The Battle of the Neighborhoods

INTRODUCTION / BUSINESS PROBLEM

PROBLEM BACKGROUND:

The NBCNEWS article https://www.nbcnews.com/news/asian-america/anti-asian-hate-crimes-increased-nearly-150-2020-mostly-n-n1260264 stated that "Anti-Asian hate crimes increased by nearly 150% in 2020, mostly in N.Y. and L.A."

"The analysis revealed a surge in cities such as New York, where anti-Asian hate crimes rose from three in 2019 to 28 in 2020, a 833 percent increase."

PROBLEM DESCRIPTION:

Ever since the start of the pandemic, Asians have been the target of hate crimes. There is a need to increase awareness in the Asian community and help them protect and empower themselves. The organizers would like to conceptualize the program as appropriate to the community of Manhattan in New York City first. Restaurants would be ideal to aim first as they can also help promote to their customers as well.

TARGET AUDIENCE:

Asian restaurants in the Manhattan borough of New York City

SUCCESS CRITERIA:

The success criteria of the project will be to provide to the organizers the spread of Asian Restaurants in Manhattan and to provide comparative data on their composition so the organizers can custom-built the program and tailor fit as appropriate for increase adaptability and make it more effective.

DATA
We will be looking at the New York City Neighborhoods data.

These data will be loaded from https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBMDeveloperSkillsNetwork-DS0701EN-SkillsNetwork/labs/newyork_data.json

	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

Then, we will explore the neighborhoods in Manhattan. Python Geocode package will be used to get the latitude and longitude coordinates for those neighborhoods.

	Borough	Neighborhood	Latitude	Longitude
0	Manhattan	Marble Hill	40.876551	-73.910660
1	Manhattan	Chinatown	40.715618	-73.994279
2	Manhattan	Washington Heights	40.851903	-73.936900
3	Manhattan	Inwood	40.867684	-73.921210
4	Manhattan	Hamilton Heights	40.823604	-73.949688

FourSquare API (https://foursquare.com/) will be used to get nearby venues at the different Manhattan neighbourhoods.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Marble Hill	40.876551	-73.91066	Bikram Yoga	40.876844	-73.906204	Yoga Studio
1	Marble Hill	40.876551	-73.91066	Arturo's	40.874412	-73.910271	Pizza Place
2	Marble Hill	40.876551	-73.91066	Tibbett Diner	40.880404	-73.908937	Diner
3	Marble Hill	40.876551	-73.91066	Astral Fitness & Wellness Center	40.876705	-73.906372	Gym
4	Marble Hill	40.876551	-73.91066	Starbucks	40.877531	-73.905582	Coffee Shop

The program will be catered to the Asian community and would like to start with Asian restaurants; therefore, we will extract the different Asian-related restaurant venues. We will analyze where they are located and break them into clusters to further cater the program to be developed depending on the distinguishing characteristics of the clusters.

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Chinatown	40.715618	-73.994279	Spicy Village	40.717010	-73.993530	Chinese Restaurant
1	Chinatown	40.715618	-73.994279	Wah Fung Number 1 Fast Food 華豐快餐店	40.717278	-73.994177	Chinese Restaurant
2	Chinatown	40.715618	-73.994279	Xi'an Famous Foods	40.715232	-73.997263	Chinese Restaurant
3	Chinatown	40.715618	-73.994279	Ling Kee Malaysian Beef Jerky	40.714713	-73.991538	Asian Restaurant
4	Chinatown	40.715618	-73.994279	Wayla	40.718291	-73.992584	Thai Restaurant
5	Chinatown	40.715618	-73.994279	Hwa Yuan	40.713618	-73.995978	Chinese Restaurant
6	Chinatown	40.715618	-73.994279	Joe's Shanghai 鹿鳴春	40.715661	-73.996693	Shanghai Restaurant
7	Chinatown	40.715618	-73.994279	Simple	40.718145	-73.991988	Asian Restaurant
8	Chinatown	40.715618	-73.994279	Yi Ji Shi Mo Noodle Corp	40.718254	-73.995930	Chinese Restaurant
9	Chinatown	40.715618	-73.994279	Phở Grand	40.717824	-73.992801	Vietnamese Restaurant
10	Chinatown	40.715618	-73.994279	Kopitiam	40.713974	-73.990868	Malay Restaurant

