The Battle of Neighborhoods - Chicago

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1. Introduction

1.1 Background

NeoCon (National Exposition of Contract Interior Furnishings) is held every June at The Mart in Chicago since 1969. As an architect I have always tried to attend this exposition which serves as the country's largest commercial interior design launch pad for innovative ideas and products for the built environment. Around 500 industry's major manufacturers and emerging companies showcase thousands of new products and services at NeoCon. 50,000 design professionals from all over the country converge at NeoCon to connect, learn and do business. Additionally the tradeshow is thrown open to the public as well.

1.2 Business problem

For the first time in its 51 year history due to Covid-19 the NeoCon was held virtually but plans are already being made for next year's NeCon 2021 which is definitely going to be bigger and better than any of the past years. The thousands of visitors that are expected to visit Chicago during the time usually pick restaurants close to The Mart (for convenience.

The objective of this project is to use Foursquare location data and regional clustering of restaurant types to highlight the best restaurants/cuisines in different neighborhoods of the city. Such a database would enable the visitors to have a richer experience of visiting a fabulous city like Chicago while getting the most of the exposition.

1.3 Interest

Besides NeoCon, Chicago is an extremely popular tourist city with nearly 58 million (57.6 million visitors recorded in 2018 according to Chicago's tourism bureau) people visiting every year. All these visitors could also find this database helpful in exploring the city and enjoying great meals in diverse neighborhoods of the city.

2. Data

The data used for this project consists of 3 parts:

1) A list of Chicago Neighborhoods from Wikipedia
2) Obtaining Latitudes and Longitudes of Neighborhoods using Geopy
3) Exploring and compiling the venues in Chicago by using Foursquare

2.1 Data Source 1 : List of Chicago Neighborhoods

The first data source is the Wikipedia page "List of Neighborhoods in Chicago" https://en.wikipedia.org/wiki/List_of_neighborhoods_in_Chicago. It provides us with all the names of the neighborhoods (200) in their respective community areas (77) as shown in Figure 2.1a.

en.wikipedia.org/wiki/List_of_neighborhoods_in_Chicago

List of neighborhoods in Chicago

From Wikipedia, the free encyclopedia

There are sometimes said to be more than 200 **neighborhoods in Chicago**.[1] though residents differ on their names and boundaries. A city ordinance prescribing and mapping 178 neighborhoods[2] is almost unknown and ignored even by municipal departments. Neighborhood names and identities have evolved over time due to real estate development and changing demographics.[3] The City of Chicago is also divided into 77 community areas which were drawn by University of Chicago researchers in the late 1920s.[4] Chicago's community areas are well-defined, generally contain multiple neighborhoods, and are less commonly used by city residents.[3][5] More historical images of Chicago neighborhoods can be found in Explore Chicago Collections, a digital repository made available by Chicago Collections archives, libraries and other cultural institutions in the city.[6]

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List of neighborhoods by community area [edit]

Neighborhood	Community area
Albany Park	Albany Park
Altgeld Gardens	Riverdale
Andersonville	Edgewater
Archer Heights	Archer Heights
Armour Square	Armour Square
Ashburn	Ashburn
Ashburn Estates	Ashburn

Figure 2.1a Wikipedia page showing Chicago's neighborhoods and community areas

2.2 Data Source 2 : Geographic Coordinates using Geopy

Geopy was used to locate the coordinates of the different community areas of Chicago city. The geocoding service Nominatim was used to populate the latitude and longitude as shown in Figure 2.2a

	Community area	Villages	Latitude	Longitude
0	Albany Park	Albany Park,Mayfair,North Mayfair,Ravenswood M...	41.971937	-87.716174
1	Archer Heights	Archer Heights	41.811422	-87.726165
2	Armour Square	Armour Square,Chinatown,Wentworth Gardens	41.840033	-87.633107
3	Ashburn	Ashburn,Ashburn Estates,Beverly View,Crestline...	39.043719	-77.487490
4	Auburn Gresham	Auburn Gresham,Gresham	41.743387	-87.656042
5	Austin	Galewood,The Island,North Austin,South Austin,...	30.271129	-97.743700
6	Avalon Park	Avalon Park,Marynook,Stony Island Park	41.745035	-87.588658
7	Avondale	Avondale,Jackowo,Polish Village,Wacławowo	33.435499	-112.349557
8	Belmont Cragin	Belmont Central,Brickyard,Cragin,Hanson Park	41.931698	-87.768670
9	Beverly	Beverly,East Beverly,West Beverly	42.558428	-70.880049
10	Bridgeport	Bridgeport	41.167041	-73.204835
11	Brighton Park	Brighton Park	41.818922	-87.698942

