Recommendation System for Places to Open a Food Court Chain in New York City

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5-17-2019

1. Introduction

1.1 Background

The City of New York is the most populous city in the United States. With an estimated 2018 population of 8,398,748 distributed over a land area of about 302.6 square miles (784 km^2). New York is also the most densely populated major city in the United States. Located at the southern tip of the state of New York, the city is the center of the New York metropolitan area, the largest metropolitan area in the world by urban landmass and one of the world's most populous megacities, with an estimated 19,979,477 people in its 2018 Metropolitan Statistical Area and 22,679,948 residents in its Combined Statistical Area. A global power city, New York City has been described as the cultural, financial, and media capital of the world, and exerts a significant impact upon commerce, entertainment, research, technology, education, politics, tourism, art, fashion, and sports. The city's fast pace has inspired the term New York minute. Home to the headquarters of the United Nations, New York is an important center for international diplomacy.

The city and its metropolitan area constitute the premier gateway for legal immigration to the United States. As many as 800 languages are spoken in New York, making it the most linguistically diverse city in the world. New York City is home to more than 3.2 million residents born outside the United States, the largest foreign-born population of any city in the world.

1.2 Business Problem

New York is the most diverse city in the United States. The city manages to bring dishes from all over the world and make them it's own. Over the past few decades, food courts have become an important way of experiencing the cities diverse food culture at a reasonable price. This project aims to help any business person interested in opening a food court chain in New York City.

New York is also rich in educational institutions. A lot of colleges and universities are located in this city. Our target customer will be the students of colleges and universities. Based on the location of different college places like administrative building, a college library, college gym, etc. this project will recommend the best places to open a food court in different neighborhoods.

2. Data

2.1 Data Collection

Situated on one of the world's largest natural harbors, New York City consists of five boroughs, each of which is a separate county of the State of New York. The five boroughs – Brooklyn, Queens, Manhattan, The Bronx, and Staten Island – were consolidated into a single city in 1898.

This 5 boroughs consist of 306 neighborhoods. In order to segement the neighborhoods and explore them, we will essentially need a dataset that contains the 5 boroughs and the neighborhoods that exist in each borough as well as the the latitude and logitude coordinates of each neighborhood. This dataset exists for free on the web here- https://geo.nyu.edu/catalog/nyu_2451_34572 We will

then use Foursquare to get the college plases location. College & University ID for foursquare is: "4d4b7105d754a06372d81259".

2.2 Data Preprocessing

The given data was initially in json format. So, it is converted into a pandas dataframe consisting of Borough, Neighborhood, Latitude and Longitude.

	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

Figure 1: Initial dataframe consisting of neighborhood data

This dataframe has all the neighborhoods of 5 Boroughs and their geolocation. It is very easy therefore to insert them into a map using folium.
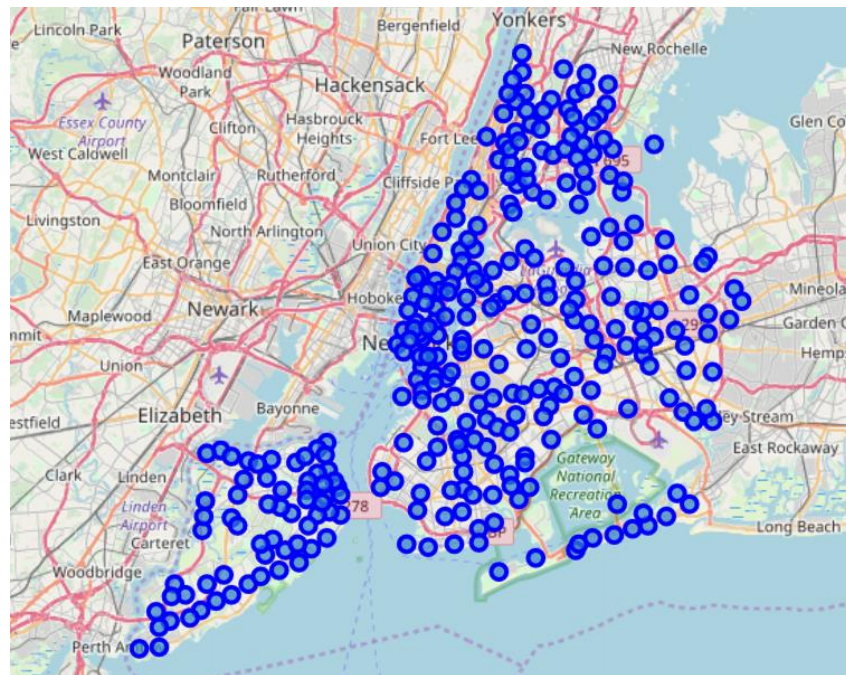
Figure 2: A map showing all the neighborhoods in New York City.

