New York Food Truck Project

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1. Introduction

Restaurant industry will never ever go out of business because the demand for "Food" never decreases. Hence is one of the most profitable and expanding type of businesses in the world.

According to the location you choose to have a restaurant, the strategy, or the restaurant type should change to ensuring that it attracts the most number of customers. Most importantly a place that many people would regularly visit would be an ideal place for a startup restaurant.

Experiencing Food Trucks in Manhattan is one of the go to reasons to New York. It has become a part of the NYC culture, and tourists who visit NY will have the Food Truck visit in their “to do bucket list”. The food trucks are not only a tourist attraction, but also for the busy workers in NY, it is a very easy and an efficient facility to get their daily meals. Hence placing food trucks in NY can be identified as a great business idea especially for a startup restaurant as it needs lesser than usual assets and investments.

However there are many factors one should study when starting a food truck. Most importantly, where to place the food truck that it would have the maximum customer base. As Manhattan has many attractions it would be ideal to place the food truck near to one of the attractions/monuments.

When starting a business the competition you will face should also be analyzed. So, only finding a place that attracts more people to place the food truck will not be enough, but should also study how many other restaurants/food places are close by.

Based on these criteria the best place to start the food truck business will be decided.

Problem

We have 6 food trucks to be placed in Manhattan and what will be the best neighborhoods to place the food trucks?

2. Data

In this project the neighborhoods of Manhattan will be considered.

Hence we will use the .json file for New York data (https://cocl.us/new_york_datase) and will extract out the information about the neighborhoods for the Manhattan borough.

Foursquare location data will be used in determination of the coordinates of each neighborhood and in deciding the most visited venues in each neighborhood within a radius of 500 meters, what type the venue is, how many food facilities are the and how many attractions are there. Also the venue data from Foursquare will be used in the process of separating the 40 neighborhoods in Manhattan to 6 clusters and picking out the best 6 neighborhoods to place the food truck.

3. Methods

Mainly there are two methods used in this study. The first being the machine learning method k-means clustering to separate the neighborhoods in the Manhattan borough, and second being a rank based system to pick the best neighborhood in each cluster to place the food truck.

3.1 k-means clustering

In this study we need to identify 6 main clusters of neighborhoods as we have 6 food trucks to place in Manhattan borough. The parameter that will be used in clustering neighborhoods is the mean of the frequency of occurrence of each type of venue.

3.2 Rank based system

The decision making of this study will be decided according to a rank based system comparing the number of food places and number of attractions in the most 20 visited places of each neighborhood.

Following is the score defined to rank the neighborhoods. A weight is added to number of attractions to attribute a higher score for neighborhoods with more than one attraction.

Score = 2*number of attractions – number of food places

According to the ranking system the neighborhoods with more attractions than food places in its top 20 most visited places will have small negative values or large positive values compared to other neighborhoods in the cluster. The neighborhood with the smallest negative value or the largest positive will obtain the rank 1, and rest of the neighborhoods will be ranked accordingly. In this analysis the neighborhoods with 0 attractions will be discarded as it will be the most important factor that we consider in placing the food trucks.

This will be rank based method will be used cluster-wise. In each cluster the neighborhood that will get rank 1 will be the potential neighborhood to place the food truck at.

4. Results

Using the json data, the following map shows the 40 neighborhoods in Manhattan, NY.