Figure 2.2a Dataframe created by populating the geographic locations of the community areas

2.3 Data Source 3 : Using Foursquare to obtain venue locations in Chicago city

A URL was constructed to send a request to the Foursquare API to explore local venues, to specify certain type of venue (restaurant), and to get the top 10 restaurant locations for every community area as shown in Figure 2.3a and 2.3b.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
1	Albany Park	41.971937	-87.716174	Peking Mandarin Resturant	41.968292	-87.715783	Chinese Restaurant
2	Albany Park	41.971937	-87.716174	Banpojung	41.975707	-87.715609	Korean Restaurant
3	Albany Park	41.971937	-87.716174	Jimmy's	41.968815	-87.717157	Fast Food Restaurant
4	Albany Park	41.971937	-87.716174	Seo Hae Kwan	41.968593	-87.717333	Korean Restaurant
5	Albany Park	41.971937	-87.716174	Chifa Grill Chicken Restaurant	41.968593	-87.717333	Latin American Restaurant
6	Albany Park	41.971937	-87.716174	Elotes Y Chicharones	41.968470	-87.716888	Mexican Restaurant
7	Albany Park	41.971937	-87.716174	Modelo Club House Restaurant	41.968398	-87.717670	Mexican Restaurant
8	Albany Park	41.971937	-87.716174	Pan Po Jung	41.975979	-87.715630	Korean Restaurant
9	Albany Park	41.971937	-87.716174	Wok N Chop	41.975984	-87.715588	Chinese Restaurant
10	Albany Park	41.971937	-87.716174	Gorilla Sushi	41.968240	-87.713559	Sushi Restaurant

Figure 2.3a. Locations of restaurant venues obtained from Foursquare

	Neighborhood	1st Most Common Restaurant	2nd Most Common Restaurant	3rd Most Common Restaurant	4th Most Common Restaurant	5th Most Common Restaurant	6th Most Common Restaurant	7th Most Common Restaurant	8th Most Common Restaurant	9th Most Common Restaurant	10th Most Common Restaurant
0	Albany Park	Korean Restaurant	Mexican Restaurant	Chinese Restaurant	Fast Food Restaurant	Latin American Restaurant	Sushi Restaurant	Vietnamese Restaurant	Eastern European Restaurant	Filipino Restaurant	Falafel Restaurant
1	Archer Heights	Italian Restaurant	Chinese Restaurant	Greek Restaurant	Vietnamese Restaurant	Empanada Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant
2	Armour Square	Fast Food Restaurant	Vietnamese Restaurant	Greek Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant	Eastern European Restaurant
3	Ashburn	Fast Food Restaurant	Restaurant	Cajun / Creole Restaurant	Sushi Restaurant	Latin American Restaurant	Mediterranean Restaurant	Mexican Restaurant	Eastern European Restaurant	Filipino Restaurant	Falafel Restaurant
4	Auburn Gresham	Restaurant	Mexican Restaurant	Vietnamese Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant	Eastern European Restaurant
5	Austin	Mexican Restaurant	Fast Food Restaurant	American Restaurant	Vietnamese Restaurant	Eastern European Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Falafel Restaurant	Ethiopian Restaurant
6	Avalon Park	Mexican Restaurant	Restaurant	American Restaurant	Latin American Restaurant	Chinese Restaurant	Eastern European Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant
7	Avondale	Mediterranean Restaurant	Vietnamese Restaurant	Eastern European Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant	Empanada Restaurant
8	Belmont Cragin	Mexican Restaurant	Chinese Restaurant	Restaurant	Japanese Restaurant	Cantonese Restaurant	Seafood Restaurant	Eastern European Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant
9	Beverly	Restaurant	Mexican Restaurant	Korean Restaurant	Mediterranean Restaurant	Chinese Restaurant	Eastern European Restaurant	Filipino Restaurant	Fast Food Restaurant	Falafel Restaurant	Ethiopian Restaurant

Figure 2.3b. The most popular categories of restaurants as per their frequencies of occurrence in the neighborhoods, data obtained from Foursquare

3. Methodology

3.1 Data Preprocessing

The Wikipedia page with the list of neighborhoods in Chicago was scraped using Beautiful Soup package. The relevant table was then extracted from the webpage and loaded into a Pandas Dataframe, with the neighborhoods being renamed as “villages” as shown in Figure 3.1a.

	Villages	Community area
0	Albany Park\n	Albany Park
1	Altgeld Gardens	Riverdale\n
2	Andersonville	Edgewater\n
3	Archer Heights\n	Archer Heights
4	Armour Square\n	Armour Square

Figure 3.1a Table extracted from Wikipedia page and loaded into a Pandas dataframe

The dataframe was cleaned to eliminate extra characters that were embedded with each village entry. Additionally each village in the original table was listed as a single entry. The dataframe was processed to aggregate all the villages that fall under the same Community area, and saved as a new dataframe called Chicago_grouped with entries for the 77 community areas in Chicago as seen in Figure 3.1b below.