METHODOLOGY
Business Understanding:

The program development team would like to deploy a program to help the Asian Restaurants in the Manhattan neighbourhoods to increase awareness on and protection from Anti-Hate crimes. We will provide them insights to the Asian restaurants in the area and what would help best cater the program for successful deployment and adaption.
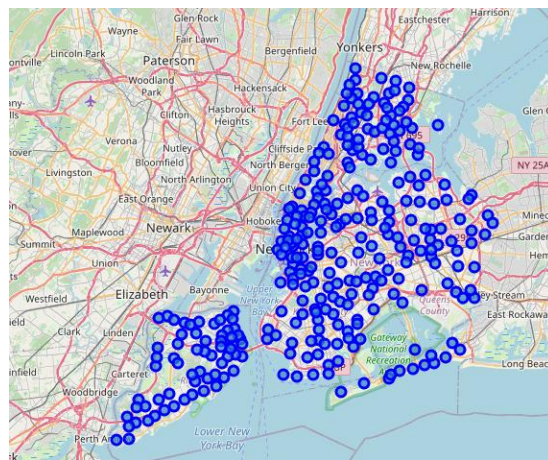
Analytic Approach:

New York city has a total of 5 boroughs and 306 neighborhoods. This project will cluster the neighbourhoods of Manhattan.
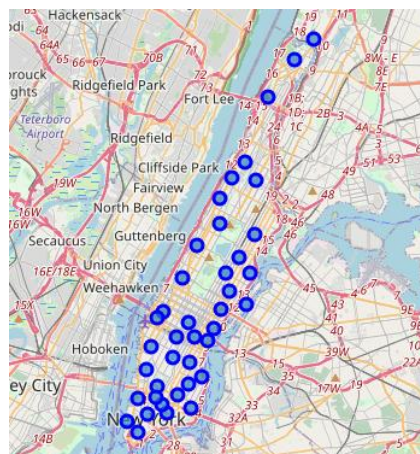
Data Exploration Analysis:

1. New York City Geographical Coordinates data (Python Geocoder package)
   a. Visualization (Folium)

   New York neighbourhood visualization

2. Manhattan Geographical Coordinates data (Python Geocode package)
   a. Visualization (Folium)

   Manhattan neighbourhood visualization

3. Foursquare API calls are made to get the top 100 venues in a radius of 500 meters.
4. Get the subset of the venue categories related to Asian restaurants.
5. Check the top 5 venues in the different Manhattan neighbourhoods.

