OPENING A NEW ETHIOPIAN RESTAURANT/FOOD STORE IN NEW YORK CITY NEIGHBORHOOD WITH THE LARGEST ETHIOPIAN COMMUNITY

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1 Introduction

1.1 Goal of the project:

To use the principles of data science along with the Foursquare API to explore the neighborhoods of New York City in order to locate the area with the highest Ethiopian population and see if there are Ethiopian restaurants or food stores that can support the community within a close proximity.

1.2 Why the need to open Ethiopian Restaurant/store

- To seize a stable business opportunity especially If there is no competition in the area. (If no other Ethiopian restaurants are located here.)
- To create community networking and public relation among Ethiopians in the area.
- To provide Injera also knows as the Ethiopian spongy bread with a reasonable price to the community since making this bread at home will cost a lot of time and money. (Injera is the crepe-like bread made from the grain teff on which spicy Ethiopian food is served and eaten communally by hand).
- Many Americans and people with no Ethiopian heritage are looking for new food experience and this provides the opportunity to let customers try and enjoy a broad range of tasty exotic dishes.

1.3 Ethiopia

Ethiopia is one of the world's oldest countries, its territorial extent having varied over the millennia of its existence. In ancient times it remained centered on Aksum, an imperial capital located in the northern part of the modern state, about 100 miles (160 km) from the Red Sea coast. Located on the Horn of Africa. The country lies completely within the tropical latitudes and is relatively compact, with similar north-south and east-west dimensions. The capital is Addis Ababa ("New Flower"), located almost at the center of the country.

Fig 1: Map showing the country Ethiopia

1.4 Little Ethiopia

Many Ethiopians fled their homeland in the 1980s because of political turmoil and a famine that lasted from 1983 to 1985. In 1980, the U.S. Census Bureau counted just 10,000 Ethiopian immigrants. Three decades later, the census counted 251,000 Ethiopian immigrants and children. And thousands have settled in Minneapolis, Seattle, Atlanta, New York, Washington DC and other cities.

1.5 When did they come to New York?

Ethiopians began arriving in Metro New York when the Marxist regime came to power in the 1970s. The 1980 refuge act opened the door for thousands who had escaped Ethiopia and were living in Sudan to come to US as refugees. A border war in the late 1990s with Eritrea created another wave of refugees. According to the US census bureau, around 4,610 Ethiopians live around New York City.

1.6 Where do they live in New York City?

The closest thing Metro New York has to a “Little Ethiopia” is a large concentration of Ethiopians living in the Parkchester condominium complex in Southeast Bronx. Smaller groups are located in Jersey City and the St. Cloud section of East Orange, New Jersey, while others are scattered throughout Metro New York.

1.7 Ethiopian Cuisine

Ethiopian cuisine characteristically consists of vegetable and often very spicy meat dishes. This is usually in the form of *wat*, a thick stew, served atop *injera*, a large sourdough flatbread, which is about 50 centimeters (20 inches) in diameter and made out of fermented teff flour

1.7.1 Injera

This is perhaps the most important foodstuff in Ethiopian cuisine, as it serves not only as a source of protein and vitamins but also as your serving utensils and, often, your plate. *Injera* is a flatbread made from teff, a grass (not a grain, like wheat) that's fermented with water for several days before being baked into large, floppy pancakes that have the texture of crepes and the taste of sourdough bread. Teff flour is incredibly high in fiber, iron and calcium. It has all the amino acids required to be a complete protein, but it's also gluten-free. It's kind of a miracle food. To eat Ethiopian food, simply tear off a piece of injera, grab some food with it, roll it up, pop the whole thing into your mouth and repeat until finished. Most restaurants will bring you silverware if you ask for it, but eating food this way is traditional and shows camaraderie among your dining companions -- especially as everyone usually eats from the same plate and most Ethiopians feed each other as they dine, not just themselves.

1.7.2 Berbere

This is the chief spice blend found in Ethiopian cooking, a fragrant blend that's somewhere between Indian curry and Southwestern chili powder. It's a dark red blend of sun-dried chiles, ginger, garlic, cardamom, nutmeg, cloves, cumin, coriander and other spices.

2. Data Requirement and Methodology

2.1 Data

2.1.1 Data from US Census bureau and migration policy

Reports from US Census bureau and migration policy Institute will be used to identify the area with the large Ethiopian community in New York City. The data can be found in the following link: https://www.migrationpolicy.org/article/sub-saharan-african-immigrants-united-states-2018#Distribution

https://www.census.gov/content/dam/Census/library/publications/2017/acs/acs-34.pdf

2.1.2 Data from New York University Spatial Data Repository

Data from NYU will be used to explore the boroughs and neighborhoods of New York City. The data can be found in the following link: https://geo.nyu.edu/catalog/nyu_2451_34572

2.1.3 Using the Foursquare API

The explore function will be used to get the most common venue categories in each neighborhood.