	Community area	Villages
0	Albany Park	Albany Park,Mayfair,North Mayfair,Ravenswood M...
1	Archer Heights	Archer Heights
2	Armour Square	Armour Square,Chinatown,Wentworth Gardens
3	Ashburn	Ashburn,Ashburn Estates,Beverly View,Crestline...
4	Auburn Gresham	Auburn Gresham,Gresham
5	Austin	Galewood,The Island,North Austin,South Austin,...
6	Avalon Park	Avalon Park,Marynook,Stony Island Park
7	Avondale	Avondale,Jackowo,Polish Village,Wacławowo
8	Belmont Cragin	Belmont Central,Brickyard,Cragin,Hanson Park
9	Beverly	Beverly,East Beverly,West Beverly
10	Bridgeport	Bridgeport

Figure 3.1b All villages aggregated into their respective community areas

3.2 Acquiring geographical coordinates

The Geopy package was used to obtain geographical coordinates of the community areas of Chicago. The geocoder class Nominatum was used to acquire the latitude and longitude data for the community areas and the city of Chicago. This information was then combined with the Chicago_grouped dataframe as shown in Figure 3.2a below

	Community area	Villages	Latitude	Longitude
0	Albany Park	Albany Park,Mayfair,North Mayfair,Ravenswood M...	41.971937	-87.716174
1	Archer Heights	Archer Heights	41.811422	-87.726165
2	Armour Square	Armour Square,Chinatown,Wentworth Gardens	41.840033	-87.633107
3	Ashburn	Ashburn,Ashburn Estates,Beverly View,Crestline...	39.043719	-77.487490
4	Auburn Gresham	Auburn Gresham,Gresham	41.743387	-87.656042
...	...	...	...	...
73	West Lawn	Ford City,West Lawn	40.329815	-75.994381
74	West Pullman	West Pullman	41.675046	-87.637823
75	West Ridge	Nortown,Peterson Park,Rosehill,West Ridge,West...	42.003548	-87.696243
76	West Town	East Village,Noble Square,Polish Downtown,Pula...	41.901421	-87.686166
77	Woodlawn	West Woodlawn,Woodlawn	38.330050	-89.032569

78 rows × 4 columns

Figure 3.2a latitude and longitude data for all the community areas is added to the dataframe

3.3 Exploratory data analysis of the Chicago neighborhoods

The different community areas of Chicago were mapped on the Chicago city map using folium as shown in Figure 3.3a below.