After that we used foursquare to find all the college places location in the New York City. Foursquare venue ID for colleges & universities is: "4d4b7105d754a06372d81259". We acquired the geolocation of all these places and added them to the initial dataframe according to the neighborhood they are located in.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Wakefield	40.894705	-73.847201	St. Theresa School	40.849301	-73.832999	College Academic Building
1	Wakefield	40.894705	-73.847201	O'Hare Hall	40.859291	-73.882599	College Residence Hall
2	Wakefield	40.894705	-73.847201	Fordham University - Rose Hill	40.861041	-73.885490	University
3	Wakefield	40.894705	-73.847201	Monroe College Jerome Hall & Campus Library	40.863212	-73.900518	General College & University
4	Wakefield	40.894705	-73.847201	Bronxnet	40.871987	-73.896252	College Administrative Building

Figure 3: Final dataframe consist of the geolocation the neighborhoods and desired venues located in them.

3. Methodology

3.1 Exploratory Data Analysis

Final dataframe is grouped by 'neighborhood' attribute. This shows how many desired venues located in each neighborhoods.

Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Allerton	50	50	50	50	50	50
Annadale	39	39	39	39	39	39
Arden Heights	45	45	45	45	45	45
Arlington	49	49	49	49	49	49
Arrochar	50	50	50	50	50	50
Arverne	16	16	16	16	16	16
Astoria	50	50	50	50	50	50
Astoria Heights	50	50	50	50	50	50
Auburndale	50	50	50	50	50	50
Bath Beach	50	50	50	50	50	50
Battery Park City	50	50	50	50	50	50
Bay Ridge	50	50	50	50	50	50
Bay Terrace	97	97	97	97	97	97
Baychester	50	50	50	50	50	50

Figure 4: Number of desired venues in each neighborhoods.

There are 71 unique categories in the dataframe. They were then one hot encoded.

	Neighborhood	Art Gallery	Athletics & Sports	Auditorium	Bookstore	Café	Church	Coffee Shop	College & University	College Academic Building	College Administrative Building	College Arts Building	College Auditorium	College Baseball Diamond	College Basketball Court
0	Wakefield	0	0	0	0	0	0	0	0	1	0	0	0	0	0
1	Wakefield	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Wakefield	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Wakefield	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Wakefield	0	0	0	0	0	0	0	0	0	1	0	0	0	0

Figure 5: Dataframe with all the categories one hot encoded.

Then we grouped rows by neighborhood and by taking the mean of the frequency of occurrence of each category.