2.2 Methodology

Below are the steps that needs to be followed to accomplish the goal of this project:

2.2.1 Identifying the borough with the highest Ethiopian Community by analyzing data obtained from the US Census bureau and migration policy Institute.

2.2.2 Identifying the neighborhoods with the highest Ethiopian Community by analyzing data obtained from the US Census bureau and migration policy Institute.

2.2.3 Identifying all restaurants within a mile of the neighborhood with the highest Ethiopian community by using data from New York University along with the Foursqaure API's explore function to get the most common venue categories in each neighborhood, and then use this feature to group the neighborhoods into clusters.

2.2.4 Verifying If any Ethiopian restaurant/store is present with in the identified restaurants lists in the previous step.

3. Data Preparation and Exploratory Data Analysis

3.1 Data Preparation

Data preparation for this project required reviewing various reports and literatures to identify the areas in New York City with the highest Ethiopian population. In addition to that, a json file containing New York City neighborhoods and boroughs was downloaded from the New York University Spatial Data Repository website. Once downloaded, the data was cleaned up and converted to a pandas dataframe to perform the required data analysis.

	Borough	Neighborhood	Latitude	Longitude
301	Manhattan	Hudson Yards	40.756658	-74.000111
302	Queens	Hammels	40.587338	-73.805530
303	Queens	Bayswater	40.611322	-73.765968
304	Queens	Queensbridge	40.756091	-73.945631
305	Staten Island	Fox Hills	40.617311	-74.081740

Fig 3: Dataframe showing NYC neighborhoods and boroughs

3.2 Exploratory Data Analysis

Based on literature review we found out most Ethiopians reside in the Bronx area particularly in the Parkchester neighborhood. As a result, we will focus and explore the Bronx borough and Parkchester neighborhood to see If we can find Ethiopian restaurant that can support the community.

3.2.1 Use geopy library to get the latitude and longitude values of Bronx, New York (to create a map of the Bronx with neighborhoods superimposed on top)

Fig 4: Map showing the Bronx with neighborhoods superimposed on top

3.2.2 Let's slice the original dataframe and create a new dataframe of the Bronx data shown in the previous Map

	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

Fig 5: Sliced Dataframe showing the Bronx neighborhoods

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

The first step in this process is to extract the Parkchester Neighborhood from the sliced dataframe (data containing only the Bronx neighborhoods from the previous step) since the reviewed reports confirmed most Ethiopians live around the area.

	index	Borough	Neighborhood	Latitude	Longitude
0	29	Bronx	Parkchester	40.837938	-73.856003

Fig 6: The Parkchester dataframe

3.1.5 Now, let's get the top 150 venues that are in Parkchester within a radius of 1 mile (1500 meters)

Although the venues search limit was set to 150, the explore function of the foursquare API returned only 100 Venues and no Ethiopian restaurants were among the lists.

	name	categories	lat	lng
0	Taqueria Tlaxcali	Mexican Restaurant	40.836098	-73.854948
1	Brisas Del Caribe Restaurant	Latin American Restaurant	40.832128	-73.851270
2	Metropolitan Oval	Plaza	40.838143	-73.860080
3	Jerry's Pizza	Pizza Place	40.835879	-73.855631
4	Brisas Express	Spanish Restaurant	40.834646	-73.862933

Fig 7: A sample table showing Venues that are located within a mile of the Parkchester neighborhood.

As you can see from the above list there is no Ethiopian restaurant/Store close to the area with the highest Ethiopian community. So let's explore the other neighborhoods further.

3.1.6 Explore Neighborhoods in the Bronx

In this step we will explore the neighborhoods in the Bronx within a search radius of 500 meters and group by neighborhood to check the number of venues returned for each neighborhood.