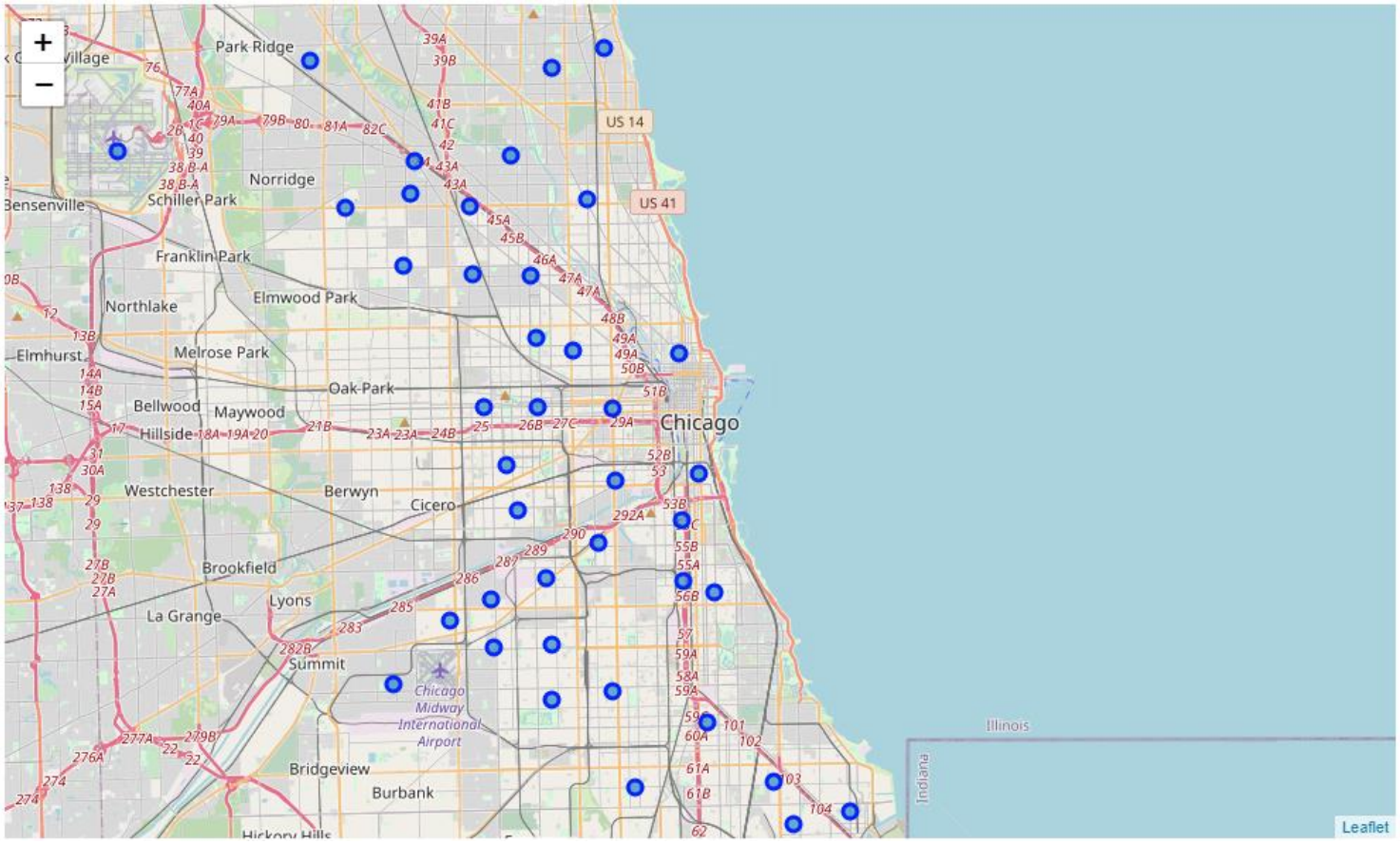

Figure 3.3a Map showing the different neighborhoods of Chicago

3.4 Getting the nearest and most popular venues to the community areas

Using the Foursquare API the nearest and most popular 50 venues around the community areas/neighborhoods were obtained. The list of venues were further filtered to only restaurants. A data frame was created to show the top 10 types or categories of restaurants popular in Chicago with their frequency as shown in Figure 3.4a below.

	Restaurant_Category	Frequency
0	Mexican Restaurant	136
1	Fast Food Restaurant	54
2	Chinese Restaurant	42
3	American Restaurant	41
4	Italian Restaurant	29
5	Restaurant	22
6	Seafood Restaurant	16
7	Latin American Restaurant	14
8	Sushi Restaurant	13
9	Asian Restaurant	11

Figure 3.4a the top 10 types of categories of restaurants popular in Chicago

Analyzing the categories of restaurants in Chicago Area; it can be inferred from the data that Mexican Restaurants are the most popular type of restaurants followed by fast food, Chinese, American, Italian, restaurant, Seafood, Latin American, Sushi, and Asian.

The dataframe was combined with the Chicago_grouped dataframe and further analyzed to check that the restaurant location coordinates had been aggregated and included in the right neighborhoods as shown in Figure 3.4b below.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
1	Albany Park	41.971937	-87.716174	Peking Mandarin Resturant	41.968292	-87.715783	Chinese Restaurant
2	Albany Park	41.971937	-87.716174	Banpojung	41.975707	-87.715609	Korean Restaurant
3	Albany Park	41.971937	-87.716174	Seo Hae Kwan	41.968593	-87.717333	Korean Restaurant
4	Albany Park	41.971937	-87.716174	Chifa Grill Chicken Restaurant	41.968593	-87.717333	Latin American Restaurant
5	Albany Park	41.971937	-87.716174	La Fogata	41.968135	-87.714796	Mexican Restaurant
6	Albany Park	41.971937	-87.716174	Pan Po Jung	41.975979	-87.715630	Korean Restaurant
7	Albany Park	41.971937	-87.716174	Gorilla Sushi	41.968240	-87.713559	Sushi Restaurant
8	Albany Park	41.971937	-87.716174	El Siglo XX	41.968470	-87.719570	Latin American Restaurant
9	Albany Park	41.971937	-87.716174	Magic Grill	41.968613	-87.712440	Mexican Restaurant
10	Albany Park	41.971937	-87.716174	El Santo Taqueria	41.975815	-87.713226	Mexican Restaurant

Figure 3.4b Coordinates of the various restaurants in the Chicago neighborhoods

3.5 Performing statistical data analysis on the venues obtained in each neighborhood

A dataframe is created with all the restaurants in each neighborhood Figure 3.5a below.

