0.0
1              0.0              0.0         0.0         0.01      0.01      0.0
2              0.0              0.0         0.0         0.03      0.04      0.0
3              0.0              0.0         0.0         0.00      0.02      0.0
4              0.0              0.0         0.0         0.03      0.06      0.0

      Bar  Baseball Field  Baseball Stadium  Basketball Court  Beach  Beer Bar \
0  0.02              0.0              0.0             0.0      0.03      0.00
1  0.00              0.0              0.0             0.0      0.01      0.00

```



2	0.03	0.0	0.0	0.0	0.0	0.00	0.00
3	0.08	0.0	0.0	0.0	0.0	0.00	0.03
4	0.03	0.0	0.0	0.0	0.0	0.00	0.00

	Beer Garden	Beer Store	Bike Shop	Bike Trail	Bistro	Boat or Ferry	\
0	0.01	0.0	0.0	0.0	0.0	0.0	
1	0.00	0.0	0.0	0.0	0.0	0.0	
2	0.01	0.0	0.0	0.0	0.0	0.0	
3	0.00	0.0	0.0	0.0	0.0	0.0	
4	0.01	0.0	0.0	0.0	0.0	0.0	

	Bookstore	Botanical Garden	Boutique	Boxing Gym	Brazilian Restaurant	\
0	0.00	0.00	0.00	0.00	0.0	
1	0.02	0.00	0.01	0.01	0.0	
2	0.00	0.00	0.00	0.00	0.0	
3	0.02	0.01	0.00	0.00	0.0	
4	0.00	0.00	0.00	0.00	0.0	

	Breakfast Spot	Brewery	Bridge	Bubble Tea Shop	Building	Burger Joint	\
0	0.01	0.01	0.00	0.02	0.0	0.02	
1	0.00	0.00	0.01	0.00	0.0	0.00	
2	0.01	0.01	0.00	0.00	0.0	0.01	
3	0.00	0.04	0.00	0.00	0.0	0.00	
4	0.01	0.00	0.00	0.02	0.0	0.01	

	Burmese Restaurant	Burrito Place	Bus Station	Butcher	Café	\
0	0.0	0.0	0.0	0.0	0.00	
1	0.0	0.0	0.0	0.0	0.01	
2	0.0	0.0	0.0	0.0	0.00	
3	0.0	0.0	0.0	0.0	0.01	
4	0.0	0.0	0.0	0.0	0.00	

	Cajun / Creole Restaurant	Candy Store	Cantonese Restaurant	\
0	0.00	0.0	0.02	
1	0.00	0.0	0.00	
2	0.00	0.0	0.01	
3	0.01	0.0	0.00	
4	0.00	0.0	0.02	

	Caribbean Restaurant	Castle Cemetery	Cheese Shop	Chinese Restaurant	\
0	0.00	0.0	0.01	0.00	
1	0.00	0.0	0.01	0.00	
2	0.00	0.0	0.00	0.01	
3	0.01	0.0	0.00	0.00	
4	0.00	0.0	0.01	0.01	

	Chocolate Shop	Church	Climbing Gym	Clothing Store	Club House	\
--	----------------	--------	--------------	----------------	------------	---

0	0.00	0.0	0.0	0.0	0.00
1	0.01	0.0	0.0	0.0	0.01
2	0.00	0.0	0.0	0.0	0.00
3	0.00	0.0	0.0	0.0	0.00
4	0.00	0.0	0.0	0.0	0.00

	Cocktail Bar	Coffee Shop	College Arts Building	Comedy Club	Comic Shop \
0	0.00	0.00	0.0	0.00	0.00
1	0.01	0.02	0.0	0.01	0.00
2	0.03	0.03	0.0	0.00	0.00
3	0.00	0.03	0.0	0.00	0.01
4	0.00	0.01	0.0	0.00	0.00

	Community Center	Concert Hall	Convenience Store	Cosmetics Shop \
0	0.0	0.0	0.0	0.01
1	0.0	0.0	0.0	0.00
2	0.0	0.0	0.0	0.02
3	0.0	0.0	0.0	0.00
4	0.0	0.0	0.0	0.01

	Cuban Restaurant	Cupcake Shop	Cycle Studio	Dance Studio	Deli / Bodega \
0	0.0	0.01	0.00	0.0	0.01
1	0.0	0.00	0.02	0.0	0.00
2	0.0	0.01	0.00	0.0	0.01
3	0.0	0.00	0.00	0.0	0.00
4	0.0	0.01	0.00	0.0	0.01

	Department Store	Dessert Shop	Diner	Discount Store	Dive Bar	Dog Run \
0	0.0	0.01	0.01	0.0	0.0	0.00
1	0.0	0.00	0.00	0.0	0.0	0.01
2	0.0	0.01	0.01	0.0	0.0	0.01
3	0.0	0.00	0.00	0.0	0.0	0.00
4	0.0	0.01	0.01	0.0	0.0	0.00

	Donut Shop	Dumpling Restaurant	Eastern European Restaurant \
0	0.01	0.00	0.01
1	0.00	0.00	0.00
2	0.00	0.00	0.00
3	0.02	0.00	0.00
4	0.01	0.01	0.01

	Ethiopian Restaurant	Event Space	Exhibit	Falafel Restaurant	Farm \
0	0.0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.0

	Farmers Market	Field	Fish Market	Flower Shop	Food	Food & Drink Shop	\
0	0.00	0.00	0.00	0.00	0.01	0.01	
1	0.00	0.00	0.00	0.00	0.00	0.00	
2	0.00	0.00	0.00	0.01	0.01	0.01	
3	0.02	0.01	0.01	0.00	0.00	0.00	
4	0.00	0.00	0.00	0.00	0.01	0.01	

	Food Court	Food Truck	Fountain	French Restaurant	Fried Chicken Joint	\
0	0.0	0.0	0.0		0.00	0.0
1	0.0	0.0	0.0		0.01	0.0
2	0.0	0.0	0.0		0.00	0.0
3	0.0	0.0	0.0		0.00	0.0
4	0.0	0.0	0.0		0.00	0.0

	Frozen Yogurt Shop	Fruit & Vegetable Store	Furniture / Home Store	\
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

	Gaming Cafe	Garden	Garden Center	Gas Station	Gastropub	\
0	0.0	0.00	0.0	0.0	0.0	
1	0.0	0.02	0.0	0.0	0.0	
2	0.0	0.01	0.0	0.0	0.0	
3	0.0	0.00	0.0	0.0	0.0	
4	0.0	0.00	0.0	0.0	0.0	

	German Restaurant	Gift Shop	Golf Course	Gourmet Shop	Greek Restaurant	\
0	0.0	0.00	0.0	0.02	0.00	
1	0.0	0.01	0.0	0.02	0.00	
2	0.0	0.00	0.0	0.01	0.04	
3	0.0	0.01	0.0	0.03	0.00	
4	0.0	0.00	0.0	0.01	0.00	

	Grocery Store	Gym	Gym / Fitness Center	Hardware Store	\
0	0.03	0.01	0.01	0.00	
1	0.01	0.01	0.01	0.00	
2	0.03	0.00	0.02	0.00	
3	0.01	0.00	0.00	0.01	
4	0.01	0.00	0.02	0.00	

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

	High School	Himalayan Restaurant	Historic Site	History Museum \
0	0.0	0.0	0.0	0.0
1	0.0	0.0	0.0	0.0
2	0.0	0.0	0.0	0.0
3	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0

	Hot Dog Joint	Hotel	Hotel Bar	Hotpot Restaurant	Ice Cream Shop \
0	0.01	0.00	0.00	0.00	0.00
1	0.01	0.03	0.01	0.00	0.03
2	0.00	0.00	0.00	0.01	0.00
3	0.00	0.00	0.00	0.00	0.01
4	0.00	0.00	0.00	0.01	0.00

	Indian Restaurant	Indie Movie Theater	Indie Theater	Indoor Play Area \
0	0.00	0.00	0.0	0.0
1	0.00	0.01	0.0	0.0
2	0.01	0.00	0.0	0.0
3	0.00	0.02	0.0	0.0
4	0.00	0.00	0.0	0.0

	Israeli Restaurant	Italian Restaurant	Japanese Restaurant	Jazz Club \
0	0.00	0.06	0.01	0.0
1	0.00	0.04	0.00	0.0
2	0.00	0.04	0.01	0.0
3	0.01	0.07	0.01	0.0
4	0.00	0.04	0.01	0.0

	Jewelry Store	Juice Bar	Kofte Place	Korean Restaurant \
0	0.0	0.00	0.0	0.0
1	0.0	0.01	0.0	0.0
2	0.0	0.01	0.0	0.0
3	0.0	0.01	0.0	0.0
4	0.0	0.00	0.0	0.0

	Latin American Restaurant	Lebanese Restaurant	Library	Lighthouse \
0	0.00	0.01	0.0	0.0
1	0.00	0.00	0.0	0.0
2	0.00	0.01	0.0	0.0
3	0.01	0.00	0.0	0.0
4	0.00	0.01	0.0	0.0

	Lingerie Store	Liquor Store	Lounge	Mac & Cheese Joint	Market \
0	0.0	0.01	0.0	0.0	0.01

1	0.0	0.00	0.0	0.0	0.00
2	0.0	0.01	0.0	0.0	0.01
3	0.0	0.00	0.0	0.0	0.00
4	0.0	0.01	0.0	0.0	0.01

	Martial Arts School	Mediterranean Restaurant	Memorial Site	Men's Store \
0	0.0	0.00	0.00	0.0
1	0.0	0.03	0.03	0.0
2	0.0	0.00	0.00	0.0
3	0.0	0.00	0.00	0.0
4	0.0	0.02	0.00	0.0

	Mexican Restaurant	Middle Eastern Restaurant	Miscellaneous Shop \
0	0.02	0.01	0.0
1	0.00	0.00	0.0
2	0.02	0.02	0.0
3	0.02	0.01	0.0
4	0.01	0.01	0.0

	Mobile Phone Shop	Monument / Landmark	Moroccan Restaurant	Movie Theater \
0	0.0	0.0	0.0	0.00
1	0.0	0.0	0.0	0.01
2	0.0	0.0	0.0	0.00
3	0.0	0.0	0.0	0.00
4	0.0	0.0	0.0	0.00

	Museum	Music Store	Music Venue	Nail Salon	National Park \
0	0.0	0.0	0.00	0.00	0.0
1	0.0	0.0	0.01	0.00	0.0
2	0.0	0.0	0.00	0.00	0.0
3	0.0	0.0	0.00	0.00	0.0
4	0.0	0.0	0.00	0.01	0.0

	New American Restaurant	Nightclub	Non-Profit	Opera House	Optical Shop \
0	0.00	0.00	0.0	0.00	0.0
1	0.02	0.00	0.0	0.00	0.0
2	0.01	0.00	0.0	0.00	0.0
3	0.03	0.01	0.0	0.02	0.0
4	0.01	0.00	0.0	0.00	0.0

	Other Great Outdoors	Other Nightlife	Other Repair 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

	Outdoors & Recreation	Paper / Office Supplies	Store	Park	\
0	0.0		0.00	0.03	
1	0.0		0.01	0.11	
2	0.0		0.00	0.03	
3	0.0		0.00	0.02	
4	0.0		0.00	0.03	

	Performing Arts Venue	Persian Restaurant	Peruvian Restaurant	Pet Store	\
0	0.00	0.0		0.0	0.0
1	0.00	0.0		0.0	0.0
2	0.00	0.0		0.0	0.0
3	0.01	0.0		0.0	0.0
4	0.00	0.0		0.0	0.0

	Pharmacy	Picnic Shelter	Pie Shop	Pier	Pilates Studio	Pizza Place	\
0	0.01	0.0	0.00	0.00		0.00	0.12
1	0.00	0.0	0.00	0.02		0.00	0.00
2	0.00	0.0	0.00	0.01		0.00	0.11
3	0.00	0.0	0.01	0.00		0.01	0.09
4	0.01	0.0	0.00	0.00		0.00	0.16

	Planetarium	Playground	Plaza	Pool	Pub	Ramen Restaurant	Record Shop	\
0	0.0	0.00	0.00	0.0	0.00		0.0	0.0
1	0.0	0.01	0.01	0.0	0.00		0.0	0.0
2	0.0	0.00	0.01	0.0	0.01		0.0	0.0
3	0.0	0.00	0.01	0.0	0.00		0.0	0.0
4	0.0	0.00	0.00	0.0	0.00		0.0	0.0

	Recreation Center	Reservoir	Restaurant	Russian Restaurant	Salad Place	\
0	0.0	0.0	0.02		0.01	0.00
1	0.0	0.0	0.01		0.00	0.02
2	0.0	0.0	0.01		0.00	0.00
3	0.0	0.0	0.00		0.00	0.00
4	0.0	0.0	0.00		0.00	0.00

	Salon / Barbershop	Sandwich Place	Scandinavian Restaurant	\
0	0.00	0.03	0.0	
1	0.02	0.02	0.0	
2	0.00	0.02	0.0	
3	0.00	0.00	0.0	
4	0.00	0.02	0.0	

	Scenic Lookout	Science Museum	Sculpture Garden	Seafood Restaurant	\
0	0.03	0.0	0.00	0.00	
1	0.04	0.0	0.00	0.00	
2	0.03	0.0	0.00	0.01	
3	0.00	0.0	0.01	0.00	

4	0.02	0.0	0.00	0.00
---	------	-----	------	------

  

	Shipping Store	Shoe Repair	Shopping Mall	Shopping Plaza	Skating Rink \
0	0.0	0.0	0.0	0.01	0.0
1	0.0	0.0	0.0	0.00	0.0
2	0.0	0.0	0.0	0.00	0.0
3	0.0	0.0	0.0	0.00	0.0
4	0.0	0.0	0.0	0.01	0.0

  

	Smoke Shop	Snack Place	Soba Restaurant	Soccer Field	Soup Place \
0	0.0	0.0	0.0	0.00	0.0
1	0.0	0.0	0.0	0.01	0.0
2	0.0	0.0	0.0	0.00	0.0
3	0.0	0.0	0.0	0.00	0.0
4	0.0	0.0	0.0	0.00	0.0

  

	South American Restaurant	Southern / Soul Food Restaurant	Souvenir Shop \
0	0.0	0.00	0.0
1	0.0	0.00	0.0
2	0.0	0.00	0.0
3	0.0	0.01	0.0
4	0.0	0.00	0.0

  

	Spa	Spanish Restaurant	Speakeasy	Sporting Goods Shop	Sports Bar \
0	0.04	0.0	0.00	0.0	0.0
1	0.01	0.0	0.01	0.0	0.0
2	0.04	0.0	0.00	0.0	0.0
3	0.00	0.0	0.00	0.0	0.0
4	0.04	0.0	0.00	0.0	0.0

  

	Sports Club	Stables	State / Provincial Park	Stationery Store \
0	0.0	0.0	0.0	0.00
1	0.0	0.0	0.0	0.01
2	0.0	0.0	0.0	0.00
3	0.0	0.0	0.0	0.00
4	0.0	0.0	0.0	0.00

  

	Steakhouse	Street Art	Supermarket	Surf Spot	Sushi Restaurant \
0	0.01	0.00	0.01	0.01	0.01
1	0.01	0.00	0.00	0.00	0.01
2	0.01	0.00	0.01	0.00	0.00
3	0.00	0.01	0.00	0.00	0.01
4	0.02	0.00	0.01	0.01	0.01

  

	Taco Place	Taiwanese Restaurant	Tapas Restaurant	Tattoo Parlor \
0	0.01	0.0	0.00	0.0
1	0.01	0.0	0.00	0.0

2	0.01		0.0	0.00	0.0
3	0.02		0.0	0.03	0.0
4	0.01		0.0	0.00	0.0

	Tea Room	Tennis Court	Thai Restaurant	Theater	Theme Park \
0	0.02	0.0	0.00	0.00	0.01
1	0.01	0.0	0.03	0.01	0.00
2	0.02	0.0	0.00	0.00	0.00
3	0.00	0.0	0.00	0.02	0.00
4	0.02	0.0	0.01	0.00	0.00

	Theme Park Ride / Attraction	Tiki Bar	Tourist Information Center \
0	0.01	0.00	0.0
1	0.01	0.00	0.0
2	0.00	0.00	0.0
3	0.00	0.01	0.0
4	0.00	0.00	0.0

	Toy / Game Store	Track	Trail	Turkish Restaurant	Udon Restaurant \
0	0.00	0.00	0.00	0.02	0.00
1	0.00	0.00	0.01	0.00	0.01
2	0.00	0.00	0.00	0.01	0.00
3	0.01	0.01	0.00	0.00	0.01
4	0.00	0.00	0.00	0.02	0.00

	Vegetarian / Vegan Restaurant	Venezuelan Restaurant	Video Game Store \
0	0.00	0.0	0.0
1	0.01	0.0	0.0
2	0.00	0.0	0.0
3	0.00	0.0	0.0
4	0.00	0.0	0.0

	Vietnamese Restaurant	Warehouse Store	Waterfront	Weight Loss Center \
0	0.01	0.01	0.0	0.0
1	0.00	0.00	0.0	0.0
2	0.01	0.00	0.0	0.0
3	0.00	0.00	0.0	0.0
4	0.03	0.01	0.0	0.0

	Whisky Bar	Wine Bar	Wine Shop	Yemeni Restaurant
0	0.0	0.01	0.00	0.00
1	0.0	0.01	0.01	0.00
2	0.0	0.01	0.00	0.01
3	0.0	0.02	0.01	0.00
4	0.0	0.02	0.00	0.00