TOP 5 VENUES:

```
----Battery Park City----
              venue  freq
0    Chinese Restaurant   0.5
1   Japanese Restaurant   0.5
2      Asian Restaurant   0.0
3   Shanghai Restaurant   0.0
4       Udon Restaurant   0.0
```

```
----Civic Center----
              venue  freq
0     Korean Restaurant   0.4
1      Sushi Restaurant   0.4
2      Asian Restaurant   0.2
3    Dim Sum Restaurant   0.0
4   Dumpling Restaurant   0.0
```

```
----Flatiron----
                venue  freq
0    Japanese Restaurant  0.50
1      Korean Restaurant  0.25
2        Thai Restaurant  0.12
3       Sushi Restaurant  0.12
4       Malay Restaurant  0.00
```

```
----Carnegie Hill----
                 venue  freq
0       Sushi Restaurant   0.4
1   Vietnamese Restaurant   0.2
2      Chinese Restaurant   0.2
3     Japanese Restaurant   0.2
4     Shanghai Restaurant   0.0
```

```
----Clinton----
                venue  freq
0     Korean Restaurant  0.25
1    Chinese Restaurant  0.25
2    Dim Sum Restaurant  0.25
3       Thai Restaurant  0.25
4   Shanghai Restaurant  0.00
```

```
----Gramercy----
                  venue  freq
0   Vietnamese Restaurant   0.2
1      Dim Sum Restaurant   0.2
2         Thai Restaurant   0.2
3     Filipino Restaurant   0.2
4        Sushi Restaurant   0.2
```

```
----Central Harlem----
              venue  freq
0   Chinese Restaurant   1.0
1     Asian Restaurant   0.0
2     Malay Restaurant   0.0
3      Udon Restaurant   0.0
4      Thai Restaurant   0.0
```

```
----East Harlem----
                venue  freq
0        Thai Restaurant   1.0
1       Asian Restaurant   0.0
2       Malay Restaurant   0.0
3        Udon Restaurant   0.0
4    Taiwanese Restaurant   0.0
```

```
----Greenwich Village----
                 venue  freq
0       Sushi Restaurant   0.5
1   Vietnamese Restaurant   0.2
2      Chinese Restaurant   0.2
3        Udon Restaurant   0.1
4       Malay Restaurant   0.0
```

```
----Chelsea----
              venue  freq
0        Thai Restaurant  0.29
1       Sushi Restaurant  0.29
2       Asian Restaurant  0.14
3     Chinese Restaurant  0.14
4    Japanese Restaurant  0.14
```

```
----East Village----
                venue  freq
0      Korean Restaurant  0.27
1   Vietnamese Restaurant  0.27
2    Japanese Restaurant  0.18
3     Chinese Restaurant  0.09
4    Filipino Restaurant  0.09
```

```
----Hamilton Heights----
                venue  freq
0    Chinese Restaurant   0.4
1      Sushi Restaurant   0.4
2   Japanese Restaurant   0.2
3      Asian Restaurant   0.0
4   Shanghai Restaurant   0.0
```

```
----Chinatown----
