The Battle of the Neighbourhoods

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1. Introduction

1.1   Background

The City of New York, is the most populous city in the United States. It is diverse and is the financial capital of USA. It is multicultural. It provides lot of business opportunities and business friendly environment. It has attracted many different players into the market. It is a global hub of business and commerce. The city is a major centre for banking and finance, retailing, world trade, transportation, tourism, real estate, new media, traditional media, advertising, legal services, accountancy, insurance, theatre, fashion, and the arts in the United States.

This also means that the market is highly competitive. As it is highly developed city so cost of doing business is also one of the highest. Thus, any new business venture or expansion needs to be analysed carefully. The insights derived from analysis will give good understanding of the business environment which help in strategically targeting the market. This will help in reduction of risk. And the Return on Investment will be reasonable.

1.2   Problem Description

A restaurant is a business which prepares and serves food and drink to customers in return for money, either paid before the meal, after the meal, or with an open account. The City of New York is famous for its excellent cuisine. It's food culture includes an array of international cuisines influenced by the city's immigrant history.

1. Central and Eastern European immigrants
2. Italian immigrants

3. Jewish immigrants and Irish immigrants
4. Chinese and other Asian restaurants, sandwich joints, trattorias, diners, and coffeehouses are ubiquitous throughout the city
5. Middle Eastern foods such as falafel and kebabs examples of modern New York street food

It is evident that to survive in such competitive market it is very important to strategically plan. Various factors need to be studied in order to decide on the Location such as:

1. New York Population
2. New York City Demographics
3. Are there any Farmers Markets, Wholesale markets etc nearby so that the ingredients can be purchased fresh to maintain quality and cost?
4. Are there any venues like Gyms, Entertainment zones, Parks etc nearby where floating population is high etc
5. Who are the competitors in that location?
6. Cuisine served / Menu of the competitors
7. Segmentation of the Borough

1.3   Target Audience

To predict the correct location, the restaurant is to be located such that it is visited and recommend by the customers. The target is the general public and the neighbourhood should be in and around neighbourhood of New York city. The Management also expects to understand the rationale of the recommendations made.

This would interest anyone who wants to start a new restaurant in New York city.

2. Data

The aim is to find the ideal place to set up a restaurant such that setup cost is low, competition is least, customers are high and place is ideal to start a new restaurant such that it is profitable for the restaurant owner and will help in reduction of risk.

1) Location Data

New York City map will be used for this project. link: https://geo.nyu.edu/catalog/nyu_2451_34572

This New York City neighbourhood Names point file was created as a guide to New York City's neighbourhoods that appear on the web resource, "New York: A City of Neighbourhoods." Best estimates of label centroids were established at a 1:1,000 scale, but are ideally viewed at a 1:50,000 scale.

Publisher: New York (City). Department of City Planning Place(s): New York, New York, United States Preservation record: http://hdl.handle.net/2451/34572

2) Consumer Product

Farmer's market and Food boxes datset. link: https://data.cityofnewyork.us/dataset/DOHMH-Farmers-Markets-and-Food-Boxes/8vwk-6iz2

This data is collected to help inform New Yorkers of the various farmers market locations around the city. These markets are physical sites where shoppers can purchase fresh-locally grown produce within the five boroughs. The Health Bucks program at the New York City Department collects this data from market to compile a list and a map of all New York City farmers markets and food box locations (map available on nyc.gov by searching ""farmers markets""). The data is collected from market operators each spring and is updated upon hearing from market operators and community members about market closings, openings, updated hours of operation, and location changes. This data changes often and is only as accurate as the feedback we receive from farmers markets. This data changes frequently. Farmers

markets and food box sites are indicated on this list only if information can be collected from the site. It may not be the most exhaustive list of farmers markets and food box sites in the city." Less

3) Population Density in New York

New York City Demographics

Cuisine of New York city

link: https://en.wikipedia.org/wiki/Cuisine_of_New_York_City

The cuisine of New York City comprises many cuisines belonging to various ethnic groups that have entered the United States through the city. Almost all ethnic cuisines are well represented in New York City, both within and outside the various ethnic neighborhoods. New York City was also the founding city of New York Restaurant Week which has spread around the world due to the discounted prices that such a deal offers.In New York City there are over 12,000 bodegas, delis and groceries and many among them are open 24/7

4) Corporate buildings in New York :

link : https://en.wikipedia.org/wiki/Economy_of_New_York_City

The economy of New York City encompasses the largest municipal and regional economy in the United States. Anchored by Wall Street in Lower Manhattan, New York City has been characterized as the world's premier financial center. It is home to the New York Stock Exchange and NASDAQ, the world's two largest stock exchanges by both market capitalization and trading activity. In 2012, the New York metropolitan area generated a gross metropolitan product (GMP) of over US 1.33 trillion with a population of 20.3 million people. The Combined Statistical Area produced a GMP of over US 1.55 trillion. Both are ranked first nationally by a wide margin and being roughly equivalent to the GDP of South Korea. The city's economy accounts for most of the economic activity in both the states of New York and New Jersey.