```
[104]: sports_facilities = ["Neighborhood","Yoga Studio","Athletics &
↳Sports","Baseball Field","Baseball Stadium","Basketball Court",
    "Bike Trail","Boxing Gym","Climbing Gym","Cycle↳
↳Studio","Field","Golf Course","Gym","Gym / Fitness Center",
    "Pilates Studio","Pool","Soccer Field","Surf Spot","Tennis↳
↳Court","Weight Loss Center"]
nyu_sports = nyu_grouped[sports_facilities]
nyu_sports
```

```
[104]:
```

	Neighborhood	Yoga Studio	Athletics & Sports \
0	Bath Beach	0.00	0.00
1	Battery Park City	0.00	0.00
2	Bay Ridge	0.01	0.00
3	Bedford Stuyvesant	0.01	0.00
4	Bensonhurst	0.00	0.00
5	Bergen Beach	0.00	0.00
6	Boerum Hill	0.00	0.01
7	Borough Park	0.00	0.00
8	Brighton Beach	0.00	0.01
9	Broadway Junction	0.01	0.00
10	Brooklyn Heights	0.00	0.01
11	Brownsville	0.02	0.00
12	Bushwick	0.02	0.00
13	Canarsie	0.00	0.00
14	Carnegie Hill	0.03	0.00
15	Carroll Gardens	0.00	0.01
16	Central Harlem	0.03	0.01
17	Chelsea	0.02	0.00
18	Chinatown	0.00	0.00
19	City Line	0.01	0.00
20	Civic Center	0.01	0.00
21	Clinton	0.02	0.00
22	Clinton Hill	0.02	0.01
23	Cobble Hill	0.01	0.01
24	Coney Island	0.00	0.00
25	Crown Heights	0.01	0.00
26	Cypress Hills	0.00	0.00
27	Ditmas Park	0.02	0.00
28	Downtown	0.01	0.01
29	Dumbo	0.01	0.01
30	Dyker Heights	0.01	0.00
31	East Flatbush	0.02	0.00
32	East Harlem	0.02	0.00
33	East New York	0.00	0.00
34	East Village	0.03	0.00
35	East Williamsburg	0.02	0.00
36	Erasmus	0.01	0.00

37	Financial District	0.00	0.00
38	Flatbush	0.00	0.00
39	Flatiron	0.02	0.00
40	Flatlands	0.00	0.00
41	Fort Greene	0.01	0.01
42	Fort Hamilton	0.01	0.00
43	Fulton Ferry	0.00	0.01
44	Georgetown	0.00	0.00
45	Gerritsen Beach	0.00	0.00
46	Gowanus	0.02	0.01
47	Gramercy	0.02	0.00
48	Gravesend	0.00	0.00
49	Greenpoint	0.03	0.00
50	Greenwich Village	0.01	0.00
51	Hamilton Heights	0.03	0.01
52	Highland Park	0.00	0.00
53	Homecrest	0.00	0.00
54	Hudson Yards	0.02	0.00
55	Inwood	0.01	0.01
56	Kensington	0.00	0.00
57	Lenox Hill	0.01	0.00
58	Lincoln Square	0.02	0.00
59	Little Italy	0.01	0.00
60	Lower East Side	0.02	0.00
61	Madison	0.00	0.00
62	Manhattan Beach	0.00	0.00
63	Manhattan Terrace	0.00	0.00
64	Manhattan Valley	0.03	0.00
65	Manhattanville	0.03	0.01
66	Marble Hill	0.01	0.01
67	Marine Park	0.00	0.00
68	Midtown	0.02	0.00
69	Midtown South	0.02	0.00
70	Midwood	0.00	0.00
71	Mill Basin	0.00	0.00
72	Mill Island	0.00	0.00
73	Morningside Heights	0.05	0.00
74	Murray Hill	0.02	0.00
75	New Lots	0.00	0.00
76	Noho	0.02	0.00
77	North Side	0.02	0.00
78	Ocean Hill	0.02	0.00
79	Ocean Parkway	0.00	0.00
80	Paerdegat Basin	0.00	0.00
81	Park Slope	0.02	0.01
82	Prospect Heights	0.01	0.01
83	Prospect Lefferts Gardens	0.01	0.00

84	Prospect Park South	0.02	0.00
85	Red Hook	0.02	0.01
86	Remsen Village	0.02	0.00
87	Roosevelt Island	0.01	0.00
88	Rugby	0.01	0.00
89	Sea Gate	0.00	0.01
90	Sheepshead Bay	0.00	0.00
91	Soho	0.01	0.00
92	South Side	0.02	0.00
93	Starrett City	0.00	0.00
94	Stuyvesant Town	0.04	0.00
95	Sunset Park	0.00	0.00
96	Sutton Place	0.01	0.00
97	Tribeca	0.02	0.00
98	Tudor City	0.02	0.00
99	Turtle Bay	0.01	0.00
100	Upper East Side	0.02	0.00
101	Upper West Side	0.03	0.00
102	Vinegar Hill	0.01	0.01
103	Washington Heights	0.01	0.01
104	Weeksville	0.02	0.00
105	West Village	0.02	0.00
106	Williamsburg	0.02	0.00
107	Windsor Terrace	0.00	0.00
108	Wingate	0.01	0.00
109	Yorkville	0.02	0.00

	Baseball Field	Baseball Stadium	Basketball Court	Bike Trail	\
0	0.00	0.00	0.000000	0.00	
1	0.00	0.00	0.000000	0.00	
2	0.00	0.00	0.000000	0.00	
3	0.00	0.00	0.000000	0.00	
4	0.00	0.00	0.000000	0.00	
5	0.01	0.00	0.000000	0.00	
6	0.00	0.00	0.000000	0.00	
7	0.01	0.00	0.000000	0.00	
8	0.00	0.01	0.000000	0.00	
9	0.00	0.00	0.000000	0.00	
10	0.00	0.00	0.000000	0.00	
11	0.00	0.00	0.000000	0.00	
12	0.00	0.00	0.000000	0.00	
13	0.01	0.00	0.000000	0.00	
14	0.00	0.00	0.000000	0.00	
15	0.00	0.00	0.000000	0.00	
16	0.01	0.02	0.010000	0.01	
17	0.00	0.00	0.000000	0.00	
18	0.00	0.00	0.000000	0.00	

19	0.02	0.00	0.000000	0.00
20	0.00	0.00	0.000000	0.00
21	0.00	0.00	0.000000	0.00
22	0.00	0.00	0.000000	0.00
23	0.00	0.00	0.000000	0.00
24	0.00	0.00	0.010309	0.00
25	0.00	0.00	0.000000	0.00
26	0.01	0.00	0.000000	0.00
27	0.01	0.00	0.000000	0.00
28	0.00	0.00	0.000000	0.00
29	0.00	0.00	0.000000	0.00
30	0.00	0.00	0.000000	0.00
31	0.01	0.00	0.000000	0.00
32	0.00	0.00	0.000000	0.00
33	0.01	0.00	0.000000	0.00
34	0.00	0.00	0.000000	0.00
35	0.00	0.00	0.000000	0.00
36	0.01	0.00	0.000000	0.00
37	0.00	0.00	0.000000	0.00
38	0.01	0.00	0.000000	0.00
39	0.00	0.00	0.000000	0.00
40	0.00	0.00	0.000000	0.00
41	0.00	0.00	0.000000	0.00
42	0.00	0.00	0.000000	0.00
43	0.00	0.00	0.000000	0.00
44	0.00	0.00	0.000000	0.00
45	0.00	0.00	0.000000	0.00
46	0.00	0.00	0.000000	0.00
47	0.00	0.00	0.000000	0.00
48	0.00	0.00	0.000000	0.00
49	0.00	0.00	0.000000	0.00
50	0.00	0.00	0.000000	0.00
51	0.01	0.02	0.010000	0.01
52	0.00	0.00	0.000000	0.00
53	0.00	0.00	0.000000	0.00
54	0.00	0.00	0.000000	0.00
55	0.00	0.00	0.010000	0.00
56	0.01	0.00	0.000000	0.00
57	0.00	0.00	0.000000	0.00
58	0.00	0.00	0.000000	0.00
59	0.00	0.00	0.000000	0.00
60	0.00	0.00	0.000000	0.00
61	0.00	0.00	0.000000	0.00
62	0.00	0.01	0.000000	0.00
63	0.00	0.00	0.000000	0.00
64	0.00	0.00	0.000000	0.00
65	0.01	0.02	0.000000	0.01

66	0.00	0.00	0.010000	0.00
67	0.00	0.00	0.000000	0.00
68	0.00	0.00	0.000000	0.00
69	0.00	0.00	0.000000	0.00
70	0.00	0.00	0.000000	0.00
71	0.00	0.00	0.000000	0.00
72	0.00	0.00	0.000000	0.00
73	0.00	0.00	0.000000	0.01
74	0.00	0.00	0.000000	0.00
75	0.00	0.00	0.000000	0.00
76	0.00	0.00	0.000000	0.00
77	0.00	0.00	0.000000	0.00
78	0.00	0.00	0.000000	0.00
79	0.00	0.00	0.000000	0.00
80	0.01	0.00	0.000000	0.00
81	0.00	0.00	0.000000	0.00
82	0.00	0.00	0.000000	0.00
83	0.00	0.00	0.000000	0.00
84	0.01	0.00	0.000000	0.00
85	0.00	0.00	0.000000	0.00
86	0.00	0.00	0.000000	0.00
87	0.00	0.00	0.000000	0.00
88	0.00	0.00	0.000000	0.00
89	0.00	0.01	0.000000	0.00
90	0.00	0.00	0.000000	0.00
91	0.00	0.00	0.000000	0.00
92	0.00	0.00	0.000000	0.00
93	0.00	0.00	0.000000	0.00
94	0.00	0.00	0.000000	0.00
95	0.01	0.00	0.000000	0.00
96	0.00	0.00	0.000000	0.00
97	0.00	0.00	0.000000	0.00
98	0.00	0.00	0.000000	0.00
99	0.00	0.00	0.000000	0.00
100	0.00	0.00	0.000000	0.00
101	0.00	0.00	0.000000	0.00
102	0.00	0.00	0.000000	0.00
103	0.01	0.02	0.010000	0.00
104	0.00	0.00	0.000000	0.00
105	0.00	0.00	0.000000	0.00
106	0.00	0.00	0.000000	0.00
107	0.00	0.00	0.000000	0.00
108	0.01	0.00	0.000000	0.00
109	0.00	0.00	0.000000	0.00

	Boxing Gym	Climbing Gym	Cycle Studio	Field	Golf Course	Gym \
0	0.00	0.00	0.00	0.00	0.00	0.010000

1	0.01	0.00	0.02	0.00	0.00	0.010000
2	0.00	0.00	0.00	0.00	0.00	0.000000
3	0.00	0.00	0.00	0.01	0.00	0.000000
4	0.00	0.00	0.00	0.00	0.00	0.000000
5	0.00	0.01	0.00	0.00	0.01	0.010000
6	0.00	0.02	0.00	0.02	0.00	0.020000
7	0.00	0.00	0.00	0.01	0.00	0.000000
8	0.00	0.00	0.00	0.00	0.00	0.020000
9	0.00	0.00	0.00	0.00	0.00	0.020000
10	0.00	0.01	0.01	0.00	0.00	0.010000
11	0.00	0.00	0.00	0.00	0.00	0.020000
12	0.01	0.00	0.00	0.00	0.00	0.000000
13	0.00	0.00	0.00	0.00	0.00	0.010000
14	0.01	0.00	0.01	0.01	0.00	0.040000
15	0.00	0.02	0.00	0.01	0.00	0.020000
16	0.01	0.00	0.01	0.01	0.00	0.020000
17	0.01	0.00	0.01	0.00	0.00	0.030000
18	0.00	0.00	0.00	0.00	0.00	0.000000
19	0.00	0.00	0.00	0.00	0.00	0.020000
20	0.01	0.00	0.01	0.00	0.00	0.000000
21	0.01	0.01	0.01	0.00	0.00	0.070000
22	0.00	0.02	0.00	0.01	0.00	0.020000
23	0.00	0.02	0.00	0.01	0.00	0.020000
24	0.00	0.00	0.00	0.00	0.00	0.010309
25	0.00	0.01	0.00	0.02	0.00	0.020000
26	0.00	0.00	0.00	0.00	0.00	0.040000
27	0.00	0.00	0.00	0.02	0.00	0.020000
28	0.00	0.01	0.00	0.01	0.00	0.020000
29	0.01	0.01	0.01	0.00	0.00	0.010000
30	0.00	0.00	0.00	0.00	0.00	0.000000
31	0.00	0.00	0.00	0.02	0.00	0.010000
32	0.01	0.00	0.00	0.01	0.00	0.010000
33	0.00	0.00	0.00	0.00	0.00	0.040000
34	0.00	0.00	0.00	0.00	0.00	0.020000
35	0.01	0.00	0.01	0.00	0.00	0.000000
36	0.00	0.00	0.00	0.02	0.00	0.010000