	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Neighborhood						
Allerton	29	29	29	29	29	29
Baychester	20	20	20	20	20	20
Bedford Park	33	33	33	33	33	33
Belmont	98	98	98	98	98	98
Bronxdale	12	12	12	12	12	12
Castle Hill	7	7	7	7	7	7
City Island	28	28	28	28	28	28
Claremont Village	18	18	18	18	18	18
Clason Point	10	10	10	10	10	10
Co-op City	16	16	16	16	16	16
Concourse	23	23	23	23	23	23
Concourse Village	37	37	37	37	37	37
Country Club	4	4	4	4	4	4
East Tremont	20	20	20	20	20	20
Eastchester	21	21	21	21	21	21
Edenwald	3	3	3	3	3	3
Edgewater Park	21	21	21	21	21	21
Fieldston	4	4	4	4	4	4
Fordham	86	86	86	86	86	86
High Bridge	27	27	27	27	27	27
Hunts Point	14	14	14	14	14	14
Kingsbridge	74	74	74	74	74	74
Kingsbridge Heights	36	36	36	36	36	36
Longwood	8	8	8	8	8	8
Melrose	31	31	31	31	31	31
Morris Heights	8	8	8	8	8	8
Morris Park	25	25	25	25	25	25

Fig 8: A sample table showing Number of Venues for each neighborhood in the Bronx

3.1.7 Analyze Each Neighborhood

First, we will use one hot coding to create a new dataframe and analyze each neighborhood.

	Neighborhood	Accessories Store	African Restaurant	American Restaurant	Arcade	Arepa Restaurant	Art Gallery	Art Museum	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	Automotive Shop	BBQ Joint	Bagel Shop	Baker
0	Wakefield	0	0	0	0	0	0	0	0	0	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	0	0	0	0	0

Fig 9: A sample table showing the one hot coding based dataframe

Next, we will group rows by neighborhood and by taking the mean of the frequency of occurrence of each category.

11	Concourse Village	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
12	Country Club	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.25	0.000000	0.000000	0.0
13	East Tremont	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.050000	0.00	0.000000	0.000000	0.0
14	Eastchester	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.047619	0.000000	0.0
15	Edenwald	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
16	Edgewater Park	0.000000	0.000000	0.047619	0.00	0.00	0.000000	0.000000	0.000000	0.047619	0.00	0.000000	0.000000	0.0
17	Fieldston	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
18	Fordham	0.011628	0.011628	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
19	High Bridge	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.037037	0.00	0.000000	0.000000	0.0
20	Hunts Point	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.071429	0.0
21	Kingsbridge	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
22	Kingsbridge Heights	0.000000	0.000000	0.027778	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
23	Longwood	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
24	Melrose	0.000000	0.000000	0.000000	0.00	0.00	0.032258	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
25	Morris Heights	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
26	Morris Park	0.000000	0.000000	0.000000	0.00	0.04	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.040000	0.0
27	Morrisania	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
28	Mott Haven	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
29	Mount Eden	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
30	Mount Hope	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
31	North Riverdale	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
32	Norwood	0.000000	0.000000	0.033333	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
33	Olinville	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.0
34	Parkchester	0.000000	0.000000	0.064516	0.00	0.00	0.000000	0.000000	0.000000	0.032258	0.00	0.000000	0.000000	0.0
35	Pelham Bay	0.000000	0.000000	0.000000	0.00	0.00	0.000000	0.000000	0.000000	0.025641	0.00	0.000000	0.025641	0.0

Fig 10: A sample table showing the mean of the frequency of occurrence of each category for each neighborhood

And now let's create the new dataframe and display 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	Pizza Place	Deli / Bodega	Supermarket	Chinese Restaurant	Playground	Breakfast Spot	Bus Station	Martial Arts School	Pharmacy	Donut Shop
1	Baychester	Donut Shop	Mattress Store	Fried Chicken Joint	Convenience Store	Pizza Place	Discount Store	Electronics Store	Sandwich Place	Bus Station	Fast Food Restaurant
2	Bedford Park	Diner	Pizza Place	Chinese Restaurant	Mexican Restaurant	Deli / Bodega	Pharmacy	Sandwich Place	Supermarket	Bus Station	Donut Shop
3	Belmont	Italian Restaurant	Pizza Place	Deli / Bodega	Bakery	Bank	Dessert Shop	Donut Shop	Grocery Store	Smoke Shop	Sandwich Place
4	Bronxdale	Mexican Restaurant	Performing Arts Venue	Bank	Paper / Office Supplies Store	Chinese Restaurant	Eastern European Restaurant	Gym	Spanish Restaurant	Italian Restaurant	Pizza Place

Fig 11: A sample table showing the top 10 venues for each neighborhood.

3.1.8 Clustering using the K-means algorithm

We have some common venue categories in the neighborhoods. In this reason I used unsupervised learning K-means algorithm to cluster the neighborhoods and I will use a degree of 5 for this project.