	Neighborhood	Number of Restaurants
1	Albany Park	10
2	Archer Heights	3
3	Armour Square	1
4	Ashburn	18
5	Auburn Gresham	2

Figure 3.5a Dataframe of all the restaurant totals in each neighborhood

Further analysis of the restaurants in different neighborhoods shows that neighborhoods like Riverdale, Clearing, Edgewater, Dunning, East Garfield Park, and Lincoln Square have a lot of popular restaurants.

Creating dummy variables and one-hot coding this dataframe allows us to analyze the frequency of each type or category of restaurant in each neighborhood as shown in Figure 3.5b below for the neighborhood of Edgewater.

```
----Edgewater----
                       venue  freq
0       Mexican Restaurant  0.27
1       Chinese Restaurant  0.18
2         Asian Restaurant  0.15
3      American Restaurant  0.09
4       Italian Restaurant  0.06
5     Fast Food Restaurant  0.06
6      Japanese Restaurant  0.03
7        Indian Restaurant  0.03
8  New American Restaurant  0.03
9          Sushi Restaurant  0.03
```

Figure 3.5b The frequency of each type or category of restaurant in the neighborhood of Edgewater

Rating the 10 most common types of restaurants in each neighborhood allows us to see the diversity of each neighborhood as shown in the Figure 3.5c below.

	Neighborhood	1st Most Common Restaurant	2nd Most Common Restaurant	3rd Most Common Restaurant	4th Most Common Restaurant	5th Most Common Restaurant	6th Most Common Restaurant	7th Most Common Restaurant	8th Most Common Restaurant	9th Most Common Restaurant	10th Most Common Restaurant
0	Albany Park	Korean Restaurant	Mexican Restaurant	Latin American Restaurant	Sushi Restaurant	Chinese Restaurant	Vietnamese Restaurant	Dumpling Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant
1	Archer Heights	Italian Restaurant	Greek Restaurant	Chinese Restaurant	Dim Sum Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant	Empanada Restaurant
2	Armour Square	Fast Food Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	Greek Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Empanada Restaurant	Eastern European Restaurant
3	Ashburn	Fast Food Restaurant	American Restaurant	Italian Restaurant	Cajun / Creole Restaurant	Restaurant	Mexican Restaurant	Chinese Restaurant	Thai Restaurant	Sushi Restaurant	Latin American Restaurant
4	Auburn Gresham	Restaurant	Mexican Restaurant	Hotpot Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant	Empanada Restaurant	Eastern European Restaurant
5	Austin	Mexican Restaurant	Fast Food Restaurant	American Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Empanada Restaurant
6	Avalon Park	Mexican Restaurant	Restaurant	American Restaurant	Latin American Restaurant	Chinese Restaurant	Dim Sum Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant
7	Avondale	Mediterranean Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant	Empanada Restaurant	Eastern European Restaurant
8	Belmont Cragin	Mexican Restaurant	Chinese Restaurant	Restaurant	Japanese Restaurant	Cantonese Restaurant	Seafood Restaurant	Dim Sum Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant
9	Beverly	Restaurant	Mexican Restaurant	Mediterranean Restaurant	Chinese Restaurant	Dim Sum Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant	Empanada Restaurant

Figure 3.5c The 10 most common restaurant for each neighborhood ranked

3.6 K-Means Clustering Machine Learning Algorithm

K-means clustering machine learning algorithm was used to cluster neighborhoods with similar types or categories of restaurants. As the most common restaurant types for each neighborhood were aggregated and ranked. K-means clustering seemed to be the best algorithm to create clusters of neighborhoods with similar types of restaurants. The clusters were established as 5 in number and the clustering labels were added to the sorted dataframe with the ranked top 10 restaurants in each neighborhood as shown in Figure 3.6a below.

	Neighborhood	Villages	Latitude	Longitude	Cluster Labels	1st Most Common Restaurant	2nd Most Common Restaurant	3rd Most Common Restaurant	4th Most Common Restaurant	5th Most Common Restaurant	6th Most Common Restaurant	7th Mo Comm Restaura
0	Albany Park	Albany Park,Mayfair,North Mayfair,Ravenswood M...	41.971937	-87.716174	1.0	Korean Restaurant	Mexican Restaurant	Latin American Restaurant	Sushi Restaurant	Chinese Restaurant	Vietnamese Restaurant	Dumpli Restaura
1	Archer Heights	Archer Heights	41.811422	-87.726165	1.0	Italian Restaurant	Greek Restaurant	Chinese Restaurant	Dim Sum Restaurant	German Restaurant	French Restaurant	Fond Restaura
2	Armour Square	Armour Square,Chinatown,Wentworth Gardens	41.840033	-87.633107	0.0	Fast Food Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	Greek Restaurant	German Restaurant	French Restaurant	Fond Restaura
3	Ashburn	Ashburn,Ashburn Estates,Beverly View,Crestline...	39.043719	-77.487490	1.0	Fast Food Restaurant	American Restaurant	Italian Restaurant	Cajun / Creole Restaurant	Restaurant	Mexican Restaurant	Chine Restaura
4	Auburn Gresham	Auburn Gresham,Gresham	41.743387	-87.656042	3.0	Restaurant	Mexican Restaurant	Hotpot Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipi Restaura