37	0.01	0.00	0.03	0.00	0.00	0.000000
38	0.00	0.00	0.00	0.02	0.00	0.010000
39	0.02	0.00	0.01	0.00	0.00	0.030000
40	0.00	0.00	0.00	0.00	0.00	0.010000
41	0.01	0.02	0.00	0.02	0.00	0.020000
42	0.00	0.00	0.00	0.00	0.00	0.000000
43	0.01	0.01	0.01	0.00	0.00	0.010000
44	0.00	0.00	0.00	0.00	0.01	0.010000
45	0.00	0.01	0.00	0.00	0.01	0.020000
46	0.00	0.01	0.00	0.02	0.00	0.010000
47	0.02	0.00	0.00	0.00	0.00	0.030000

48	0.00	0.00	0.00	0.00	0.00	0.010000
49	0.02	0.01	0.00	0.00	0.00	0.020000
50	0.01	0.00	0.00	0.00	0.00	0.010000
51	0.01	0.00	0.01	0.00	0.00	0.010000
52	0.00	0.00	0.00	0.00	0.00	0.030000
53	0.00	0.00	0.00	0.00	0.00	0.010000
54	0.01	0.00	0.00	0.00	0.00	0.070000
55	0.00	0.00	0.00	0.00	0.00	0.000000
56	0.00	0.00	0.00	0.02	0.00	0.010000
57	0.01	0.01	0.01	0.01	0.00	0.070000
58	0.01	0.00	0.01	0.01	0.00	0.060000
59	0.00	0.00	0.00	0.00	0.00	0.000000
60	0.00	0.00	0.00	0.00	0.00	0.000000
61	0.00	0.00	0.00	0.00	0.00	0.000000
62	0.00	0.00	0.00	0.00	0.00	0.030000
63	0.00	0.00	0.00	0.00	0.00	0.000000
64	0.01	0.00	0.00	0.01	0.00	0.020000
65	0.01	0.00	0.01	0.01	0.00	0.010000
66	0.00	0.00	0.00	0.00	0.00	0.000000
67	0.00	0.00	0.00	0.00	0.01	0.010000
68	0.01	0.01	0.01	0.00	0.00	0.070000
69	0.01	0.00	0.00	0.00	0.00	0.060000
70	0.00	0.00	0.00	0.01	0.00	0.010000
71	0.00	0.01	0.00	0.00	0.01	0.000000
72	0.00	0.01	0.00	0.00	0.01	0.000000
73	0.01	0.00	0.01	0.01	0.00	0.030000
74	0.01	0.01	0.01	0.00	0.00	0.070000
75	0.00	0.00	0.00	0.00	0.00	0.040000
76	0.00	0.00	0.00	0.00	0.00	0.020000
77	0.01	0.00	0.00	0.00	0.00	0.000000
78	0.00	0.00	0.00	0.00	0.00	0.020000
79	0.00	0.00	0.00	0.00	0.00	0.000000
80	0.00	0.00	0.00	0.00	0.01	0.010000
81	0.00	0.01	0.00	0.02	0.00	0.010000
82	0.00	0.01	0.00	0.02	0.00	0.010000
83	0.00	0.00	0.00	0.02	0.00	0.000000
84	0.00	0.00	0.00	0.02	0.00	0.010000
85	0.00	0.01	0.01	0.00	0.00	0.010000
86	0.00	0.00	0.00	0.00	0.00	0.030000
87	0.01	0.01	0.01	0.01	0.00	0.060000
88	0.00	0.00	0.00	0.02	0.00	0.030000
89	0.00	0.00	0.00	0.00	0.00	0.010000
90	0.00	0.00	0.00	0.00	0.00	0.030000
91	0.00	0.00	0.00	0.00	0.00	0.010000
92	0.01	0.00	0.00	0.00	0.00	0.000000
93	0.00	0.00	0.00	0.00	0.00	0.020000
94	0.01	0.00	0.00	0.00	0.00	0.020000

95	0.00	0.00	0.00	0.01	0.00	0.020000
96	0.01	0.01	0.01	0.00	0.00	0.070000
97	0.01	0.00	0.01	0.00	0.00	0.000000
98	0.01	0.01	0.01	0.00	0.00	0.070000
99	0.01	0.01	0.01	0.00	0.00	0.070000
100	0.00	0.00	0.01	0.01	0.00	0.030000
101	0.00	0.00	0.00	0.01	0.00	0.020000
102	0.01	0.01	0.01	0.00	0.00	0.010000
103	0.00	0.00	0.00	0.00	0.00	0.000000
104	0.00	0.00	0.00	0.02	0.00	0.020000
105	0.01	0.00	0.01	0.00	0.00	0.020000
106	0.00	0.00	0.01	0.00	0.00	0.000000
107	0.00	0.01	0.00	0.02	0.00	0.020000
108	0.00	0.00	0.00	0.02	0.00	0.020000
109	0.00	0.00	0.01	0.01	0.00	0.030000

	Gym / Fitness Center	Pilates Studio	Pool	Soccer Field	Surf Spot \
0	0.01	0.00	0.00	0.00	0.010000
1	0.01	0.00	0.00	0.01	0.000000
2	0.02	0.00	0.00	0.00	0.000000
3	0.00	0.01	0.00	0.00	0.000000
4	0.02	0.00	0.00	0.00	0.010000
5	0.01	0.00	0.00	0.00	0.000000
6	0.01	0.01	0.00	0.00	0.000000
7	0.02	0.00	0.00	0.00	0.000000
8	0.00	0.00	0.00	0.00	0.010000
9	0.00	0.00	0.00	0.00	0.000000
10	0.01	0.00	0.00	0.01	0.000000
11	0.00	0.00	0.00	0.00	0.000000
12	0.00	0.01	0.00	0.00	0.000000
13	0.02	0.00	0.00	0.00	0.000000
14	0.01	0.00	0.00	0.00	0.000000
15	0.01	0.00	0.00	0.00	0.000000
16	0.00	0.00	0.00	0.01	0.000000
17	0.02	0.00	0.00	0.00	0.000000
18	0.01	0.00	0.00	0.01	0.000000
19	0.02	0.00	0.00	0.00	0.000000
20	0.01	0.00	0.00	0.01	0.000000
21	0.02	0.00	0.00	0.00	0.000000
22	0.01	0.01	0.00	0.00	0.000000
23	0.01	0.00	0.00	0.00	0.000000
24	0.00	0.00	0.00	0.00	0.010309
25	0.00	0.00	0.00	0.00	0.000000
26	0.02	0.00	0.00	0.00	0.000000
27	0.00	0.00	0.00	0.00	0.000000
28	0.01	0.01	0.00	0.00	0.000000
29	0.02	0.00	0.00	0.01	0.000000



30	0.02	0.00	0.00	0.00	0.010000
31	0.01	0.00	0.00	0.00	0.000000
32	0.00	0.00	0.00	0.00	0.000000
33	0.01	0.00	0.00	0.00	0.000000
34	0.02	0.00	0.00	0.00	0.000000
35	0.00	0.01	0.00	0.00	0.000000
36	0.00	0.00	0.00	0.00	0.000000
37	0.02	0.00	0.00	0.01	0.000000
38	0.01	0.00	0.00	0.00	0.000000
39	0.02	0.00	0.00	0.00	0.000000
40	0.02	0.00	0.00	0.00	0.000000
41	0.01	0.01	0.00	0.00	0.000000
42	0.02	0.00	0.00	0.00	0.010000
43	0.02	0.00	0.00	0.01	0.000000
44	0.01	0.00	0.00	0.00	0.000000
45	0.00	0.00	0.00	0.00	0.000000
46	0.01	0.00	0.00	0.00	0.000000
47	0.02	0.00	0.00	0.00	0.000000
48	0.00	0.00	0.00	0.00	0.010000
49	0.01	0.01	0.00	0.00	0.000000
50	0.01	0.00	0.00	0.00	0.000000
51	0.00	0.00	0.00	0.01	0.000000
52	0.01	0.00	0.00	0.00	0.000000
53	0.00	0.00	0.00	0.00	0.010000
54	0.01	0.00	0.00	0.00	0.000000
55	0.00	0.00	0.01	0.00	0.000000
56	0.00	0.00	0.00	0.00	0.000000
57	0.01	0.00	0.00	0.00	0.000000
58	0.02	0.00	0.00	0.00	0.000000
59	0.01	0.00	0.00	0.00	0.000000
60	0.01	0.00	0.00	0.00	0.000000
61	0.01	0.00	0.00	0.00	0.000000
62	0.00	0.00	0.00	0.00	0.000000
63	0.02	0.00	0.00	0.00	0.000000
64	0.00	0.00	0.00	0.00	0.000000
65	0.00	0.00	0.00	0.01	0.000000
66	0.00	0.00	0.00	0.00	0.000000
67	0.01	0.00	0.00	0.00	0.000000
68	0.02	0.00	0.00	0.00	0.000000
69	0.02	0.00	0.00	0.00	0.000000
70	0.01	0.00	0.00	0.00	0.000000
71	0.01	0.00	0.00	0.00	0.000000
72	0.00	0.00	0.00	0.00	0.000000
73	0.00	0.00	0.00	0.00	0.000000
74	0.03	0.00	0.00	0.00	0.000000
75	0.00	0.00	0.00	0.00	0.000000
76	0.01	0.00	0.00	0.00	0.000000

77	0.01	0.00	0.00	0.00	0.000000
78	0.00	0.00	0.00	0.00	0.000000
79	0.02	0.00	0.00	0.00	0.010000
80	0.02	0.00	0.00	0.00	0.000000
81	0.01	0.00	0.00	0.00	0.000000
82	0.01	0.00	0.00	0.00	0.000000
83	0.00	0.00	0.00	0.00	0.000000
84	0.00	0.00	0.00	0.00	0.000000
85	0.01	0.00	0.00	0.01	0.000000
86	0.01	0.00	0.00	0.00	0.000000
87	0.01	0.00	0.00	0.00	0.000000
88	0.01	0.00	0.00	0.00	0.000000
89	0.01	0.00	0.00	0.00	0.010000
90	0.00	0.00	0.00	0.00	0.000000
91	0.01	0.00	0.00	0.00	0.000000
92	0.00	0.01	0.00	0.00	0.000000
93	0.01	0.00	0.00	0.00	0.000000
94	0.02	0.00	0.00	0.00	0.000000
95	0.01	0.00	0.00	0.00	0.000000
96	0.02	0.00	0.00	0.00	0.000000
97	0.02	0.00	0.00	0.00	0.000000
98	0.03	0.00	0.00	0.00	0.000000
99	0.02	0.00	0.00	0.00	0.000000
100	0.01	0.00	0.00	0.00	0.000000
101	0.00	0.00	0.00	0.00	0.000000
102	0.01	0.00	0.00	0.01	0.000000
103	0.00	0.00	0.00	0.01	0.000000
104	0.00	0.00	0.00	0.00	0.000000
105	0.03	0.00	0.00	0.00	0.000000
106	0.00	0.01	0.00	0.00	0.000000
107	0.00	0.00	0.00	0.00	0.000000
108	0.00	0.00	0.00	0.00	0.000000
109	0.01	0.00	0.00	0.00	0.000000

	Tennis Court	Weight Loss Center
0	0.00	0.00
1	0.00	0.00
2	0.00	0.00
3	0.00	0.00
4	0.00	0.00
5	0.00	0.00
6	0.00	0.00
7	0.01	0.00
8	0.00	0.00
9	0.00	0.00
10	0.00	0.00
11	0.00	0.00

12	0.00	0.00
13	0.00	0.00
14	0.00	0.00
15	0.00	0.00
16	0.01	0.00
17	0.00	0.00
18	0.00	0.00
19	0.00	0.00
20	0.00	0.00
21	0.00	0.00
22	0.00	0.00
23	0.00	0.00
24	0.00	0.00
25	0.00	0.00
26	0.00	0.01
27	0.01	0.00
28	0.00	0.00
29	0.00	0.00
30	0.00	0.00
31	0.01	0.00
32	0.00	0.00
33	0.00	0.00
34	0.00	0.00
35	0.00	0.00
36	0.01	0.00
37	0.00	0.00
38	0.01	0.00
39	0.00	0.00
40	0.00	0.00
41	0.00	0.00
42	0.00	0.00
43	0.00	0.00
44	0.00	0.00
45	0.00	0.00
46	0.00	0.00
47	0.00	0.00
48	0.00	0.00
49	0.00	0.00
50	0.00	0.00
51	0.00	0.00
52	0.00	0.01
53	0.00	0.00
54	0.00	0.00
55	0.00	0.00
56	0.01	0.00
57	0.00	0.00
58	0.00	0.00

59	0.00	0.00
60	0.00	0.00
61	0.00	0.00
62	0.00	0.00
63	0.00	0.00
64	0.00	0.00
65	0.00	0.00
66	0.00	0.00
67	0.00	0.00
68	0.00	0.00
69	0.00	0.00
70	0.01	0.00
71	0.00	0.00
72	0.00	0.00
73	0.00	0.00
74	0.00	0.00
75	0.00	0.00
76	0.00	0.00
77	0.00	0.00
78	0.00	0.00
79	0.01	0.00
80	0.00	0.00
81	0.00	0.00
82	0.00	0.00
83	0.01	0.00
84	0.01	0.00
85	0.00	0.00
86	0.00	0.00
87	0.00	0.00
88	0.01	0.00
89	0.00	0.00
90	0.00	0.00
91	0.00	0.00
92	0.00	0.00
93	0.00	0.00
94	0.00	0.00
95	0.01	0.00
96	0.00	0.00
97	0.00	0.00
98	0.00	0.00
99	0.00	0.00
100	0.00	0.00
101	0.00	0.00
102	0.00	0.00
103	0.00	0.00
104	0.00	0.00
105	0.00	0.00

106	0.00	0.00
107	0.01	0.00
108	0.01	0.00
109	0.00	0.00