The first step in this process is to create a new dataframe that includes the cluster as well as the top 10 venues for each neighborhood.

	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 M Comr Venue
0	Bronx	Wakefield	40.894705	-73.847201	1	Pharmacy	Ice Cream Shop	Gas Station	Pizza Place	Deli / Bodega	Dessert Shop	Sandwich Place	Laundromat	Donut Shop
1	Bronx	Co-op City	40.874294	-73.829939	0	Bus Station	Fast Food Restaurant	Pizza Place	Grocery Store	Baseball Field	Optical Shop	Bagel Shop	Restaurant	Chine Resta
2	Bronx	Eastchester	40.887556	-73.827806	0	Caribbean Restaurant	Deli / Bodega	Diner	Convenience Store	Metro Station	Platform	Chinese Restaurant	Donut Shop	Seafo Resta
3	Bronx	Fieldston	40.895437	-73.905643	0	Plaza	Music Venue	River	Bus Station	Doctor's Office	Fish & Chips Shop	Fast Food Restaurant	Farmers Market	Eye Docto
4	Bronx	Riverdale	40.890834	-73.912585	4	Park	Plaza	Food Truck	Bus Station	Bank	Gym	Donut Shop	Fish & Chips Shop	Fast F Resta

Fig 12: A sample table showing the clusters with the associated top 10 venues

Let’s visualize the resulting clusters.