Figure 3.6a Clustering Labels added to the dataframe with neighborhoods, villages and ranked restaurant type data

As there were 77 community areas in all in Chicago but when we aggregated the top venues there were some neighborhoods that did not come up with any venues. The dataframe was cleaned to drop the names of the neighborhood without any venues or with null values. The resulting dataframe ended up with 41 neighborhoods that had restaurants that were popular and well rated.

Finally the 5 clusters created by the K-means clustering were plotted on the map of Chicago to visualize the location of each cluster as shown in Figure 3.6b below.

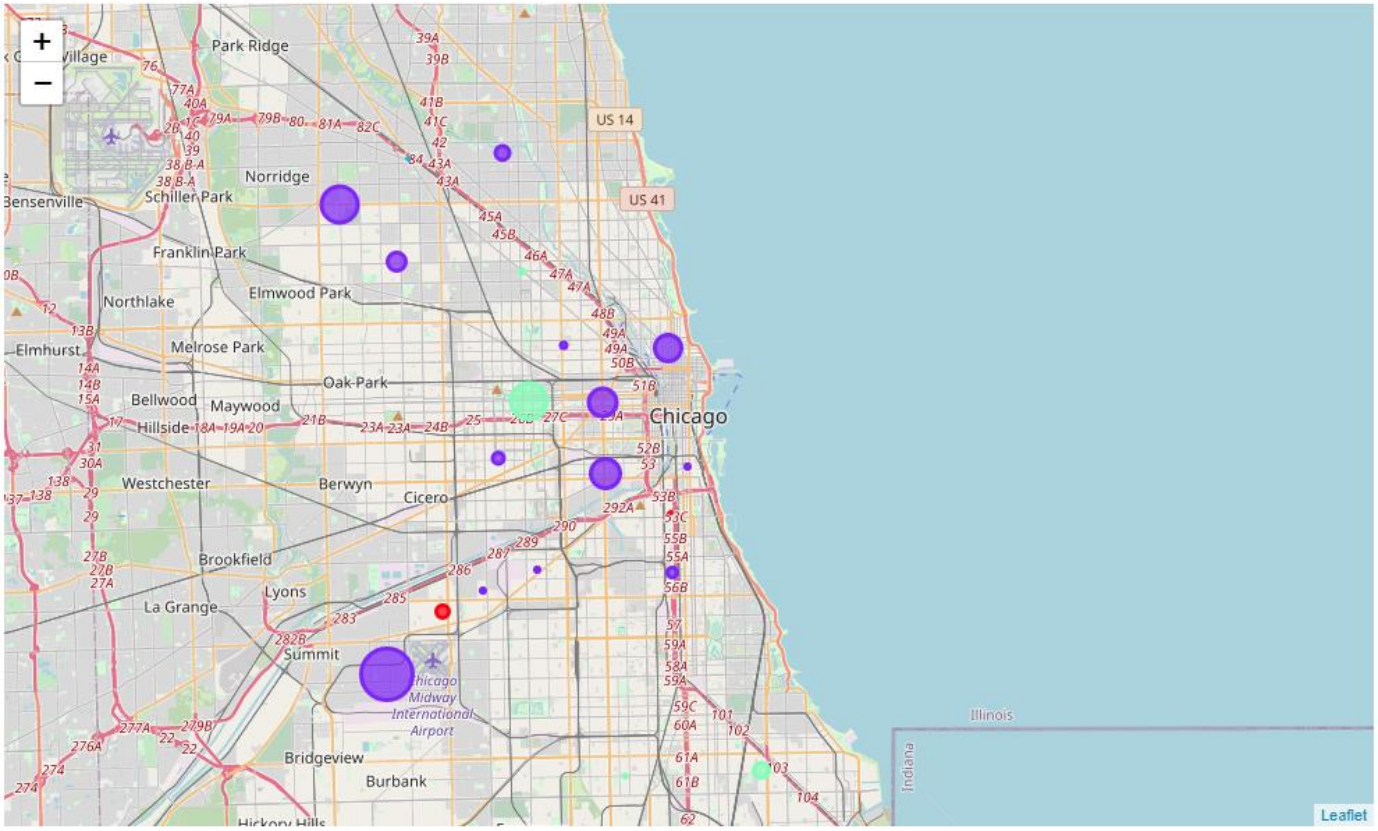

Figure 3.6b Clusters of restaurants in Chicago

4. Results

K-means algorithm run on the dataframe for all the top 10 rated restaurants in the different neighborhoods of Chicago has created 5 clusters. Let us analyze each cluster.