	Neighborhood	Art Gallery	Athletics & Sports	Auditorium	Bookstore	Café	Church	Coffee Shop	College & University	College Academic Building	College Administrative Building	College Arts Building	College Auditorium	College Baseball Diamond
0	Allerton	0.0	0.00	0.00	0.000000	0.0	0.00	0.000000	0.000000	0.260000	0.100000	0.020000	0.020000	0.000000
1	Annadale	0.0	0.00	0.00	0.000000	0.0	0.00	0.000000	0.000000	0.076923	0.000000	0.000000	0.000000	0.000000
2	Arden Heights	0.0	0.00	0.00	0.022222	0.0	0.00	0.000000	0.000000	0.088889	0.000000	0.000000	0.000000	0.000000
3	Arlington	0.0	0.00	0.00	0.020408	0.0	0.00	0.000000	0.040816	0.204082	0.142857	0.020408	0.020408	0.020408
4	Arrochar	0.0	0.00	0.00	0.000000	0.0	0.00	0.020000	0.000000	0.060000	0.100000	0.000000	0.020000	0.000000
5	Arverne	0.0	0.00	0.00	0.000000	0.0	0.00	0.000000	0.125000	0.437500	0.062500	0.000000	0.000000	0.000000
6	Astoria	0.0	0.00	0.00	0.000000	0.0	0.00	0.000000	0.000000	0.220000	0.100000	0.000000	0.000000	0.000000
7	Astoria Heights	0.0	0.00	0.00	0.000000	0.0	0.00	0.000000	0.000000	0.120000	0.120000	0.020000	0.000000	0.000000
8	Auburndale	0.0	0.00	0.00	0.000000	0.0	0.00	0.000000	0.020000	0.140000	0.100000	0.060000	0.020000	0.020000
9	Bath Beach	0.0	0.00	0.00	0.000000	0.0	0.00	0.000000	0.000000	0.200000	0.000000	0.060000	0.000000	0.000000
10	Battery Park City	0.0	0.02	0.02	0.000000	0.0	0.00	0.000000	0.000000	0.260000	0.060000	0.000000	0.040000	0.000000
11	Bay Ridge	0.0	0.00	0.00	0.000000	0.0	0.00	0.000000	0.000000	0.120000	0.040000	0.000000	0.000000	0.000000
12	Bay Terrace	0.0	0.00	0.00	0.010309	0.0	0.00	0.010309	0.000000	0.144330	0.072165	0.041237	0.030928	0.000000
13	Baychester	0.0	0.00	0.00	0.000000	0.0	0.00	0.000000	0.000000	0.280000	0.100000	0.020000	0.000000	0.000000
14	Bayside	0.0	0.00	0.00	0.000000	0.0	0.00	0.000000	0.020000	0.140000	0.100000	0.060000	0.020000	0.020000

Figure 6: Dataframe with rows grouped by neighborhood.

We sorted the venues in descending order. Then we created a new dataframe displaying the top 10 venues for each neighborhood.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Allerton	College Academic Building	College Administrative Building	General College & University	College Residence Hall	College Library	College Quad	College Cafeteria	Medical School	College Gym	Student Center
1	Annadale	University	Sorority House	General College & University	College Classroom	College Academic Building	Fraternity House	Student Center	Gym	Trade School	College Theater
2	Arden Heights	University	General College & University	Sorority House	College Academic Building	College Classroom	College Gym	Fraternity House	College Bookstore	Gym	Trade School
3	Arlington	College Academic Building	College Administrative Building	College Science Building	General College & University	Community College	University	Student Center	College & University	College Cafeteria	Gym / Fitness Center
4	Arrochar	General College & University	College Administrative Building	College Residence Hall	Student Center	University	College Academic Building	College Classroom	College Science Building	College Quad	College Football Field

Figure 7: A new dataframe displaying the top 10 venues for each neighborhood.

3.2 Clustering

Finally, we clustered the venues to find the suitable locations for the food court chain. We used K-means clustering and the number of clusters is set to 10.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Allerton	College Academic Building	College Administrative Building	General College & University	College Residence Hall	College Library	College Quad	College Cafeteria	Medical School	College Gym	Student Center
1	Annadale	University	Sorority House	General College & University	College Classroom	College Academic Building	Fraternity House	Student Center	Gym	Trade School	College Theater
2	Arden Heights	University	General College & University	Sorority House	College Academic Building	College Classroom	College Gym	Fraternity House	College Bookstore	Gym	Trade School
3	Arlington	College Academic Building	College Administrative Building	College Science Building	General College & University	Community College	University	Student Center	College & University	College Cafeteria	Gym / Fitness Center
4	Arrochar	General College & University	College Administrative Building	College Residence Hall	Student Center	University	College Academic Building	College Classroom	College Science Building	College Quad	College Football Field

Figure 8: venues clustered to get the most suitable places for food courts.