              venue  freq
0     Chinese Restaurant  0.43
1       Asian Restaurant  0.09
2    Dumpling Restaurant  0.09
3       Malay Restaurant  0.09
4   Vietnamese Restaurant  0.09
```

```
----Financial District----
                    venue  freq
0   Japanese Curry Restaurant   0.5
1        Japanese Restaurant   0.5
2           Asian Restaurant   0.0
3        Shanghai Restaurant   0.0
4            Udon Restaurant   0.0
```

```
----Hudson Yards----
                venue  freq
0        Thai Restaurant   1.0
1       Asian Restaurant   0.0
2       Malay Restaurant   0.0
3        Udon Restaurant   0.0
4    Taiwanese Restaurant   0.0
```

```
----Inwood----
                venue  freq
0  Chinese Restaurant   1.0
1    Asian Restaurant   0.0
2    Malay Restaurant   0.0
3     Udon Restaurant   0.0
4     Thai Restaurant   0.0


----Lenox Hill----
                venue  freq
0    Sushi Restaurant  0.50
1     Thai Restaurant  0.25
2  Chinese Restaurant  0.12
3 Japanese Restaurant  0.12
4    Asian Restaurant  0.00


----Lincoln Square----
                venue  freq
0  Chinese Restaurant   1.0
1    Asian Restaurant   0.0
2    Malay Restaurant   0.0
3     Udon Restaurant   0.0
4     Thai Restaurant   0.0


----Little Italy----
                 venue  freq
0   Chinese Restaurant   0.3
1 Vietnamese Restaurant  0.2
2  Japanese Restaurant   0.2
3      Thai Restaurant   0.2
4     Asian Restaurant   0.1


----Lower East Side----
                  venue  freq
0    Chinese Restaurant  0.43
1 Vietnamese Restaurant  0.14
2       Thai Restaurant  0.14
3   Filipino Restaurant  0.14
4   Japanese Restaurant  0.14


----Tudor City----
                  venue  freq
0     Sushi Restaurant   0.3
1 Vietnamese Restaurant  0.2
2       Thai Restaurant  0.2
3   Japanese Restaurant  0.1
4   Shanghai Restaurant  0.1


----Turtle Bay----
                       venue  freq
0        Japanese Restaurant  0.33
1           Sushi Restaurant  0.33
2            Thai Restaurant  0.17
3           Asian Restaurant  0.08
4  Japanese Curry Restaurant  0.08


----Upper East Side----
                venue  freq
0  Chinese Restaurant  0.25
1     Thai Restaurant  0.25
2 Japanese Restaurant  0.25
3    Sushi Restaurant  0.25
4    Asian Restaurant  0.00


----Upper West Side----
                  venue  freq
0       Thai Restaurant  0.25
1      Sushi Restaurant  0.25
2      Asian Restaurant  0.12
3   Japanese Restaurant  0.12
4 Vietnamese Restaurant  0.12
```

```
----Manhattan Valley----
                  venue  freq
0       Thai Restaurant   0.4
1     Korean Restaurant   0.2