4.1 Cluster 1

	Neighborhood	1st Most Common Restaurant	2nd Most Common Restaurant	3rd Most Common Restaurant	4th Most Common Restaurant	5th Most Common Restaurant	6th Most Common Restaurant	7th Most Common Restaurant	8th Most Common Restaurant	9th Most Common Restaurant	10th Most Common Restaurant
2	Armour Square	Fast Food Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	Greek Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Empanada Restaurant	Eastern European Restaurant
27	Garfield Ridge	Fast Food Restaurant	Middle Eastern Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Empanada Restaurant	Eastern European Restaurant
33	Hyde Park	Fast Food Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	Greek Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Empanada Restaurant	Eastern European Restaurant
37	Lake View	Fast Food Restaurant	American Restaurant	Seafood Restaurant	Tex-Mex Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant
54	Norwood Park	American Restaurant	Fast Food Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	Greek Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Empanada Restaurant

Figure 4.1a Cluster 1 restaurants

Cluster 1 has predominantly Fast-food, Vietnamese, and Dim sum restaurants. If a visitor were craving Italian or Mexican food these neighborhoods would definitely not be a good choice for them.

4.2 Cluster 2

A sampling of the restaurants from cluster 2 is shown below in Figure 4.2a.

21	Edgewater	Mexican Restaurant	Chinese Restaurant	Asian Restaurant	American Restaurant	Fast Food Restaurant	Italian Restaurant	Indian Restaurant	South American Restaurant	Japanese Restaurant	New American Restaurant
24	Forest Glen	Italian Restaurant	Fast Food Restaurant	Mexican Restaurant	Vietnamese Restaurant	Hotpot Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Empanada Restaurant
25	Fuller Park	Restaurant	French Restaurant	Fast Food Restaurant	Mexican Restaurant	Southern / Soul Food Restaurant	New American Restaurant	Greek Restaurant	Dim Sum Restaurant	Fondue Restaurant	Filipino Restaurant
40	Lincoln Square	Italian Restaurant	Cuban Restaurant	Chinese Restaurant	Fast Food Restaurant	American Restaurant	Mediterranean Restaurant	Japanese Restaurant	Turkish Restaurant	Thai Restaurant	Asian Restaurant
42	Lower West Side	Mexican Restaurant	Sushi Restaurant	Thai Restaurant	Vegetarian / Vegan Restaurant	American Restaurant	Vietnamese Restaurant	Italian Restaurant	Chinese Restaurant	French Restaurant	Brazilian Restaurant
47	Near North Side	Mexican Restaurant	Latin American Restaurant	Restaurant	Ukrainian Restaurant	American Restaurant	Italian Restaurant	Sushi Restaurant	Eastern European Restaurant	Seafood Restaurant	Chinese Restaurant
48	Near South Side	Tapas Restaurant	Mexican Restaurant	Chinese Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant
49	Near West Side	Latin American Restaurant	Mexican Restaurant	American Restaurant	Thai Restaurant	Asian Restaurant	Chinese Restaurant	Fast Food Restaurant	Italian Restaurant	Spanish Restaurant	Empanada Restaurant
52	North Lawndale	Restaurant	Fast Food Restaurant	African Restaurant	American Restaurant	French Restaurant	Tapas Restaurant	Dim Sum Restaurant	German Restaurant	Fondue Restaurant	Filipino Restaurant
59	Riverdale	Mexican Restaurant	Vietnamese Restaurant	Chinese Restaurant	Vegetarian / Vegan Restaurant	Japanese Restaurant	American Restaurant	Afghan Restaurant	Sushi Restaurant	Mediterranean Restaurant	African Restaurant

Figure 4.2a Cluster 2 restaurants

Cluster 2 predominantly has Mexican, Tapas, Latin American, and Italian Restaurants. Visitors would be better off going to cluster 1 if they are craving Asian food.