```
[105]: num_top_venues = 5

for hood in nyu_sports['Neighborhood']:
    print("----"+hood+"----")
    temp = nyu_sports[nyu_sports['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')
```

----Bath Beach----

	venue	freq
0	Surf Spot	0.01
1	Gym / Fitness Center	0.01
2	Gym	0.01
3	Yoga Studio	0.00
4	Golf Course	0.00

----Battery Park City----

	venue	freq
0	Cycle Studio	0.02
1	Gym	0.01
2	Soccer Field	0.01
3	Boxing Gym	0.01
4	Gym / Fitness Center	0.01

----Bay Ridge----

	venue	freq
0	Gym / Fitness Center	0.02
1	Yoga Studio	0.01
2	Golf Course	0.00
3	Tennis Court	0.00
4	Surf Spot	0.00

----Bedford Stuyvesant----

	venue	freq
--	-------	------

0	Yoga Studio	0.01
1	Pilates Studio	0.01
2	Field	0.01
3	Baseball Stadium	0.00
4	Basketball Court	0.00

----Bensonhurst----

	venue	freq
0	Gym / Fitness Center	0.02
1	Surf Spot	0.01
2	Yoga Studio	0.00
3	Golf Course	0.00
4	Tennis Court	0.00

----Bergen Beach----

	venue	freq
0	Gym	0.01
1	Baseball Field	0.01
2	Climbing Gym	0.01
3	Gym / Fitness Center	0.01
4	Golf Course	0.01

----Boerum Hill----

	venue	freq
0	Field	0.02
1	Gym	0.02
2	Climbing Gym	0.02
3	Pilates Studio	0.01
4	Gym / Fitness Center	0.01

----Borough Park----

	venue	freq
0	Gym / Fitness Center	0.02
1	Field	0.01
2	Baseball Field	0.01
3	Tennis Court	0.01
4	Golf Course	0.00

----Brighton Beach----

	venue	freq
0	Gym	0.02
1	Baseball Stadium	0.01
2	Surf Spot	0.01

3	Athletics & Sports	0.01
4	Yoga Studio	0.00

----Broadway Junction----

	venue	freq
0	Gym	0.02
1	Yoga Studio	0.01
2	Golf Course	0.00
3	Tennis Court	0.00
4	Surf Spot	0.00

----Brooklyn Heights----

	venue	freq
0	Gym	0.01
1	Soccer Field	0.01
2	Climbing Gym	0.01
3	Cycle Studio	0.01
4	Athletics & Sports	0.01

----Brownsville----

	venue	freq
0	Yoga Studio	0.02
1	Gym	0.02
2	Golf Course	0.00
3	Tennis Court	0.00
4	Surf Spot	0.00

----Bushwick----

	venue	freq
0	Yoga Studio	0.02
1	Boxing Gym	0.01
2	Pilates Studio	0.01
3	Golf Course	0.00
4	Tennis Court	0.00

----Canarsie----

	venue	freq
0	Gym / Fitness Center	0.02
1	Baseball Field	0.01
2	Gym	0.01
3	Yoga Studio	0.00
4	Golf Course	0.00

----Carnegie Hill----

	venue	freq
0	Gym	0.04
1	Yoga Studio	0.03
2	Boxing Gym	0.01
3	Gym / Fitness Center	0.01
4	Cycle Studio	0.01

----Carroll Gardens----

	venue	freq
0	Gym	0.02
1	Climbing Gym	0.02
2	Field	0.01
3	Gym / Fitness Center	0.01
4	Athletics & Sports	0.01

----Central Harlem----

	venue	freq
0	Yoga Studio	0.03
1	Baseball Stadium	0.02
2	Gym	0.02
3	Cycle Studio	0.01
4	Tennis Court	0.01

----Chelsea----

	venue	freq
0	Gym	0.03
1	Yoga Studio	0.02
2	Gym / Fitness Center	0.02
3	Boxing Gym	0.01
4	Cycle Studio	0.01

----Chinatown----

	venue	freq
0	Soccer Field	0.01
1	Gym / Fitness Center	0.01
2	Yoga Studio	0.00
3	Golf Course	0.00
4	Tennis Court	0.00

----City Line----

	venue	freq
--	-------	------



0	Baseball Field	0.02
1	Gym / Fitness Center	0.02
2	Gym	0.02
3	Yoga Studio	0.01
4	Golf Course	0.00

----Civic Center----

	venue	freq
0	Yoga Studio	0.01
1	Soccer Field	0.01
2	Boxing Gym	0.01
3	Cycle Studio	0.01
4	Gym / Fitness Center	0.01

----Clinton----

	venue	freq
0	Gym	0.07
1	Yoga Studio	0.02
2	Gym / Fitness Center	0.02
3	Boxing Gym	0.01
4	Climbing Gym	0.01

----Clinton Hill----

	venue	freq
0	Yoga Studio	0.02
1	Climbing Gym	0.02
2	Gym	0.02
3	Pilates Studio	0.01
4	Gym / Fitness Center	0.01

----Cobble Hill----

	venue	freq
0	Climbing Gym	0.02
1	Gym	0.02
2	Yoga Studio	0.01
3	Gym / Fitness Center	0.01
4	Athletics & Sports	0.01

----Coney Island----

	venue	freq
0	Surf Spot	0.01
1	Basketball Court	0.01
2	Gym	0.01

3	Yoga Studio	0.00
4	Golf Course	0.00

----Crown Heights----

	venue	freq
0	Field	0.02
1	Gym	0.02
2	Climbing Gym	0.01
3	Yoga Studio	0.01
4	Basketball Court	0.00

----Cypress Hills----

	venue	freq
0	Gym	0.04
1	Gym / Fitness Center	0.02
2	Weight Loss Center	0.01
3	Baseball Field	0.01
4	Golf Course	0.00

----Ditmas Park----

	venue	freq
0	Yoga Studio	0.02
1	Gym	0.02
2	Field	0.02
3	Baseball Field	0.01
4	Tennis Court	0.01

----Downtown----

	venue	freq
0	Gym	0.02
1	Yoga Studio	0.01
2	Climbing Gym	0.01
3	Pilates Studio	0.01
4	Gym / Fitness Center	0.01

----Dumbo----

	venue	freq
0	Gym / Fitness Center	0.02
1	Yoga Studio	0.01
2	Soccer Field	0.01
3	Boxing Gym	0.01
4	Climbing Gym	0.01

----Dyker Heights----

	venue	freq
0	Gym / Fitness Center	0.02
1	Yoga Studio	0.01
2	Surf Spot	0.01
3	Golf Course	0.00
4	Tennis Court	0.00

----East Flatbush----

	venue	freq
0	Yoga Studio	0.02
1	Field	0.02
2	Baseball Field	0.01
3	Gym	0.01
4	Tennis Court	0.01

----East Harlem----

	venue	freq
0	Yoga Studio	0.02
1	Boxing Gym	0.01
2	Gym	0.01
3	Field	0.01
4	Basketball Court	0.00

----East New York----

	venue	freq
0	Gym	0.04
1	Baseball Field	0.01
2	Gym / Fitness Center	0.01
3	Yoga Studio	0.00
4	Golf Course	0.00

----East Village----

	venue	freq
0	Yoga Studio	0.03
1	Gym / Fitness Center	0.02
2	Gym	0.02
3	Golf Course	0.00
4	Tennis Court	0.00

----East Williamsburg----

	venue	freq
--	-------	------

0	Yoga Studio	0.02
1	Boxing Gym	0.01
2	Pilates Studio	0.01
3	Cycle Studio	0.01
4	Gym	0.00

----Erasmus----

	venue	freq
0	Field	0.02
1	Gym	0.01
2	Tennis Court	0.01
3	Yoga Studio	0.01
4	Baseball Field	0.01

----Financial District----

	venue	freq
0	Cycle Studio	0.03
1	Gym / Fitness Center	0.02
2	Soccer Field	0.01
3	Boxing Gym	0.01
4	Yoga Studio	0.00

----Flatbush----

	venue	freq
0	Field	0.02
1	Baseball Field	0.01
2	Tennis Court	0.01
3	Gym / Fitness Center	0.01
4	Gym	0.01

----Flatiron----

	venue	freq
0	Gym	0.03
1	Yoga Studio	0.02
2	Boxing Gym	0.02
3	Gym / Fitness Center	0.02
4	Cycle Studio	0.01

----Flatlands----

	venue	freq
0	Gym / Fitness Center	0.02
1	Gym	0.01
2	Yoga Studio	0.00

3	Golf Course	0.00
4	Tennis Court	0.00

----Fort Greene----

	venue	freq
0	Field	0.02
1	Climbing Gym	0.02
2	Gym	0.02
3	Pilates Studio	0.01
4	Gym / Fitness Center	0.01

----Fort Hamilton----

	venue	freq
0	Gym / Fitness Center	0.02
1	Yoga Studio	0.01
2	Surf Spot	0.01
3	Golf Course	0.00
4	Tennis Court	0.00

----Fulton Ferry----

	venue	freq
0	Gym / Fitness Center	0.02
1	Soccer Field	0.01
2	Boxing Gym	0.01
3	Climbing Gym	0.01
4	Cycle Studio	0.01

----Georgetown----

	venue	freq
0	Golf Course	0.01
1	Gym / Fitness Center	0.01
2	Gym	0.01
3	Yoga Studio	0.00
4	Tennis Court	0.00

----Gerritsen Beach----

	venue	freq
0	Gym	0.02
1	Golf Course	0.01
2	Climbing Gym	0.01
3	Yoga Studio	0.00
4	Tennis Court	0.00

----Gowanus----

	venue	freq
0	Yoga Studio	0.02
1	Field	0.02
2	Gym / Fitness Center	0.01
3	Climbing Gym	0.01
4	Athletics & Sports	0.01

----Gramercy----

	venue	freq
0	Gym	0.03
1	Yoga Studio	0.02
2	Boxing Gym	0.02
3	Gym / Fitness Center	0.02
4	Golf Course	0.00

----Gravesend----

	venue	freq
0	Surf Spot	0.01
1	Gym	0.01
2	Yoga Studio	0.00
3	Golf Course	0.00
4	Tennis Court	0.00

----Greenpoint----

	venue	freq
0	Yoga Studio	0.03
1	Gym	0.02
2	Boxing Gym	0.02
3	Climbing Gym	0.01
4	Pilates Studio	0.01

----Greenwich Village----

	venue	freq
0	Yoga Studio	0.01
1	Boxing Gym	0.01
2	Gym / Fitness Center	0.01
3	Gym	0.01
4	Golf Course	0.00

----Hamilton Heights----

	venue	freq
--	-------	------

0	Yoga Studio	0.03
1	Baseball Stadium	0.02
2	Baseball Field	0.01
3	Basketball Court	0.01
4	Bike Trail	0.01

----Highland Park----

	venue	freq
0	Gym	0.03
1	Weight Loss Center	0.01
2	Gym / Fitness Center	0.01
3	Golf Course	0.00
4	Tennis Court	0.00

----Homecrest----

	venue	freq
0	Surf Spot	0.01
1	Gym	0.01
2	Yoga Studio	0.00
3	Golf Course	0.00
4	Tennis Court	0.00