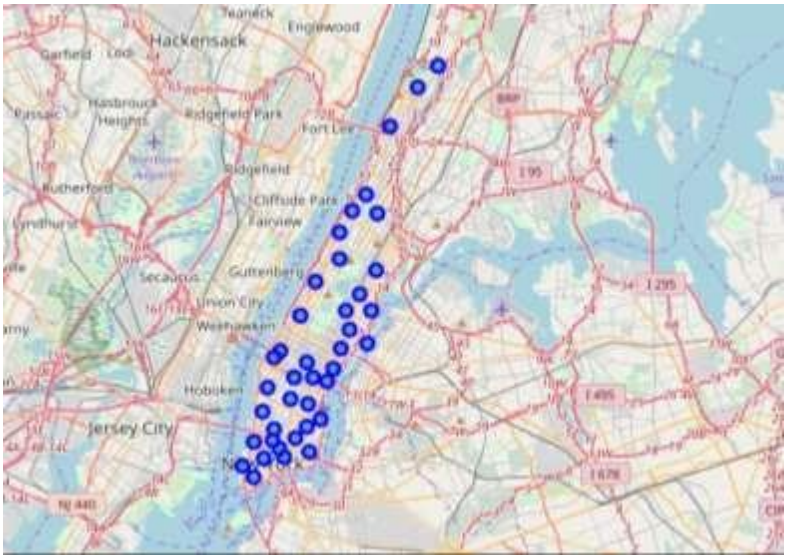

Figure 01: Neighborhood locations in the Manhattan borough, NY.

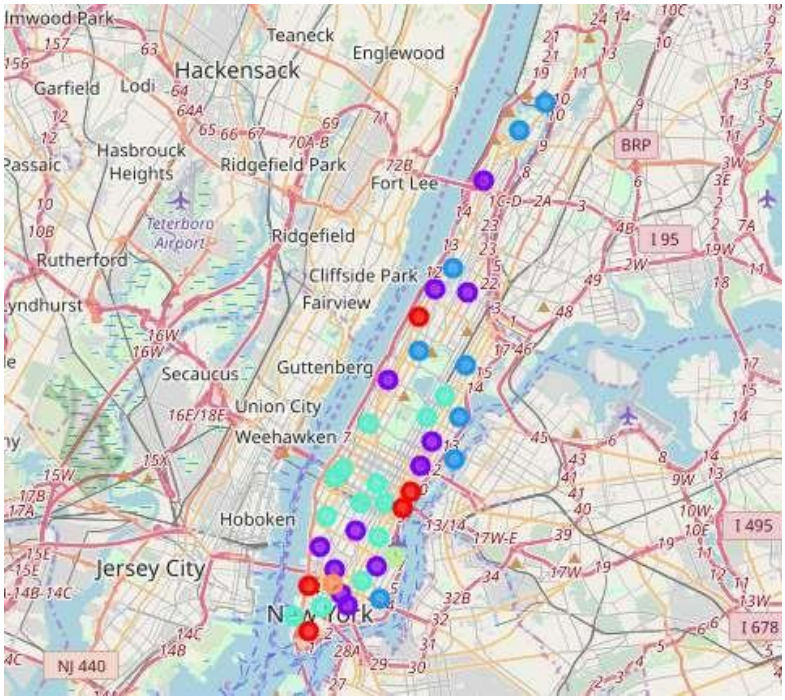

Figure 02: Six clusters of neighborhoods in Manhattan by their mean of the frequency of occurrence of each type of venue.

The following table summarizes the number of food places and the number of attractions in each neighborhood that are in the 20 most visited places within a 500 meter radius of neighborhood coordinates.

Table 01: Number of Attractions, number of food places and cluster number of neighborhood in the top 20 most visited places in each Manhattan neighborhood within 500 meter radius.

Neighborhood	Number of Attractions	Number of Food Places	Cluster number
Battery Park City	5	9	3
Carnegie Hill	0	9	3
Central Harlem	1	8	1
Chelsea	0	13	3
Chinatown	1	11	1
Civic Center	2	11	3
Clinton	3	8	3
East Harlem	3	13	2
East Village	0	0	1
Financial District	2	11	0
Flatiron	0	8	1
Gramercy	0	10	3
Greenwich Village	0	13	1
Hamilton Heights	0	12	2
Hudson Yards	2	7	3
Inwood	1	12	2
Lenox Hill	0	9	1
Lincoln Square	4	5	3
Little Italy	0	12	1
Lower East Side	2	12	2
Manhattan Valley	2	12	2
Manhattanville	5	13	1
Marble Hill	1	6	2
Midtown	1	10	3
Midtown South	0	7	3
Morningside Heights	2	8	0
Murray Hill	0	14	3
Noho	2	12	3
Roosevelt Island	6	7	2
Soho	1	4	5
Stuyvesant Town	5	6	4
Sutton Place	0	11	1
Tribeca	1	8	0
Tudor City	2	13	0
Turtle Bay	2	9	0
Upper East Side	1	13	3
Upper West Side	1	10	1
Washington Heights	1	12	1
West Village	1	8	1
Yorkville	2	10	2

Table 02: Ranks of Cluster 0 neighborhoods.