4) New York Venue Co-ordinates:

Foursquare API to explore neighborhoods in New York City.

3. Methodology

The data of places in NY and their latitudes and longitudes are acquired from a .json file : https://ibm.box.com/shared/static/fbpwbovar7lf8p5sgddm06cgipa2rxpe.json

```
[8]:  neighborhoods.head()
```

```
[8]:        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
```

```
[10]:  print(len(neighborhoods['Borough'].unique())),
       print(neighborhoods.shape[0])

       5
       306
```

This data is then used to make markers on the NY map for better visualization. These are the places we are likely to setup a restaurant.
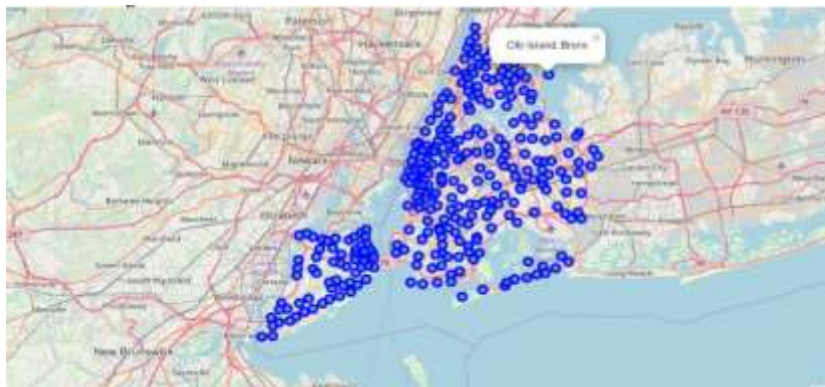
A map of New York city and the places acquired from the json file in blue.

Now, it is necessary to see the population density of a region, the overall revenue of that region to setup a business model and what cuisine is preferred by the majority.

df1

	Borough	Country	Estimate2017	GDP1	GDP2	LandArea1_miles	LandArea2_kms	Person_miles	Person_kms
0	The Bronx	Bronx	1471160	28.787	19570	42.10	109.04	34653	13231
1	Brooklyn	Kings	2648771	63.303	23900	70.82	183.42	37137	14649
2	Manhattan	New York	1664727	629.682	378250	22.83	59.13	72033	27826
3	Queens	Queens	2358582	73.842	31310	108.53	281.09	21460	8354
4	Staten Island	Richmond	479458	11.249	23460	58.37	151.18	8112	3132

Manhattan has the highest GDP amongst other cities

	City compared to State & U.S.	City compared to State & U.S..1	City compared to State & U.S..2	City compared to State & U.S..3
0	Foreign born	3.04115e+06	4.36007e+06	4.07544e+07
1	White (non-Hispanic)	3.59706e+06	1.27314e+07	2.23532e+08
2	Black	2.08466e+06	3.08112e+06	3.89019e+07
3	Hispanic (any race)	2.33809e+06	3.41055e+06	5.03255e+07
4	Asian	1.03824e+06	1.4146e+06	1.48198e+07

White(non-Hispanic) has the population density in NY.

Overall likeliness to eat a particular cuisine by New York city citizens.

Overall likeliness to eat a particular cuisine by people of Bronx.

Overall likeliness to eat a particular cuisine by people of Queens.

Overall likeliness to eat a particular cuisine by people of Brooklyn.

Overall likeliness to eat a particular cuisine by people of Manhattan.

```
For n_clusters=2, The Silhouette Coefficient is 0.4871293940839321
For n_clusters=3, The Silhouette Coefficient is 0.3573994321239044
For n_clusters=4, The Silhouette Coefficient is 0.35298553966663604
For n_clusters=5, The Silhouette Coefficient is 0.29761589770234786
For n_clusters=6, The Silhouette Coefficient is 0.2990612968058512
For n_clusters=7, The Silhouette Coefficient is 0.2351583011296776
For n_clusters=8, The Silhouette Coefficient is 0.21871872090157196
For n_clusters=9, The Silhouette Coefficient is 0.23350766868053857
```

The silhouette score for different values of k.