	Borough	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Bronx	Wakefield	40.894705	-73.847201	6	College Academic Building	General College & University	College Administrative Building	College Residence Hall	College Quad	College Gym	College Cafeteria	College Library	College Classroom	University
1	Bronx	Co-op City	40.874294	-73.829939	6	College Academic Building	College Residence Hall	College Administrative Building	College Cafeteria	College Gym	College Library	Medical School	General College & University	Student Center	University
2	Bronx	Eastchester	40.887556	-73.827806	6	College Academic Building	College Residence Hall	College Gym	General College & University	University	College Cafeteria	College Classroom	Medical School	College Library	College Auditorium
3	Bronx	Fieldston	40.895437	-73.905643	6	College Academic Building	General College & University	College Administrative Building	College Gym	College Library	College Residence Hall	College Quad	Student Center	College Classroom	College Cafeteria
4	Bronx	Riverdale	40.890834	-73.912585	6	College Academic Building	General College & University	College Administrative Building	College Library	College Residence Hall	College Gym	College Quad	Student Center	College Classroom	College Cafeteria

Figure 9: Clustered venues with the neighborhood they are located in.

4. Results

We finally visualize the resulting clusters by adding them to a map of New York City using folium. It is the final results that shows our recommended places to open food courts. Apparently, there are a lot of places suitable for opening food courts. So we ranked them by the density of venues shown in figure-9 and provided top 10 places best suited as a place to open food court chain.

Figure 10: Recommended place to open a food court shown in map.

Here are the results of 10 clusters.

Cluster-1:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
169	Rosedale	College Academic Building	General College & University	College Library	Student Center	College Classroom	Fraternity House	University	College Gym	College Rec Center	College Administrative Building
188	Laurelton	Student Center	College Academic Building	College Library	General College & University	College Gym	College Classroom	College Rec Center	Fraternity House	Trade School	Medical School
193	Brookville	College Academic Building	Student Center	College Library	College Classroom	Fraternity House	General College & University	College Gym	College Rec Center	University	Trade School
213	Great Kills	General College & University	College Classroom	College Academic Building	College Science Building	University	Trade School	Sorority House	College Administrative Building	Fraternity House	College Communications Building
214	Eltingville	General College & University	College Academic Building	College Classroom	College Science Building	University	Trade School	Sorority House	College Administrative Building	College Lab	Fraternity House
215	Annadale	University	Sorority House	General College & University	College Classroom	College Academic Building	Fraternity House	Student Center	Gym	Trade School	College Theater

Cluster-2:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
46	Bay Ridge	General College & University	College Academic Building	Student Center	College Classroom	College Residence Hall	College Administrative Building	Elementary School	College Quad	University	School
71	Cypress Hills	General College & University	College Academic Building	College Classroom	Student Center	College Administrative Building	Trade School	College Auditorium	High School	College Arts Building	College Rec Center
72	East New York	College Academic Building	General College & University	College Administrative Building	Student Center	College Classroom	College Science Building	Medical School	College Library	University	School
81	Dyker Heights	General College & University	Student Center	College Academic Building	College Classroom	College Residence Hall	College Administrative Building	University	Elementary School	Middle School	College Bookstore
85	Sea Gate	General College & University	College Classroom	Student Center	College Academic Building	College Bookstore	College Arts Building	Elementary School	College Communications Building	College Track	Community College
99	Fort Hamilton	General College & University	College Academic Building	Student Center	College Administrative Building	College Residence Hall	College Classroom	University	Elementary School	College Quad	College Arts Building