----Hudson Yards----

	venue	freq
0	Gym	0.07
1	Yoga Studio	0.02
2	Boxing Gym	0.01
3	Gym / Fitness Center	0.01
4	Golf Course	0.00

----Inwood----

	venue	freq
0	Yoga Studio	0.01
1	Basketball Court	0.01
2	Pool	0.01
3	Athletics & Sports	0.01
4	Gym	0.00

----Kensington----

	venue	freq
0	Field	0.02
1	Baseball Field	0.01
2	Tennis Court	0.01

3	Gym	0.01
4	Golf Course	0.00

----Lenox Hill----

	venue	freq
0	Gym	0.07
1	Yoga Studio	0.01
2	Boxing Gym	0.01
3	Gym / Fitness Center	0.01
4	Cycle Studio	0.01

----Lincoln Square----

	venue	freq
0	Gym	0.06
1	Yoga Studio	0.02
2	Gym / Fitness Center	0.02
3	Boxing Gym	0.01
4	Cycle Studio	0.01

----Little Italy----

	venue	freq
0	Yoga Studio	0.01
1	Gym / Fitness Center	0.01
2	Golf Course	0.00
3	Tennis Court	0.00
4	Surf Spot	0.00

----Lower East Side----

	venue	freq
0	Yoga Studio	0.02
1	Gym / Fitness Center	0.01
2	Golf Course	0.00
3	Tennis Court	0.00
4	Surf Spot	0.00

----Madison----

	venue	freq
0	Gym / Fitness Center	0.01
1	Yoga Studio	0.00
2	Golf Course	0.00
3	Tennis Court	0.00
4	Surf Spot	0.00



----Manhattan Beach----

	venue	freq
0	Gym	0.03
1	Baseball Stadium	0.01
2	Yoga Studio	0.00
3	Golf Course	0.00
4	Tennis Court	0.00

----Manhattan Terrace----

	venue	freq
0	Gym / Fitness Center	0.02
1	Yoga Studio	0.00
2	Golf Course	0.00
3	Tennis Court	0.00
4	Surf Spot	0.00

----Manhattan Valley----

	venue	freq
0	Yoga Studio	0.03
1	Gym	0.02
2	Boxing Gym	0.01
3	Field	0.01
4	Basketball Court	0.00

----Manhattanville----

	venue	freq
0	Yoga Studio	0.03
1	Baseball Stadium	0.02
2	Cycle Studio	0.01
3	Soccer Field	0.01
4	Gym	0.01

----Marble Hill----

	venue	freq
0	Yoga Studio	0.01
1	Basketball Court	0.01
2	Athletics & Sports	0.01
3	Gym	0.00
4	Tennis Court	0.00

----Marine Park----

	venue	freq
--	-------	------

0	Golf Course	0.01
1	Gym / Fitness Center	0.01
2	Gym	0.01
3	Yoga Studio	0.00
4	Tennis Court	0.00

----Midtown----

	venue	freq
0	Gym	0.07
1	Yoga Studio	0.02
2	Gym / Fitness Center	0.02
3	Boxing Gym	0.01
4	Climbing Gym	0.01

----Midtown South----

	venue	freq
0	Gym	0.06
1	Yoga Studio	0.02
2	Gym / Fitness Center	0.02
3	Boxing Gym	0.01
4	Golf Course	0.00

----Midwood----

	venue	freq
0	Field	0.01
1	Tennis Court	0.01
2	Gym / Fitness Center	0.01
3	Gym	0.01
4	Golf Course	0.00

----Mill Basin----

	venue	freq
0	Golf Course	0.01
1	Climbing Gym	0.01
2	Gym / Fitness Center	0.01
3	Yoga Studio	0.00
4	Tennis Court	0.00

----Mill Island----

	venue	freq
0	Golf Course	0.01
1	Climbing Gym	0.01
2	Yoga Studio	0.00

3	Tennis Court	0.00
4	Surf Spot	0.00

----Morningside Heights----

	venue	freq
0	Yoga Studio	0.05
1	Gym	0.03
2	Bike Trail	0.01
3	Cycle Studio	0.01
4	Boxing Gym	0.01

----Murray Hill----

	venue	freq
0	Gym	0.07
1	Gym / Fitness Center	0.03
2	Yoga Studio	0.02
3	Boxing Gym	0.01
4	Climbing Gym	0.01

----New Lots----

	venue	freq
0	Gym	0.04
1	Yoga Studio	0.00
2	Golf Course	0.00
3	Tennis Court	0.00
4	Surf Spot	0.00

----Noho----

	venue	freq
0	Yoga Studio	0.02
1	Gym	0.02
2	Gym / Fitness Center	0.01
3	Golf Course	0.00
4	Tennis Court	0.00

----North Side----

	venue	freq
0	Yoga Studio	0.02
1	Boxing Gym	0.01
2	Gym / Fitness Center	0.01
3	Golf Course	0.00
4	Tennis Court	0.00

----Ocean Hill----

	venue	freq
0	Yoga Studio	0.02
1	Gym	0.02
2	Golf Course	0.00
3	Tennis Court	0.00
4	Surf Spot	0.00

----Ocean Parkway----

	venue	freq
0	Gym / Fitness Center	0.02
1	Tennis Court	0.01
2	Surf Spot	0.01
3	Yoga Studio	0.00
4	Golf Course	0.00

----Paerdegat Basin----

	venue	freq
0	Gym / Fitness Center	0.02
1	Golf Course	0.01
2	Baseball Field	0.01
3	Gym	0.01
4	Yoga Studio	0.00

----Park Slope----

	venue	freq
0	Yoga Studio	0.02
1	Field	0.02
2	Gym / Fitness Center	0.01
3	Climbing Gym	0.01
4	Athletics & Sports	0.01

----Prospect Heights----

	venue	freq
0	Field	0.02
1	Climbing Gym	0.01
2	Gym / Fitness Center	0.01
3	Gym	0.01
4	Athletics & Sports	0.01

----Prospect Lefferts Gardens----

	venue	freq
--	-------	------

0	Field	0.02
1	Tennis Court	0.01
2	Yoga Studio	0.01
3	Baseball Stadium	0.00
4	Basketball Court	0.00

----Prospect Park South----

	venue	freq
0	Yoga Studio	0.02
1	Field	0.02
2	Baseball Field	0.01
3	Gym	0.01
4	Tennis Court	0.01

----Red Hook----

	venue	freq
0	Yoga Studio	0.02
1	Gym	0.01
2	Soccer Field	0.01
3	Climbing Gym	0.01
4	Cycle Studio	0.01

----Remsen Village----

	venue	freq
0	Gym	0.03
1	Yoga Studio	0.02
2	Gym / Fitness Center	0.01
3	Golf Course	0.00
4	Tennis Court	0.00

----Roosevelt Island----

	venue	freq
0	Gym	0.06
1	Yoga Studio	0.01
2	Boxing Gym	0.01
3	Gym / Fitness Center	0.01
4	Cycle Studio	0.01

----Rugby----

	venue	freq
0	Gym	0.03
1	Field	0.02
2	Tennis Court	0.01

3	Gym / Fitness Center	0.01
4	Yoga Studio	0.01

----Sea Gate----

	venue	freq
0	Gym	0.01
1	Baseball Stadium	0.01
2	Surf Spot	0.01
3	Gym / Fitness Center	0.01
4	Athletics & Sports	0.01

----Sheepshead Bay----

	venue	freq
0	Gym	0.03
1	Yoga Studio	0.00
2	Golf Course	0.00
3	Tennis Court	0.00
4	Surf Spot	0.00

----Soho----

	venue	freq
0	Yoga Studio	0.01
1	Gym / Fitness Center	0.01
2	Gym	0.01
3	Golf Course	0.00
4	Tennis Court	0.00

----South Side----

	venue	freq
0	Yoga Studio	0.02
1	Boxing Gym	0.01
2	Pilates Studio	0.01
3	Golf Course	0.00
4	Tennis Court	0.00

----Starrett City----

	venue	freq
0	Gym	0.02
1	Gym / Fitness Center	0.01
2	Yoga Studio	0.00
3	Golf Course	0.00
4	Tennis Court	0.00

----Stuyvesant Town----

	venue	freq
0	Yoga Studio	0.04
1	Gym / Fitness Center	0.02
2	Gym	0.02
3	Boxing Gym	0.01
4	Golf Course	0.00

----Sunset Park----

	venue	freq
0	Gym	0.02
1	Field	0.01
2	Baseball Field	0.01
3	Tennis Court	0.01
4	Gym / Fitness Center	0.01

----Sutton Place----

	venue	freq
0	Gym	0.07
1	Gym / Fitness Center	0.02
2	Yoga Studio	0.01
3	Boxing Gym	0.01
4	Climbing Gym	0.01

----Tribeca----

	venue	freq
0	Yoga Studio	0.02
1	Gym / Fitness Center	0.02
2	Boxing Gym	0.01
3	Cycle Studio	0.01
4	Gym	0.00

----Tudor City----

	venue	freq
0	Gym	0.07
1	Gym / Fitness Center	0.03
2	Yoga Studio	0.02
3	Boxing Gym	0.01
4	Climbing Gym	0.01

----Turtle Bay----

	venue	freq
--	-------	------

0	Gym	0.07
1	Gym / Fitness Center	0.02
2	Yoga Studio	0.01
3	Boxing Gym	0.01
4	Climbing Gym	0.01

----Upper East Side----

	venue	freq
0	Gym	0.03
1	Yoga Studio	0.02
2	Cycle Studio	0.01
3	Gym / Fitness Center	0.01
4	Field	0.01

----Upper West Side----

	venue	freq
0	Yoga Studio	0.03
1	Gym	0.02
2	Field	0.01
3	Baseball Stadium	0.00
4	Basketball Court	0.00

----Vinegar Hill----

	venue	freq
0	Yoga Studio	0.01
1	Gym / Fitness Center	0.01
2	Soccer Field	0.01
3	Boxing Gym	0.01
4	Climbing Gym	0.01

----Washington Heights----

	venue	freq
0	Baseball Stadium	0.02
1	Yoga Studio	0.01
2	Baseball Field	0.01
3	Basketball Court	0.01
4	Soccer Field	0.01

----Weeksville----

	venue	freq
0	Yoga Studio	0.02
1	Gym	0.02
2	Field	0.02



3	Baseball Stadium	0.00
4	Basketball Court	0.00

----West Village----

	venue	freq
0	Gym / Fitness Center	0.03
1	Yoga Studio	0.02
2	Gym	0.02
3	Boxing Gym	0.01
4	Cycle Studio	0.01

----Williamsburg----

	venue	freq
0	Yoga Studio	0.02
1	Pilates Studio	0.01
2	Cycle Studio	0.01
3	Golf Course	0.00
4	Tennis Court	0.00

----Windsor Terrace----

	venue	freq
0	Field	0.02
1	Gym	0.02
2	Tennis Court	0.01
3	Climbing Gym	0.01
4	Golf Course	0.00

----Wingate----

	venue	freq
0	Field	0.02
1	Gym	0.02
2	Tennis Court	0.01
3	Yoga Studio	0.01
4	Baseball Field	0.01

----Yorkville----

	venue	freq
0	Gym	0.03
1	Yoga Studio	0.02
2	Cycle Studio	0.01
3	Gym / Fitness Center	0.01
4	Field	0.01