	Afghan Restaurant	African Restaurant	American Restaurant	Arepa Restaurant	Argentinian Restaurant	Asian Restaurant	Australian Restaurant	Austrian Restaurant	Brazilian Restaurant	Burmese Restaurant	Cajun / Creole Restaurant	Cambodian Restaurant	Cantonese Restaurant
cluster0	0.018692	0.074766	1.794393	0.130841	0.149533	0.757009	8.411215e-02	6.542056e-02	0.102804	9.345794e-03	0.102804	2.803738e-02	1.121495e-01
cluster1	0.005128	0.020513	0.717949	0.020513	0.005128	0.241026	-3.816392e-17	6.591949e-17	0.020513	-8.239937e-18	0.020513	1.734723e-17	6.938894e-17

The silhouette score for different clusters.

	Borough	Neighborhood	Latitude	Longitude	Total	Cluster_Labels
0	Brooklyn	Sea Gate	40.576375	-74.007873	0	1
1	Staten Island	Todt Hill	40.597069	-74.111329	0	1
2	Staten Island	Rossville	40.549404	-74.215729	0	1
3	Staten Island	Bloomfield	40.605779	-74.187256	0	1

Best places to setup the location for a restaurant

	Borough	Neighborhood	Latitude	Longitude	Total	Cluster_Labels
0	Bronx	Wakefield	40.894705	-73.847201	14	1
1	Bronx	Co-op City	40.874294	-73.829939	14	1
2	Bronx	Eastchester	40.887556	-73.827806	13	1
3	Bronx	Fieldston	40.895437	-73.905643	7	1
4	Bronx	Riverdale	40.890834	-73.912585	11	1
5	Manhattan	Marble Hill	40.876551	-73.910660	15	1
6	Bronx	Woodlawn	40.898273	-73.867315	7	1
7	Bronx	Norwood	40.877224	-73.879391	14	1
8	Bronx	Williamsbridge	40.881039	-73.857446	15	1
9	Bronx	Baychester	40.866858	-73.835798	15	1
10	Bronx	Pelham Parkway	40.857413	-73.854756	10	1
11	Bronx	City Island	40.847247	-73.786488	13	1
12	Bronx	Bedford Park	40.870185	-73.885512	10	1
13	Bronx	University Heights	40.855727	-73.910416	12	1
14	Bronx	Morris Heights	40.847898	-73.919672	13	1
15	Bronx	East Tremont	40.842696	-73.887356	9	1
16	Bronx	West Farms	40.839475	-73.877745	5	1
17	Bronx	High Bridge	40.836623	-73.926102	5	1
18	Bronx	Melrose	40.819754	-73.909422	18	1
19	Bronx	Mott Haven	40.806239	-73.916100	14	1

Places that have saturated and not ideal to setup a restaurant
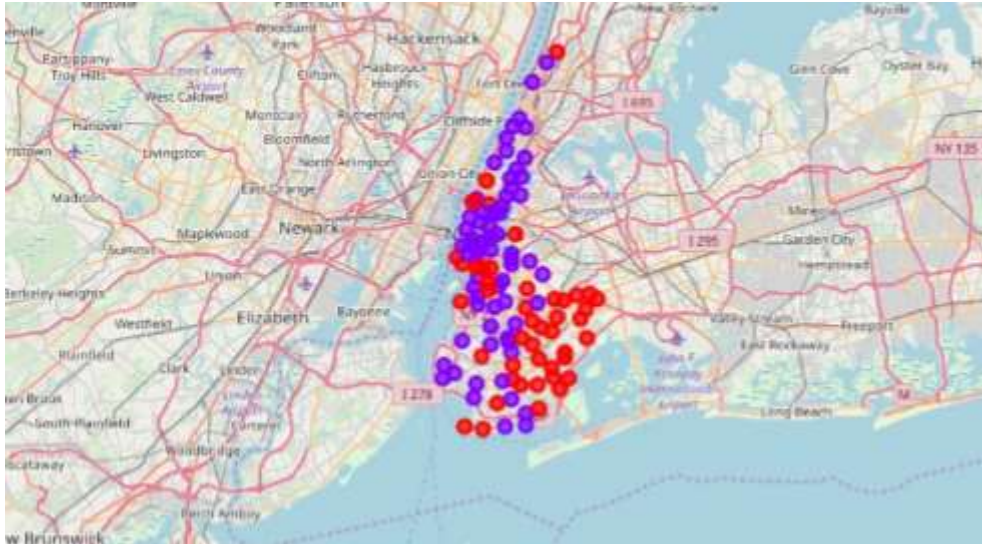
Cluster 0 (Non-saturated, purple) and Cluster 1 (Saturated, red)

4. Result:

The best places to setup a restaurant given the conditions taken into account are:

1) Seagate, Brooklyn @ [40.576, -74.007]
2) Todt Hill, Staten Island @ [40.5970, -74.111]
3) Rossville, Staten Island @ [40.5494, -74.2157]
4) Bloomfield, Staten Island @ [40.6057, -74.1872]