Neighborhood	Number of Attractions	Number of Food Places	Cluster number	Score	Rank
Morningside Heights	2	8	0	-4	1
Turtle Bay	2	9	0	-5	2
Tribeca	1	8	0	-6	3
Financial District	2	11	0	-7	4
Tudor City	2	13	0	-9	5

Table 03: Ranks of Cluster 1 neighborhoods (Neighborhoods with 0 attractions are discarded).

Neighborhood	Number of Attractions	Number of Food Places	Cluster number	Score	Rank
~~East Village~~	~~0~~	~~0~~	~~1~~	~~0~~	~~*~~
Manhattanville	5	13	1	-3	1
Central Harlem	1	8	1	-6	2.5
West Village	1	8	1	-6	2.5
~~Flatiron~~	~~0~~	~~8~~	~~1~~	~~-8~~	~~*~~
Upper West Side	1	10	1	-8	3
Chinatown	1	11	1	-9	4
~~Lenox Hill~~	~~0~~	~~9~~	~~1~~	~~-9~~	~~*~~
Washington Heights	1	12	1	-10	5
~~Sutton Place~~	~~0~~	~~11~~	~~1~~	~~-11~~	~~*~~
~~Little Italy~~	~~0~~	~~12~~	~~1~~	~~-12~~	~~*~~
~~Greenwich Village~~	~~0~~	~~13~~	~~1~~	~~-13~~	~~*~~

Table 03: Ranks of Cluster 2 neighborhoods (Neighborhoods with 0 attractions are discarded).

Neighborhood	Number of Attractions	Number of Food Places	Cluster number	Score	Rank
Roosevelt Island	6	7	2	5	1
Marble Hill	1	6	2	-4	2
Yorkville	2	10	2	-6	3
East Harlem	3	13	2	-7	4
Lower East Side	2	12	2	-8	5.5
Manhattan Valley	2	12	2	-8	5.5
Inwood	1	12	2	-10	6
~~Hamilton Heights~~	~~0~~	~~12~~	~~2~~	~~-12~~	~~*~~

Table 04: Ranks of Cluster 3 neighborhoods (Neighborhoods with 0 attractions are discarded).

Neighborhood	Number of Attractions	Number of Food Places	Cluster number	Score	Rank
Lincoln Square	4	5	3	3	1
Battery Park City	5	9	3	1	2
Clinton	3	8	3	-2	3
Hudson Yards	2	7	3	-3	4
Civic Center	2	11	3	-7	5
~~Midtown South~~	~~0~~	~~7~~	~~3~~	~~-7~~	~~*~~
Midtown	1	10	3	-8	6.5
Noho	2	12	3	-8	6.5
Carnegie Hill	~~0~~	~~9~~	~~3~~	~~-9~~	~~*~~
Gramercy	~~0~~	~~10~~	~~3~~	~~-10~~	~~*~~
Upper East Side	1	13	3	-11	8
Chelsea	~~0~~	~~13~~	~~3~~	~~-13~~	~~*~~
Murray Hill	~~0~~	~~14~~	~~3~~	~~-14~~	~~*~~

Table 05: Ranks of Cluster 4 neighborhoods.

Neighborhood	Number of Attractions	Number of Food Places	Cluster number	Score	Rank
Stuyvesant Town	5	6	4	4	1

Table 06: Ranks of Cluster 5 neighborhoods.

Neighborhood	Number of Attractions	Number of Food Places	Cluster number	Score	Rank
Soho	1	4	5	-2	1

5. Conclusion

According to the Rankings in each cluster, the food trucks will be placed in the following neighborhoods: Morningside Heights, Manhattanville, Roosevelt Island, Lincoln Square, Stuyvesant Town, Soho.

6. Discussion

Although we can place the food trucks in the highest ranking neighborhoods in each cluster, it seems cluster 3 has some interesting places like Battery Park which has a large positive value. Hence placing food trucks in such neighborhoods could be more advantages that placing the food trucks in Morningside Heights, Manhattanville or Soho that has negative scores although they are cluster winners.