```
[106]: # Create the dataframe displaying the top 10 sports facilities for each
        ↳ neighborhood
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]

num_top_venues = 10

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
sports_facilities_sorted = pd.DataFrame(columns=columns)
sports_facilities_sorted['Neighborhood'] = nyu_sports['Neighborhood']

for ind in np.arange(nyu_sports.shape[0]):
    sports_facilities_sorted.iloc[ind, 1:] =
        ↳ return_most_common_venues(nyu_sports.iloc[ind, :], num_top_venues)

sports_facilities_sorted.head()
```

```
[106]:      Neighborhood 1st Most Common Venue 2nd Most Common Venue \
0      Bath Beach      Surf Spot  Gym / Fitness Center
1  Battery Park City      Cycle Studio      Boxing Gym
2      Bay Ridge  Gym / Fitness Center      Yoga Studio
3  Bedford Stuyvesant      Field      Pilates Studio
4      Bensonhurst  Gym / Fitness Center      Surf Spot

      3rd Most Common Venue 4th Most Common Venue 5th Most Common Venue \
0      Gym      Weight Loss Center      Climbing Gym
1      Soccer Field  Gym / Fitness Center      Gym
2      Cycle Studio      Athletics & Sports      Baseball Field
3      Yoga Studio      Soccer Field      Pool
4      Weight Loss Center      Climbing Gym      Athletics & Sports

      6th Most Common Venue 7th Most Common Venue 8th Most Common Venue \
```

0	Athletics & Sports	Baseball Field	Baseball Stadium
1	Weight Loss Center	Athletics & Sports	Baseball Field
2	Baseball Stadium	Basketball Court	Bike Trail
3	Surf Spot	Gym / Fitness Center	Gym
4	Baseball Field	Baseball Stadium	Basketball Court

	9th Most Common Venue	10th Most Common Venue
0	Basketball Court	Bike Trail
1	Baseball Stadium	Basketball Court
2	Boxing Gym	Climbing Gym
3	Golf Course	Tennis Court
4	Bike Trail	Boxing Gym

```
[107]: # K means clustering

# more libraries to import
import random
import matplotlib.pyplot as plt
from sklearn.datasets.samples_generator import make_blobs
%matplotlib inline

# set number of clusters
kclusters = 5

nyu_sports_clustering = nyu_sports.drop('Neighborhood', 1)

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

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

```
[107]: array([4, 0, 0, 0, 0, 4, 3, 0, 4, 4], dtype=int32)
```

```
[108]: # Create the new dataframe including the cluster and the top 10 sports_
      ↳ facilities for each neighborhood
# add clustering labels
sports_facilities_sorted.insert(0, 'Cluster Labels', kmeans.labels_)

nyu_merged = nyu_data

# merge nyu_sports with nyu_data to add latitude/longitude for each neighborhood
nyu_merged = nyu_merged.join(sports_facilities_sorted.
      ↳ set_index('Neighborhood'), on='Neighborhood')

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

```
[108]:
```

	Borough	Neighborhood	Latitude	Longitude	Cluster Labels	\
0	Manhattan	Marble Hill	40.876551	-73.910660		0
1	Manhattan	Chinatown	40.715618	-73.994279		0
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		2

  

	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	\
0	Yoga Studio	Athletics & Sports	Basketball Court	
1	Soccer Field	Gym / Fitness Center	Weight Loss Center	
2	Baseball Stadium	Yoga Studio	Athletics & Sports	
3	Yoga Studio	Athletics & Sports	Pool	
4	Yoga Studio	Baseball Stadium	Athletics & Sports	

  

	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	\
0	Cycle Studio	Baseball Field	Baseball Stadium	
1	Climbing Gym	Athletics & Sports	Baseball Field	
2	Soccer Field	Baseball Field	Basketball Court	
3	Basketball Court	Cycle Studio	Baseball Field	
4	Soccer Field	Baseball Field	Basketball Court	

  

	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	\
0	Bike Trail	Boxing Gym	Climbing Gym	
1	Baseball Stadium	Basketball Court	Bike Trail	
2	Cycle Studio	Bike Trail	Boxing Gym	
3	Baseball Stadium	Bike Trail	Boxing Gym	
4	Gym	Bike Trail	Boxing Gym	

  

	10th Most Common Venue
0	Weight Loss Center
1	Boxing Gym
2	Climbing Gym
3	Climbing Gym
4	Cycle Studio

```
[125]: # Visualize the resulting clusters
# 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(nyu_merged['Latitude'],
    ↪nyu_merged['Longitude'], nyu_merged['Neighborhood'], nyu_merged['Cluster_
    ↪Labels']):
    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

```

[125]: <folium.folium.Map at 0x7fb410bc7470>

Examine Clusters

```

[129]: # Cluster 1
cluster1 = nyu_merged.loc[nyu_merged['Cluster Labels'] == 0, nyu_merged.
    ↪columns[[1] + list(range(5, nyu_merged.shape[1]))]]
cluster1

```

```

[129]:
      Neighborhood 1st Most Common Venue 2nd Most Common Venue \
0      Marble Hill      Yoga Studio      Athletics & Sports
1      Chinatown      Soccer Field      Gym / Fitness Center
2  Washington Heights      Baseball Stadium      Yoga Studio
3      Inwood      Yoga Studio      Athletics & Sports
18  Greenwich Village      Yoga Studio      Gym / Fitness Center
20  Lower East Side      Yoga Studio      Gym / Fitness Center
21      Tribeca      Yoga Studio      Gym / Fitness Center
22  Little Italy      Yoga Studio      Gym / Fitness Center
23      Soho      Yoga Studio      Gym / Fitness Center
28  Battery Park City      Cycle Studio      Boxing Gym
29  Financial District      Cycle Studio      Gym / Fitness Center
32      Civic Center      Yoga Studio      Soccer Field
40      Bay Ridge      Gym / Fitness Center      Yoga Studio
41  Bensonhurst      Gym / Fitness Center      Surf Spot
47  Manhattan Terrace      Gym / Fitness Center      Weight Loss Center
55  Williamsburg      Yoga Studio      Cycle Studio
56  Bushwick      Yoga Studio      Pilates Studio
57  Bedford Stuyvesant      Field      Pilates Studio
58  Brooklyn Heights      Athletics & Sports      Soccer Field
61      Red Hook      Yoga Studio      Athletics & Sports
70  Mill Island      Golf Course      Climbing Gym
74  Borough Park      Gym / Fitness Center      Field

```

75	Dyker Heights	Gym / Fitness Center	Yoga Studio
89	East Williamsburg	Yoga Studio	Cycle Studio
90	North Side	Yoga Studio	Gym / Fitness Center
91	South Side	Yoga Studio	Pilates Studio
92	Ocean Parkway	Gym / Fitness Center	Surf Spot
93	Fort Hamilton	Gym / Fitness Center	Yoga Studio
100	Mill Basin	Climbing Gym	Gym / Fitness Center
101	Fulton Ferry	Gym / Fitness Center	Boxing Gym
102	Vinegar Hill	Yoga Studio	Boxing Gym
105	Dumbo	Gym / Fitness Center	Yoga Studio
108	Madison	Gym / Fitness Center	Weight Loss Center

	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue \
0	Basketball Court	Cycle Studio	Baseball Field
1	Weight Loss Center	Climbing Gym	Athletics & Sports
2	Athletics & Sports	Soccer Field	Baseball Field
3	Pool	Basketball Court	Cycle Studio
18	Gym	Boxing Gym	Climbing Gym
20	Cycle Studio	Athletics & Sports	Baseball Field
21	Cycle Studio	Boxing Gym	Athletics & Sports
22	Cycle Studio	Athletics & Sports	Baseball Field
23	Gym	Climbing Gym	Athletics & Sports
28	Soccer Field	Gym / Fitness Center	Gym
29	Soccer Field	Boxing Gym	Weight Loss Center
32	Gym / Fitness Center	Boxing Gym	Cycle Studio
40	Cycle Studio	Athletics & Sports	Baseball Field
41	Weight Loss Center	Climbing Gym	Athletics & Sports
47	Cycle Studio	Athletics & Sports	Baseball Field
55	Pilates Studio	Athletics & Sports	Baseball Field
56	Boxing Gym	Cycle Studio	Athletics & Sports
57	Yoga Studio	Soccer Field	Pool
58	Gym / Fitness Center	Gym	Cycle Studio
61	Soccer Field	Gym / Fitness Center	Gym
70	Weight Loss Center	Cycle Studio	Athletics & Sports
74	Baseball Field	Tennis Court	Climbing Gym
75	Surf Spot	Climbing Gym	Athletics & Sports
89	Pilates Studio	Boxing Gym	Athletics & Sports
90	Boxing Gym	Cycle Studio	Athletics & Sports
91	Boxing Gym	Cycle Studio	Athletics & Sports
92	Tennis Court	Weight Loss Center	Climbing Gym
93	Surf Spot	Climbing Gym	Athletics & Sports
100	Golf Course	Weight Loss Center	Athletics & Sports
101	Athletics & Sports	Soccer Field	Gym
102	Athletics & Sports	Soccer Field	Gym / Fitness Center
105	Boxing Gym	Athletics & Sports	Soccer Field
108	Cycle Studio	Athletics & Sports	Baseball Field

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue \
0	Baseball Stadium	Bike Trail	Boxing Gym
1	Baseball Field	Baseball Stadium	Basketball Court
2	Basketball Court	Cycle Studio	Bike Trail
3	Baseball Field	Baseball Stadium	Bike Trail
18	Athletics & Sports	Baseball Field	Baseball Stadium
20	Baseball Stadium	Basketball Court	Bike Trail
21	Baseball Field	Baseball Stadium	Basketball Court
22	Baseball Stadium	Basketball Court	Bike Trail
23	Baseball Field	Baseball Stadium	Basketball Court
28	Weight Loss Center	Athletics & Sports	Baseball Field
29	Climbing Gym	Athletics & Sports	Baseball Field
32	Climbing Gym	Athletics & Sports	Baseball Field
40	Baseball Stadium	Basketball Court	Bike Trail
41	Baseball Field	Baseball Stadium	Basketball Court
47	Baseball Stadium	Basketball Court	Bike Trail
55	Baseball Stadium	Basketball Court	Bike Trail
56	Baseball Field	Baseball Stadium	Basketball Court
57	Surf Spot	Gym / Fitness Center	Gym
58	Climbing Gym	Weight Loss Center	Boxing Gym
61	Cycle Studio	Climbing Gym	Boxing Gym
70	Baseball Field	Baseball Stadium	Basketball Court
74	Athletics & Sports	Baseball Stadium	Basketball Court
75	Baseball Field	Baseball Stadium	Basketball Court
89	Baseball Field	Baseball Stadium	Basketball Court
90	Baseball Field	Baseball Stadium	Basketball Court
91	Baseball Field	Baseball Stadium	Basketball Court
92	Athletics & Sports	Baseball Field	Baseball Stadium
93	Baseball Field	Baseball Stadium	Basketball Court
100	Baseball Field	Baseball Stadium	Basketball Court
101	Cycle Studio	Climbing Gym	Weight Loss Center
102	Gym	Cycle Studio	Climbing Gym
105	Gym	Cycle Studio	Climbing Gym
108	Baseball Stadium	Basketball Court	Bike Trail

	9th Most Common Venue	10th Most Common Venue
0	Climbing Gym	Weight Loss Center
1	Bike Trail	Boxing Gym
2	Boxing Gym	Climbing Gym
3	Boxing Gym	Climbing Gym
18	Basketball Court	Bike Trail
20	Boxing Gym	Climbing Gym
21	Bike Trail	Climbing Gym
22	Boxing Gym	Climbing Gym
23	Bike Trail	Boxing Gym
28	Baseball Stadium	Basketball Court
29	Baseball Stadium	Basketball Court

32	Baseball Stadium	Basketball Court
40	Boxing Gym	Climbing Gym
41	Bike Trail	Boxing Gym
47	Boxing Gym	Climbing Gym
55	Boxing Gym	Climbing Gym
56	Bike Trail	Climbing Gym
57	Golf Course	Tennis Court
58	Baseball Field	Baseball Stadium
61	Baseball Field	Baseball Stadium
70	Bike Trail	Boxing Gym
74	Bike Trail	Boxing Gym
75	Bike Trail	Boxing Gym
89	Bike Trail	Climbing Gym
90	Bike Trail	Climbing Gym
91	Bike Trail	Climbing Gym
92	Basketball Court	Bike Trail
93	Bike Trail	Boxing Gym
100	Bike Trail	Boxing Gym
101	Baseball Field	Baseball Stadium
102	Baseball Field	Baseball Stadium
105	Baseball Field	Baseball Stadium
108	Boxing Gym	Climbing Gym