Cluster-3:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
19	High Bridge	College Academic Building	College Library	College Residence Hall	Student Center	General College & University	College Arts Building	College Administrative Building	College Cafeteria	College Quad	College Science Building
20	Melrose	College Academic Building	College Library	College Residence Hall	Student Center	General College & University	College Arts Building	College Administrative Building	College Cafeteria	College Quad	College Science Building
21	Mott Haven	College Academic Building	College Library	Student Center	College Residence Hall	General College & University	College Science Building	College Quad	College Cafeteria	College Administrative Building	College Arts Building
22	Port Morris	College Academic Building	College Library	College Residence Hall	Student Center	College Administrative Building	College Arts Building	Hospital	College Quad	College Cafeteria	Deli / Bodega
43	Concourse	College Academic Building	College Library	College Residence Hall	Student Center	General College & University	College Arts Building	College Administrative Building	College Cafeteria	College Quad	College Science Building
49	Greenpoint	College Academic Building	College Administrative Building	College Library	Law School	University	College Auditorium	Hospital	College Theater	Student Center	College Technology Building
61	Williamsburg	College Academic Building	College Administrative Building	College Library	Hospital	University	College Auditorium	General College & University	Law School	Student Center	College Theater

Cluster-4:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Wakefield	College Academic Building	General College & University	College Administrative Building	College Residence Hall	College Quad	College Gym	College Cafeteria	College Library	College Classroom	University
1	Co-op City	College Academic Building	College Residence Hall	College Administrative Building	College Cafeteria	College Gym	College Library	Medical School	General College & University	Student Center	University
2	Eastchester	College Academic Building	College Residence Hall	College Gym	General College & University	University	College Cafeteria	College Classroom	Medical School	College Library	College Auditorium
3	Fieldston	College Academic Building	General College & University	College Administrative Building	College Gym	College Library	College Residence Hall	College Quad	Student Center	College Classroom	College Cafeteria
4	Riverdale	College Academic Building	General College & University	College Administrative Building	College Library	College Residence Hall	College Gym	College Quad	Student Center	College Classroom	College Cafeteria
5	Kingsbridge	College Academic Building	General College & University	Medical School	College Residence Hall	College Administrative Building	Student Center	College Library	College Science Building	University	College Classroom

Cluster-5:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
38	Schuylerville	College Academic Building	College Classroom	College Residence Hall	Student Center	College Rec Center	Fraternity House	College Administrative Building	Medical School	University	High School
40	Castle Hill	College Academic Building	College Classroom	Medical School	College Residence Hall	University	College Rec Center	College Administrative Building	Trade School	High School	Student Center
47	Bensonhurst	College Academic Building	General College & University	College Classroom	College Quad	University	Student Center	Elementary School	College Arts Building	College Cafeteria	College Bookstore
48	Sunset Park	College Academic Building	General College & University	College Classroom	College Library	College Rec Center	College Quad	Elementary School	College Cafeteria	Medical School	College Administrative Building
50	Gravesend	College Academic Building	General College & University	College Classroom	College Arts Building	College Cafeteria	College Math Building	College Quad	Elementary School	College Bookstore	College Library
51	Brighton Beach	College Academic Building	College Classroom	General College & University	College Math Building	College Arts Building	College Quad	College Cafeteria	College Library	College Science Building	Medical School

Cluster-6:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
48	Sunset Park	College Academic Building	General College & University	College Classroom	College Library	College Rec Center	College Quad	Elementary School	College Cafeteria	Medical School	College Administrative Building
54	Flatbush	College Academic Building	College Classroom	General College & University	College Library	Elementary School	College Gym	College Lab	Medical School	College Quad	College Cafeteria
55	Crown Heights	College Academic Building	College Library	College Classroom	General College & University	College Lab	College Cafeteria	College Quad	College Administrative Building	Medical School	Law School
56	East Flatbush	College Academic Building	College Classroom	General College & University	College Library	College Quad	College Gym	College Lab	Medical School	College Cafeteria	College Science Building
57	Kensington	College Academic Building	College Library	College Classroom	General College & University	College Lab	College Quad	College Cafeteria	College Gym	Medical School	Elementary School
58	Windsor Terrace	College Academic Building	College Classroom	College Library	General College & University	College Quad	College Lab	College Cafeteria	College Administrative Building	College Arts Building	College Theater
59	Prospect Heights	College Academic Building	General College & University	College Classroom	College Lab	College Administrative Building	College Quad	College Library	College Arts Building	College Theater	College Cafeteria