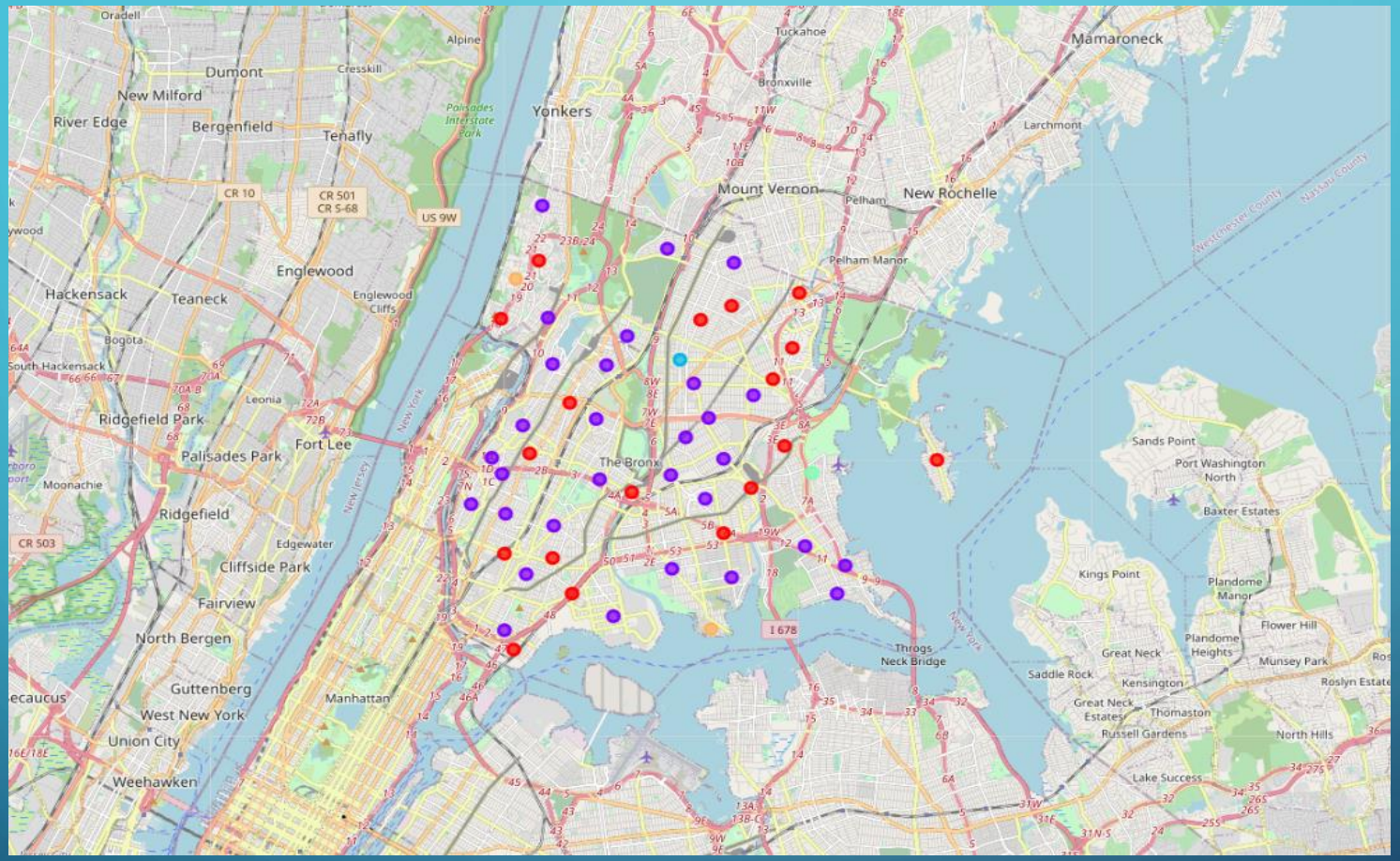

Fig 13: A map showing the clusters

The final step is to examine the clusters and below is a sample table showing the results.

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
1	Co-op City	Bus Station	Fast Food Restaurant	Pizza Place	Grocery Store	Baseball Field	Optical Shop	Bagel Shop	Restaurant	Chinese Restaurant	Discount Store
2	Eastchester	Caribbean Restaurant	Deli / Bodega	Diner	Convenience Store	Metro Station	Platform	Chinese Restaurant	Donut Shop	Seafood Restaurant	Bus Stop
3	Fieldston	Plaza	Music Venue	River	Bus Station	Doctor's Office	Fish & Chips Shop	Fast Food Restaurant	Farmers Market	Eye Doctor	Electronics Store
8	Williamsbridge	Dance Studio	Soup Place	Nightclub	Bar	Caribbean Restaurant	Eastern European Restaurant	Fish Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
9	Baychester	Donut Shop	Mattress Store	Fried Chicken Joint	Convenience Store	Pizza Place	Discount Store	Electronics Store	Sandwich Place	Bus Station	Fast Food Restaurant

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
0	Wakefield	Pharmacy	Ice Cream Shop	Gas Station	Pizza Place	Deli / Bodega	Dessert Shop	Sandwich Place	Laundromat	Donut Shop	Fish & Chips Shop
5	Kingsbridge	Pizza Place	Bar	Latin American Restaurant	Bakery	Sandwich Place	Mexican Restaurant	Supermarket	Deli / Bodega	Pharmacy	Donut Shop
6	Woodlawn	Deli / Bodega	Playground	Bar	Pub	Pizza Place	Food Truck	Indian Restaurant	Train Station	Trail	Italian Restaurant
7	Norwood	Pizza Place	Park	Bank	Pharmacy	Fast Food Restaurant	Cafeteria	Mexican Restaurant	Burger Joint	Bus Station	Mobile Phone Shop
10	Pelham Parkway	Pizza Place	Italian Restaurant	Frozen Yogurt Shop	Sandwich Place	Eye Doctor	Sushi Restaurant	Bank	Smoke Shop	Gas Station	Spa

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
40	Olinville	Caribbean Restaurant	Convenience Store	Metro Station	Basketball Court	Supermarket	Food	Deli / Bodega	Discount Store	Distillery	Flower Shop

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
28	Country Club	Sandwich Place	Playground	Athletics & Sports	Donut Shop	Flower Shop	Fish Market	Fish & Chips Shop	Fast Food Restaurant	Farmers Market	Eye Doctor

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
4	Riverdale	Park	Plaza	Food Truck	Bus Station	Bank	Gym	Donut Shop	Fish & Chips Shop	Fast Food Restaurant	Farmers Market
26	Clason Point	Park	Pool	South American Restaurant	Boat or Ferry	Bus Stop	Grocery Store	Convenience Store	Discount Store	Electronics Store	Dance Studio

5 Discussion and Conclusion

5.1 Discussion

Based on the above result, it can be said Ethiopian restaurants aren't common or can't be accessed in the Bronx area. The result also shows African restaurants aren't in the top 10 Venue list among the different neighborhoods. By extracting the list of all venues within a mile of Parkchester, Bronx the area known for larger Ethiopian residence, we found out there are no Ethiopian restaurants that can support the community.

5.2 Conclusion

Around 4500 Ethiopians residents are located in the South Bronx area and particularly the Parkchester condominium complex. However, there is no Ethiopian restaurant in the area that can provide the community with networking opportunity and local food. Opening Ethiopian restaurant close to this area can be beneficial financially since there will be a demand for the famous Injera bread which is required to complete every Ethiopian meal. The restaurant also provides others in the area that are looking for new food experience but most of all It will create an environment where Ethiopians can gather and enjoy their company.

6.0 Reference

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