```
[130]: # Cluster 2
cluster2 = nyu_merged.loc[nyu_merged['Cluster Labels'] == 1, nyu_merged.
↳ columns[[1] + list(range(5, nyu_merged.shape[1]))]]
cluster2
```

```
[130]: Neighborhood 1st Most Common Venue 2nd Most Common Venue \
10      Lenox Hill      Gym      Field
11  Roosevelt Island      Gym      Field
13    Lincoln Square      Gym      Yoga Studio
14      Clinton      Gym      Yoga Studio
15      Midtown      Gym      Yoga Studio
16    Murray Hill      Gym  Gym / Fitness Center
33  Midtown South      Gym      Yoga Studio
34    Sutton Place      Gym  Gym / Fitness Center
35      Turtle Bay      Gym  Gym / Fitness Center
36      Tudor City      Gym  Gym / Fitness Center
39    Hudson Yards      Gym      Yoga Studio

3rd Most Common Venue 4th Most Common Venue 5th Most Common Venue \
10  Gym / Fitness Center      Boxing Gym      Climbing Gym
11  Gym / Fitness Center      Boxing Gym      Climbing Gym
13  Gym / Fitness Center      Boxing Gym      Cycle Studio
14  Gym / Fitness Center      Climbing Gym      Boxing Gym
15  Gym / Fitness Center      Climbing Gym      Boxing Gym
```



16	Yoga Studio	Climbing Gym	Boxing Gym
33	Gym / Fitness Center	Boxing Gym	Climbing Gym
34	Yoga Studio	Climbing Gym	Boxing Gym
35	Yoga Studio	Climbing Gym	Boxing Gym
36	Yoga Studio	Climbing Gym	Boxing Gym
39	Gym / Fitness Center	Boxing Gym	Climbing Gym

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue \
10	Cycle Studio	Yoga Studio	Pilates Studio
11	Cycle Studio	Yoga Studio	Pilates Studio
13	Field	Pilates Studio	Pool
14	Cycle Studio	Athletics & Sports	Baseball Field
15	Cycle Studio	Athletics & Sports	Baseball Field
16	Cycle Studio	Athletics & Sports	Baseball Field
33	Athletics & Sports	Baseball Field	Baseball Stadium
34	Cycle Studio	Athletics & Sports	Baseball Field
35	Cycle Studio	Athletics & Sports	Baseball Field
36	Cycle Studio	Athletics & Sports	Baseball Field
39	Athletics & Sports	Baseball Field	Baseball Stadium

	9th Most Common Venue	10th Most Common Venue
10	Golf Course	Tennis Court
11	Golf Course	Tennis Court
13	Golf Course	Tennis Court
14	Baseball Stadium	Basketball Court
15	Baseball Stadium	Basketball Court
16	Baseball Stadium	Basketball Court
33	Basketball Court	Bike Trail
34	Baseball Stadium	Basketball Court
35	Baseball Stadium	Basketball Court
36	Baseball Stadium	Basketball Court
39	Basketball Court	Bike Trail

```
[131]: # Cluster 3
cluster3 = nyu_merged.loc[nyu_merged['Cluster Labels'] == 2, nyu_merged.
→columns[[1] + list(range(5, nyu_merged.shape[1]))]]
cluster3
```

	Neighborhood	1st Most Common Venue	2nd Most Common Venue \
4	Hamilton Heights	Yoga Studio	Baseball Stadium
5	Manhattanville	Yoga Studio	Baseball Stadium
6	Central Harlem	Yoga Studio	Baseball Stadium
7	East Harlem	Yoga Studio	Gym
8	Upper East Side	Gym	Yoga Studio
9	Yorkville	Gym	Yoga Studio
12	Upper West Side	Yoga Studio	Gym
17	Chelsea	Gym	Yoga Studio

19	East Village	Yoga Studio	Gym / Fitness Center
24	West Village	Gym / Fitness Center	Yoga Studio
25	Manhattan Valley	Yoga Studio	Gym
26	Morningside Heights	Yoga Studio	Gym
27	Gramercy	Gym	Yoga Studio
30	Carnegie Hill	Gym	Yoga Studio
31	Noho	Yoga Studio	Gym
37	Stuyvesant Town	Yoga Studio	Gym / Fitness Center
38	Flatiron	Gym	Yoga Studio
43	Greenpoint	Yoga Studio	Gym
54	Brownsville	Yoga Studio	Gym
83	Ocean Hill	Yoga Studio	Gym
97	Remsen Village	Gym	Yoga Studio

	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue \
4	Athletics & Sports	Soccer Field	Baseball Field
5	Cycle Studio	Athletics & Sports	Baseball Field
6	Gym	Cycle Studio	Athletics & Sports
7	Boxing Gym	Field	Pool
8	Gym / Fitness Center	Cycle Studio	Field
9	Gym / Fitness Center	Cycle Studio	Field
12	Field	Soccer Field	Pool
17	Gym / Fitness Center	Boxing Gym	Cycle Studio
19	Gym	Climbing Gym	Athletics & Sports
24	Gym	Boxing Gym	Cycle Studio
25	Boxing Gym	Field	Pool
26	Bike Trail	Boxing Gym	Cycle Studio
27	Gym / Fitness Center	Boxing Gym	Climbing Gym
30	Gym / Fitness Center	Boxing Gym	Cycle Studio
31	Gym / Fitness Center	Climbing Gym	Athletics & Sports
37	Gym	Boxing Gym	Climbing Gym
38	Gym / Fitness Center	Boxing Gym	Cycle Studio
43	Boxing Gym	Climbing Gym	Pilates Studio
54	Cycle Studio	Athletics & Sports	Baseball Field
83	Cycle Studio	Athletics & Sports	Baseball Field
97	Gym / Fitness Center	Climbing Gym	Athletics & Sports

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue \
4	Basketball Court	Gym	Bike Trail
5	Bike Trail	Boxing Gym	Field
6	Baseball Field	Basketball Court	Bike Trail
7	Pilates Studio	Gym / Fitness Center	Soccer Field
8	Pilates Studio	Pool	Soccer Field
9	Pilates Studio	Pool	Soccer Field
12	Pilates Studio	Gym / Fitness Center	Surf Spot
17	Climbing Gym	Athletics & Sports	Baseball Field
19	Baseball Field	Baseball Stadium	Basketball Court

24	Climbing Gym	Athletics & Sports	Baseball Field
25	Pilates Studio	Gym / Fitness Center	Soccer Field
26	Field	Gym / Fitness Center	Pilates Studio
27	Athletics & Sports	Baseball Field	Baseball Stadium
30	Field	Pilates Studio	Pool
31	Baseball Field	Baseball Stadium	Basketball Court
37	Athletics & Sports	Baseball Field	Baseball Stadium
38	Climbing Gym	Athletics & Sports	Baseball Field
43	Gym / Fitness Center	Athletics & Sports	Baseball Field
54	Baseball Stadium	Basketball Court	Bike Trail
83	Baseball Stadium	Basketball Court	Bike Trail
97	Baseball Field	Baseball Stadium	Basketball Court

	9th Most Common Venue	10th Most Common Venue
4	Boxing Gym	Cycle Studio
5	Gym	Soccer Field
6	Boxing Gym	Field
7	Golf Course	Tennis Court
8	Golf Course	Tennis Court
9	Golf Course	Tennis Court
12	Golf Course	Tennis Court
17	Baseball Stadium	Basketball Court
19	Bike Trail	Boxing Gym
24	Baseball Stadium	Basketball Court
25	Golf Course	Tennis Court
26	Golf Course	Tennis Court
27	Basketball Court	Bike Trail
30	Golf Course	Tennis Court
31	Bike Trail	Boxing Gym
37	Basketball Court	Bike Trail
38	Baseball Stadium	Basketball Court
43	Baseball Stadium	Basketball Court
54	Boxing Gym	Climbing Gym
83	Boxing Gym	Climbing Gym
97	Bike Trail	Boxing Gym

```
[133]: # Cluster 4
cluster4 = nyu_merged.loc[nyu_merged['Cluster Labels'] == 3, nyu_merged.
    ↪columns[[1] + list(range(5, nyu_merged.shape[1]))]]
cluster4
```