2   Szechuan Restaurant   0.2
3 Vietnamese Restaurant   0.2
4   Dumpling Restaurant   0.0


----Manhattanville----
                       venue  freq
0         Chinese Restaurant   0.4
1        Dumpling Restaurant   0.2
2  Japanese Curry Restaurant   0.2
3           Sushi Restaurant   0.2
4           Asian Restaurant   0.0


----Midtown----
                  venue  freq
0   Japanese Restaurant  0.29
1      Sushi Restaurant  0.29
2 Vietnamese Restaurant  0.14
3    Chinese Restaurant  0.14
4   Szechuan Restaurant  0.14


----Midtown South----
                venue  freq
0   Korean Restaurant  0.86
1 Japanese Restaurant  0.14
2    Malay Restaurant  0.00
3     Udon Restaurant  0.00
4     Thai Restaurant  0.00


----Murray Hill----
                  venue  freq
0   Japanese Restaurant  0.38
1 Vietnamese Restaurant  0.15
2      Sushi Restaurant  0.15
3       Thai Restaurant  0.08
4   Shanghai Restaurant  0.08


----Washington Heights----
                venue  freq
0  Chinese Restaurant  0.33
1     Thai Restaurant  0.33
2    Sushi Restaurant  0.33
3    Asian Restaurant  0.00
4    Malay Restaurant  0.00


----West Village----
                venue  freq
0  Chinese Restaurant  0.50
1   Korean Restaurant  0.25
2    Sushi Restaurant  0.25
3    Malay Restaurant  0.00
4     Udon Restaurant  0.00


----Yorkville----
                  venue  freq
0      Sushi Restaurant  0.33
1   Japanese Restaurant  0.25
2 Vietnamese Restaurant  0.17
3       Thai Restaurant  0.08
4      Asian Restaurant  0.08
```

```
----Noho----
                  venue  freq
0      Sushi Restaurant   0.3
1     Asian Restaurant    0.2
2  Japanese Restaurant    0.2
3      Udon Restaurant    0.1
4 Vietnamese Restaurant   0.1


----Roosevelt Island----
                venue  freq
0 Japanese Restaurant   1.0
1    Asian Restaurant   0.0
2    Malay Restaurant   0.0
3     Udon Restaurant   0.0
4     Thai Restaurant   0.0


----Soho----
                 venue  freq
0    Asian Restaurant   0.50
1  Chinese Restaurant   0.25
2 Japanese Restaurant   0.25
3 Shanghai Restaurant   0.00
4     Udon Restaurant   0.00


----Sutton Place----
                venue  freq
0  Chinese Restaurant   0.4
1    Asian Restaurant   0.2
2     Thai Restaurant   0.2
3    Sushi Restaurant   0.2
4    Malay Restaurant   0.0


----Tribeca----
                venue  freq
0   Korean Restaurant   0.5
1    Sushi Restaurant   0.5
2    Malay Restaurant   0.0
3     Udon Restaurant   0.0
4     Thai Restaurant   0.0
```
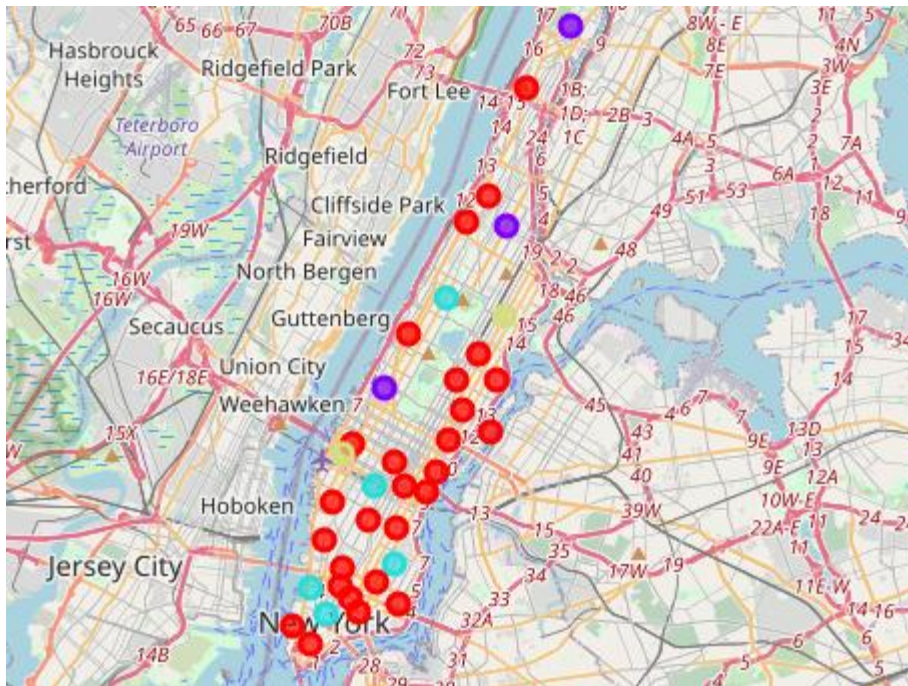
Manhattan Neighborhoods with the most Asian Restaurants

Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Chinatown	23	23	23	23	23	23
Midtown South	21	21	21	21	21	21
Murray Hill	13	13	13	13	13	13
Yorkville	12	12	12	12	12	12
Turtle Bay	12	12	12	12	12	12
East Village	12	12	12	12	12	12
Greenwich Village	10	10	10	10	10	10
Tudor City	10	10	10	10	10	10
Noho	10	10	10	10	10	10
Little Italy	10	10	10	10	10	10
Flatiron	8	8	8	8	8	8

6. Analyze each neighbourhood by grouping the rows by neighbourhood and taking the mean of the frequency of occurrence of each venue category
7. Identify the best number of cluster for K-means clustering using silhouette_score from sklearn.metrics.
8. Use K-means clustering algorithm to partition into 4 clusters.

Visualization of 4 Clusters

9. Compare the different clusters

RESULTS

Categorize the neighbourhoods into 4 clusters

Cluster 0

	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	Battery Park City	Japanese Restaurant	Chinese Restaurant	Vietnamese Restaurant	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Filipino Restaurant	Japanese Curry Restaurant	Korean Restaurant	Udon Restaurant
1	Carnegie Hill	Sushi Restaurant	Vietnamese Restaurant	Japanese Restaurant	Chinese Restaurant	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Filipino Restaurant	Japanese Curry Restaurant	Korean Restaurant
3	Chelsea	Thai Restaurant	Sushi Restaurant	Asian Restaurant	Chinese Restaurant	Japanese Restaurant	Japanese Curry Restaurant	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Filipino Restaurant
4	Chinatown	Chinese Restaurant	Vietnamese Restaurant	Malay Restaurant	Dumpling Restaurant	Asian Restaurant	Shanghai Restaurant	Taiwanese Restaurant	Dim Sum Restaurant	Thai Restaurant	Cantonese Restaurant
6	Clinton	Korean Restaurant	Thai Restaurant	Chinese Restaurant	Dim Sum Restaurant	Japanese Restaurant	Cantonese Restaurant	Dumpling Restaurant	Filipino Restaurant	Japanese Curry Restaurant	Vietnamese Restaurant
9	Financial District	Japanese Restaurant	Japanese Curry Restaurant	Vietnamese Restaurant	Cantonese Restaurant	Chinese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Filipino Restaurant	Korean Restaurant	Udon Restaurant
10	Flatiron	Japanese Restaurant	Korean Restaurant	Thai Restaurant	Sushi Restaurant	Japanese Curry Restaurant	Cantonese Restaurant	Chinese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Filipino Restaurant

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
2	Central Harlem	Chinese Restaurant	Vietnamese Restaurant	Japanese Restaurant	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Filipino Restaurant	Japanese Curry Restaurant	Korean Restaurant	Udon Restaurant
15	Inwood	Chinese Restaurant	Vietnamese Restaurant	Japanese Restaurant	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Filipino Restaurant	Japanese Curry Restaurant	Korean Restaurant	Udon Restaurant
17	Lincoln Square	Chinese Restaurant	Vietnamese Restaurant	Japanese Restaurant	Cantonese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Filipino Restaurant	Japanese Curry Restaurant	Korean Restaurant	Udon 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
5	Civic Center	Korean Restaurant	Sushi Restaurant	Asian Restaurant	Taiwanese Restaurant	Szechuan Restaurant	Thai Restaurant	Shanghai Restaurant	Malay Restaurant	Udon Restaurant	Japanese Restaurant
8	East Village	Vietnamese Restaurant	Korean Restaurant	Japanese Restaurant	Taiwanese Restaurant	Filipino Restaurant	Chinese Restaurant	Thai Restaurant	Szechuan Restaurant	Sushi Restaurant	Shanghai Restaurant
20	Manhattan Valley	Thai Restaurant	Vietnamese Restaurant	Szechuan Restaurant	Korean Restaurant	Taiwanese Restaurant	Sushi Restaurant	Shanghai Restaurant	Malay Restaurant	Udon Restaurant	Japanese Restaurant
23	Midtown South	Korean Restaurant	Japanese Restaurant	Cantonese Restaurant	Chinese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Filipino Restaurant	Japanese Curry Restaurant	Vietnamese Restaurant	Udon Restaurant
29	Tribeca	Korean Restaurant	Sushi Restaurant	Japanese Restaurant	Cantonese Restaurant	Chinese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Filipino Restaurant	Japanese Curry Restaurant	Vietnamese Restaurant

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
7	East Harlem	Thai Restaurant	Vietnamese Restaurant	Japanese Restaurant	Cantonese Restaurant	Chinese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Filipino Restaurant	Japanese Curry Restaurant	Korean Restaurant
14	Hudson Yards	Thai Restaurant	Vietnamese Restaurant	Japanese Restaurant	Cantonese Restaurant	Chinese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Filipino Restaurant	Japanese Curry Restaurant	Korean Restaurant

DISCUSSION

- The project can target the top neighbourhoods with the most Asian restaurants.
- The top Asian restaurants per neighbourhood can give insights to the customization of the program
- Cluster 0 shows that the most common are Japanese restaurants
- Cluster 1 shows that the most common are Chinese Restaurants
- Cluster 2 shows that most common are Korean Restaurants
- Cluster 3 shows that the most common are Thai Restaurants

CONCLUSION

We recommend to the program team to start with Chinatown and Midtown South where they can find most of the Asian restaurants.

The can cater the program to be more adaptable to the different clusters: Japanese, Chinese Korean and Thai.