Cluster-7:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Wakefield	College Academic Building	General College & University	College Administrative Building	College Residence Hall	College Quad	College Gym	College Cafeteria	College Library	College Classroom	University
1	Co-op City	College Academic Building	College Residence Hall	College Administrative Building	College Cafeteria	College Gym	College Library	Medical School	General College & University	Student Center	University
2	Eastchester	College Academic Building	College Residence Hall	College Gym	General College & University	University	College Cafeteria	College Classroom	Medical School	College Library	College Auditorium
3	Fieldston	College Academic Building	General College & University	College Administrative Building	College Gym	College Library	College Residence Hall	College Quad	Student Center	College Classroom	College Cafeteria
4	Riverdale	College Academic Building	General College & University	College Administrative Building	College Library	College Residence Hall	College Gym	College Quad	Student Center	College Classroom	College Cafeteria
5	Kingsbridge	College Academic Building	General College & University	Medical School	College Residence Hall	College Administrative Building	Student Center	College Library	College Science Building	University	College Classroom

Cluster-8:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
191	Rockaway Park	College Academic Building	College Communications Building	College Engineering Building	College Football Field	College Gym	College Lab	College Library	College Math Building	College Quad	Yoga Studio

Cluster-9:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
47	Bensonhurst	College Academic Building	General College & University	College Classroom	College Quad	University	Student Center	Elementary School	College Arts Building	College Cafeteria	College Bookstore
50	Gravesend	College Academic Building	General College & University	College Classroom	College Arts Building	College Cafeteria	College Math Building	College Quad	Elementary School	College Bookstore	College Library
51	Brighton Beach	College Academic Building	College Classroom	General College & University	College Math Building	College Arts Building	College Quad	College Cafeteria	College Library	College Science Building	Medical School
52	Sheepshead Bay	College Academic Building	College Classroom	General College & University	College Arts Building	College Library	College Cafeteria	College Math Building	School	College Quad	High School
53	Manhattan Terrace	College Academic Building	General College & University	College Classroom	College Library	College Cafeteria	Elementary School	Medical School	College Math Building	University	Student Center

Cluster-10:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
72	East New York	College Academic Building	General College & University	College Administrative Building	Student Center	College Classroom	College Science Building	Medical School	College Library	University	School
73	Starrett City	College Academic Building	Student Center	General College & University	College Administrative Building	College Science Building	College Library	College Classroom	Medical School	College Cafeteria	School
140	Sunnyside	College Academic Building	College Administrative Building	General College & University	College Library	College Science Building	University	Student Center	College Residence Hall	College Communications Building	College Cafeteria
155	Glen Oaks	General College & University	College Residence Hall	Medical School	College Academic Building	University	College Library	College Arts Building	College Administrative Building	College Science Building	College Lab
156	Bellerose	General College & University	College Administrative Building	College Academic Building	College Residence Hall	College Cafeteria	Medical School	College Library	University	College Bookstore	College Quad
168	Cambria Heights	College Administrative Building	Student Center	College Cafeteria	General College & University	College Residence Hall	College Gym	College Classroom	College Academic Building	College Bookstore	University

5. Discussion

Foursquare sandbox developer account is used to collect the venue data. So, the number of calls can be made per day is limited. With this limited resource we tried our best to make a practical recommendation. We see from the map that Manhattan area has the most dense suitable places to open a food court. Although the accuracy of our recommendation cannot be evaluated easily Any businessperson use these finding and use it with other practical observations to make better decisions.

6. Conclusion

This recommendation system can be enhanced in many ways. We can use the approximate number of students in a given venue to make better decision. Also, as food courts are mobile shops, we can move them from time to time to better exploit the recommendation. Obviously, these will require additional timeframe attribute to figure out places are most occupied by students between which time. This will increase our recommendation result more viable and robust.