```
[133]: Neighborhood 1st Most Common Venue 2nd Most Common Venue \
48 Flatbush Field Baseball Field
49 Crown Heights Field Gym
50 East Flatbush Field Yoga Studio
51 Kensington Field Baseball Field
52 Windsor Terrace Field Gym
```

53	Prospect Heights	Field	Gym / Fitness Center
59	Cobble Hill	Climbing Gym	Gym
60	Carroll Gardens	Climbing Gym	Gym
62	Gowanus	Field	Yoga Studio
63	Fort Greene	Field	Climbing Gym
64	Park Slope	Field	Yoga Studio
78	Clinton Hill	Yoga Studio	Climbing Gym
80	Downtown	Gym	Field
81	Boerum Hill	Field	Climbing Gym
82	Prospect Lefferts Gardens	Field	Tennis Court
87	Prospect Park South	Field	Yoga Studio
94	Ditmas Park	Field	Gym
95	Wingate	Field	Gym
96	Rugby	Gym	Field
103	Weeksville	Field	Gym
109	Erasmus	Field	Gym

	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue \
48	Gym / Fitness Center	Gym	Tennis Court
49	Climbing Gym	Yoga Studio	Pool
50	Baseball Field	Gym / Fitness Center	Gym
51	Gym	Tennis Court	Climbing Gym
52	Climbing Gym	Tennis Court	Athletics & Sports
53	Athletics & Sports	Climbing Gym	Gym
59	Field	Gym / Fitness Center	Athletics & Sports
60	Field	Athletics & Sports	Gym / Fitness Center
62	Athletics & Sports	Gym / Fitness Center	Gym
63	Gym	Gym / Fitness Center	Athletics & Sports
64	Athletics & Sports	Gym / Fitness Center	Gym
78	Gym	Gym / Fitness Center	Athletics & Sports
80	Gym / Fitness Center	Athletics & Sports	Climbing Gym
81	Gym	Athletics & Sports	Pilates Studio
82	Yoga Studio	Soccer Field	Pool
87	Baseball Field	Gym	Tennis Court
94	Yoga Studio	Tennis Court	Baseball Field
95	Baseball Field	Tennis Court	Yoga Studio
96	Gym / Fitness Center	Tennis Court	Yoga Studio
103	Yoga Studio	Soccer Field	Pool
109	Baseball Field	Tennis Court	Yoga Studio

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue \
48	Climbing Gym	Athletics & Sports	Baseball Stadium
49	Pilates Studio	Gym / Fitness Center	Soccer Field
50	Tennis Court	Surf Spot	Boxing Gym
51	Athletics & Sports	Baseball Stadium	Basketball Court
52	Baseball Field	Baseball Stadium	Basketball Court
53	Yoga Studio	Pilates Studio	Pool

59	Yoga Studio	Pilates Studio	Pool
60	Baseball Field	Baseball Stadium	Basketball Court
62	Climbing Gym	Surf Spot	Boxing Gym
63	Boxing Gym	Yoga Studio	Pilates Studio
64	Climbing Gym	Surf Spot	Boxing Gym
78	Field	Pilates Studio	Pool
80	Yoga Studio	Pilates Studio	Pool
81	Gym / Fitness Center	Baseball Field	Baseball Stadium
82	Pilates Studio	Gym / Fitness Center	Gym
87	Surf Spot	Boxing Gym	Athletics & Sports
94	Soccer Field	Pool	Pilates Studio
95	Pilates Studio	Gym / Fitness Center	Pool
96	Pilates Studio	Pool	Soccer Field
103	Pilates Studio	Gym / Fitness Center	Surf Spot
109	Pilates Studio	Gym / Fitness Center	Pool

	9th Most Common Venue	10th Most Common Venue
48	Basketball Court	Bike Trail
49	Golf Course	Tennis Court
50	Athletics & Sports	Baseball Stadium
51	Bike Trail	Boxing Gym
52	Bike Trail	Boxing Gym
53	Golf Course	Tennis Court
59	Golf Course	Tennis Court
60	Bike Trail	Boxing Gym
62	Baseball Field	Baseball Stadium
63	Golf Course	Tennis Court
64	Baseball Field	Baseball Stadium
78	Golf Course	Tennis Court
80	Golf Course	Tennis Court
81	Basketball Court	Bike Trail
82	Golf Course	Surf Spot
87	Baseball Stadium	Basketball Court
94	Gym / Fitness Center	Surf Spot
95	Golf Course	Soccer Field
96	Golf Course	Surf Spot
103	Golf Course	Tennis Court
109	Golf Course	Soccer Field

```
[134]: # Cluster 5
cluster5 = nyu_merged.loc[nyu_merged['Cluster Labels'] == 4, nyu_merged.
    ↪columns[[1] + list(range(5, nyu_merged.shape[1]))]]
cluster5
```

```
[134]: Neighborhood 1st Most Common Venue 2nd Most Common Venue \
42      Sunset Park      Gym      Field
44      Gravesend      Surf Spot      Gym
```

45	Brighton Beach	Gym	Surf Spot
46	Sheepshead Bay	Gym	Weight Loss Center
65	Cypress Hills	Gym	Gym / Fitness Center
66	East New York	Gym	Baseball Field
67	Starrett City	Gym	Gym / Fitness Center
68	Canarsie	Gym / Fitness Center	Baseball Field
69	Flatlands	Gym / Fitness Center	Gym
71	Manhattan Beach	Gym	Baseball Stadium
72	Coney Island	Surf Spot	Basketball Court
73	Bath Beach	Surf Spot	Gym / Fitness Center
76	Gerritsen Beach	Gym	Climbing Gym
77	Marine Park	Gym / Fitness Center	Gym
79	Sea Gate	Surf Spot	Athletics & Sports
84	City Line	Baseball Field	Gym / Fitness Center
85	Bergen Beach	Climbing Gym	Baseball Field
86	Midwood	Field	Gym / Fitness Center
88	Georgetown	Gym / Fitness Center	Gym
98	New Lots	Gym	Weight Loss Center
99	Paerdegat Basin	Gym / Fitness Center	Baseball Field
104	Broadway Junction	Gym	Yoga Studio
106	Homecrest	Surf Spot	Gym
107	Highland Park	Gym	Weight Loss Center

	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue \
42	Baseball Field	Gym / Fitness Center	Tennis Court
44	Weight Loss Center	Climbing Gym	Athletics & Sports
45	Athletics & Sports	Baseball Stadium	Weight Loss Center
46	Cycle Studio	Athletics & Sports	Baseball Field
65	Weight Loss Center	Baseball Field	Climbing Gym
66	Gym / Fitness Center	Weight Loss Center	Climbing Gym
67	Weight Loss Center	Climbing Gym	Athletics & Sports
68	Gym	Weight Loss Center	Climbing Gym
69	Weight Loss Center	Climbing Gym	Athletics & Sports
71	Weight Loss Center	Cycle Studio	Athletics & Sports
72	Gym	Weight Loss Center	Climbing Gym
73	Gym	Weight Loss Center	Climbing Gym
76	Golf Course	Weight Loss Center	Athletics & Sports
77	Golf Course	Weight Loss Center	Climbing Gym
79	Baseball Stadium	Gym / Fitness Center	Gym
84	Gym	Yoga Studio	Climbing Gym
85	Gym / Fitness Center	Gym	Golf Course
86	Gym	Tennis Court	Climbing Gym
88	Golf Course	Weight Loss Center	Climbing Gym
98	Cycle Studio	Athletics & Sports	Baseball Field
99	Gym	Golf Course	Weight Loss Center
104	Cycle Studio	Athletics & Sports	Baseball Field
106	Weight Loss Center	Climbing Gym	Athletics & Sports

107 Gym / Fitness Center Climbing Gym Athletics & Sports

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue \
42	Climbing Gym	Athletics & Sports	Baseball Stadium
44	Baseball Field	Baseball Stadium	Basketball Court
45	Climbing Gym	Baseball Field	Basketball Court
46	Baseball Stadium	Basketball Court	Bike Trail
65	Athletics & Sports	Baseball Stadium	Basketball Court
66	Athletics & Sports	Baseball Stadium	Basketball Court
67	Baseball Field	Baseball Stadium	Basketball Court
68	Athletics & Sports	Baseball Stadium	Basketball Court
69	Baseball Field	Baseball Stadium	Basketball Court
71	Baseball Field	Basketball Court	Bike Trail
72	Athletics & Sports	Baseball Field	Baseball Stadium
73	Athletics & Sports	Baseball Field	Baseball Stadium
76	Baseball Field	Baseball Stadium	Basketball Court
77	Athletics & Sports	Baseball Field	Baseball Stadium
79	Weight Loss Center	Climbing Gym	Baseball Field
84	Athletics & Sports	Baseball Stadium	Basketball Court
85	Weight Loss Center	Athletics & Sports	Baseball Stadium
86	Athletics & Sports	Baseball Field	Baseball Stadium
88	Athletics & Sports	Baseball Field	Baseball Stadium
98	Baseball Stadium	Basketball Court	Bike Trail
99	Climbing Gym	Athletics & Sports	Baseball Stadium
104	Baseball Stadium	Basketball Court	Bike Trail
106	Baseball Field	Baseball Stadium	Basketball Court
107	Baseball Field	Baseball Stadium	Basketball Court

	9th Most Common Venue	10th Most Common Venue
42	Basketball Court	Bike Trail
44	Bike Trail	Boxing Gym
45	Bike Trail	Boxing Gym
46	Boxing Gym	Climbing Gym
65	Bike Trail	Boxing Gym
66	Bike Trail	Boxing Gym
67	Bike Trail	Boxing Gym
68	Bike Trail	Boxing Gym
69	Bike Trail	Boxing Gym
71	Boxing Gym	Climbing Gym
72	Bike Trail	Boxing Gym
73	Basketball Court	Bike Trail
76	Bike Trail	Boxing Gym
77	Basketball Court	Bike Trail
79	Basketball Court	Bike Trail
84	Bike Trail	Boxing Gym
85	Basketball Court	Bike Trail
86	Basketball Court	Bike Trail

88	Basketball Court	Bike Trail
98	Boxing Gym	Climbing Gym
99	Basketball Court	Bike Trail
104	Boxing Gym	Climbing Gym
106	Bike Trail	Boxing Gym
107	Bike Trail	Boxing Gym

## 4 Results

Most common sports facilities in cluster1 neighborhoods are Yoga Studios and Gym / Fitness Center

```
[135]: cluster1['Neighborhood']
```

```
[135]: 0      Marble Hill
      1      Chinatown
      2  Washington Heights
      3      Inwood
      18  Greenwich Village
      20  Lower East Side
      21      Tribeca
      22  Little Italy
      23      Soho
      28  Battery Park City
      29  Financial District
      32      Civic Center
      40      Bay Ridge
      41  Bensonhurst
      47  Manhattan Terrace
      55  Williamsburg
      56  Bushwick
      57  Bedford Stuyvesant
      58  Brooklyn Heights
      61      Red Hook
      70  Mill Island
      74  Borough Park
      75  Dyker Heights
      89  East Williamsburg
      90      North Side
      91      South Side
      92  Ocean Parkway
      93  Fort Hamilton
     100  Mill Basin
     101  Fulton Ferry
     102  Vinegar Hill
     105      Dumbo
     108      Madison
```



Name: Neighborhood, dtype: object

Most common sports facilities in cluster2 neighborhoods are Gyms

```
[136]: cluster2['Neighborhood']
```

```
[136]: 10      Lenox Hill
      11      Roosevelt Island
      13      Lincoln Square
      14      Clinton
      15      Midtown
      16      Murray Hill
      33      Midtown South
      34      Sutton Place
      35      Turtle Bay
      36      Tudor City
      39      Hudson Yards
      Name: Neighborhood, dtype: object
```

Most common sports facilities in cluster3 neighborhoods are Yoga Studios and Gyms

```
[137]: cluster3['Neighborhood']
```

```
[137]: 4      Hamilton Heights
      5      Manhattanville
      6      Central Harlem
      7      East Harlem
      8      Upper East Side
      9      Yorkville
     12      Upper West Side
     17      Chelsea
     19      East Village
     24      West Village
     25      Manhattan Valley
     26      Morningside Heights
     27      Gramercy
     30      Carnegie Hill
     31      Noho
     37      Stuyvesant Town
     38      Flatiron
     43      Greenpoint
     54      Brownsville
     83      Ocean Hill
     97      Remsen Village
      Name: Neighborhood, dtype: object
```

Most common sports facilities in cluster4 neighborhoods are Fields and Climbing Gyms

```
[138]: cluster4['Neighborhood']
```

```
[138]: 48          Flatbush
      49          Crown Heights
      50          East Flatbush
      51          Kensington
      52          Windsor Terrace
      53          Prospect Heights
      59          Cobble Hill
      60          Carroll Gardens
      62          Gowanus
      63          Fort Greene
      64          Park Slope
      78          Clinton Hill
      80          Downtown
      81          Boerum Hill
      82  Prospect Lefferts Gardens
      87          Prospect Park South
      94          Ditmas Park
      95          Wingate
      96          Rugby
     103          Weeksville
     109          Erasmus
      Name: Neighborhood, dtype: object
```

Most common sports facilities in cluster5 neighborhoods are Gyms and Gyms / Fitness Centers

```
[139]: cluster5['Neighborhood']
```

```
[139]: 42          Sunset Park
      44          Gravesend
      45          Brighton Beach
      46          Sheepshead Bay
      65          Cypress Hills
      66          East New York
      67          Starrett City
      68          Canarsie
      69          Flatlands
      71  Manhattan Beach
      72          Coney Island
      73          Bath Beach
      76  Gerritsen Beach
      77          Marine Park
      79          Sea Gate
      84          City Line
      85          Bergen Beach
      86          Midwood
```

```
88          Georgetown
98          New Lots
99    Paerdegat Basin
104    Broadway Junction
106          Homecrest
107    Highland Park
Name: Neighborhood, dtype: object
```

## 5 Discussion

Even though there are some variations in different clusters, it is notable that gyms, fitness centers, and yoga studios are the most common sports facilities that college students can find in New York City, especially nearby New York University buildings. It well reflects the trend of sports facilities college students prefer: weight training, yoga, and cardio workout.

## 6 Conclusion

This capstone project proves that the location of sports facilities reflects the needs of residents. As young people spend most of their time around New York University, the area around it is filled with sports facilities they like.