4.3 Cluster 3

	Neighborhood	1st Most Common Restaurant	2nd Most Common Restaurant	3rd Most Common Restaurant	4th Most Common Restaurant	5th Most Common Restaurant	6th Most Common Restaurant	7th Most Common Restaurant	8th Most Common Restaurant	9th Most Common Restaurant	10th Most Common Restaurant
35	Jefferson Park	American Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	Greek Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant	Empanada Restaurant
45	Morgan Park	American Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	Greek Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant	Empanada Restaurant

Figure 4.3a Cluster 3 restaurants

Cluster 3 predominantly has American, Vietnamese and Dim Sum Restaurants. These neighborhoods also seem to have more niche restaurants such as Greek, French, Fondue and Filipino which suggest the neighborhoods could be more relaxed and quasi-suburban.

4.4 Cluster 4

	Neighborhood	1st Most Common Restaurant	2nd Most Common Restaurant	3rd Most Common Restaurant	4th Most Common Restaurant	5th Most Common Restaurant	6th Most Common Restaurant	7th Most Common Restaurant	8th Most Common Restaurant	9th Most Common Restaurant	10th Most Common Restaurant
4	Auburn Gresham	Restaurant	Mexican Restaurant	Hotpot Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant	Empanada Restaurant	Eastern European Restaurant
5	Austin	Mexican Restaurant	Fast Food Restaurant	American Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Empanada Restaurant
6	Avalon Park	Mexican Restaurant	Restaurant	American Restaurant	Latin American Restaurant	Chinese Restaurant	Dim Sum Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant
12	Burnside	Mexican Restaurant	American Restaurant	Chinese Restaurant	Vietnamese Restaurant	Dumpling Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant
17	Douglas	Mexican Restaurant	Fast Food Restaurant	American Restaurant	Asian Restaurant	Southern / Soul Food Restaurant	Vietnamese Restaurant	Dumpling Restaurant	German Restaurant	French Restaurant	Fondue Restaurant
19	East Garfield Park	Mexican Restaurant	Restaurant	German Restaurant	Turkish Restaurant	Thai Restaurant	Sushi Restaurant	Korean Restaurant	Seafood Restaurant	Latin American Restaurant	Chinese Restaurant
23	Englewood	Mexican Restaurant	Italian Restaurant	Fast Food Restaurant	Seafood Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Empanada Restaurant
41	Logan Square	Mexican Restaurant	Fast Food Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Empanada Restaurant	Eastern European Restaurant
50	New City	Mexican Restaurant	American Restaurant	Fast Food Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Empanada Restaurant
58	Pullman	Mexican Restaurant	Latin American Restaurant	Fast Food Restaurant	Seafood Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Empanada Restaurant

Figure 4.4a Cluster 4 restaurants

Cluster 4 predominantly has Mexican and American restaurants.

4.5 Cluster 5

	Neighborhood	1st Most Common Restaurant	2nd Most Common Restaurant	3rd Most Common Restaurant	4th Most Common Restaurant	5th Most Common Restaurant	6th Most Common Restaurant	7th Most Common Restaurant	8th Most Common Restaurant	9th Most Common Restaurant	10th Most Common Restaurant
7	Avondale	Mediterranean Restaurant	Vietnamese Restaurant	Dim Sum Restaurant	German Restaurant	French Restaurant	Fondue Restaurant	Filipino Restaurant	Fast Food Restaurant	Empanada Restaurant	Eastern European Restaurant

Figure 4.5a Cluster 5 restaurants

Cluster 5 has predominantly Mediterranean and Vietnamese restaurants.

5. Discussion and recommendations

The 5 clusters created have predominantly similar restaurants as their top ranked restaurant types which was the objective of this exercise. Visitors can now choose depending on the time available to them and the cuisine interests of their group, which neighborhood they would like to visit and enjoy a certain type of meal.

If time is limited and the group has varied tastes then the neighborhoods in Cluster 1 such as Armour Square and Hyde Park closer to the Chicago Loop would be an ideal choice for their abundance of fast food, Vietnamese and dim sum restaurants.

Similarly visitors who want the best of the Mexican, Latin American and Italian restaurants should head to any of the neighborhoods in Cluster 2 such as Near North Side, near West Side or Near South Side.

To get away from the hustle bustle of the city for a bit and without having to venture out too far into the suburbs , Cluster 3 offers great neighborhoods for excellent dinner options in a relaxed, quasi-suburban setting.

6. Conclusion

In conclusion this exercise has been very helpful in exploring a new city that was not part of our course and be able to use the web scraping, data pre-processing, acquiring of geographical coordinates using Geopy, acquiring venues using Foursquare, mapping locations using Folium and finally clustering the different neighborhoods to solve the business problem.

The objective of this project to use Foursquare location data and regional clustering of restaurant types to highlight the best restaurants/cuisines in different neighborhoods of the city has been successfully accomplished by the creation of the clusters of the neighborhoods.

My hope is that this database will be helpful for all the NeoCon visitors and Chicago city in exploring the city and enjoying great meals in diverse neighborhoods of the city.