IBM Data Science Professional Certificate

IBM Applied Data Science Capstone

Capstone Project – The Battle of Neighborhoods

EVALUATING JAPANESE RESTAURANTS IN NEW YORK CITY USING K-MEANS MACHINE LEARNING CLUSTERING METHOD

MARCELO ABBEHUSEN MAGALHÃES

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1. INTRODUCTION

By the year of 2011, there were about 20 thousand japanese immigrants living in New York City. According to the 2017 United States Census Bureau, there were 1,466,514 Americans with japanese ancestry living in USA.

The Asian American population is greatly urbanized, with nearly three-quarters of them living in metropolitan areas with population greater than 2.5 million. New York City is one of the three areas with the highest Asian American Populations (Greater Los Angeles Area, New York Metropolitan Area and San Francisco Bay Area).

According to the USA 2010 Census, New York is home to more that one million Asian Americans.

This project will attempt to answer the questions “Where should an investor open a Japanese Restaurant in NYC?” and “Where should I go If I want a great and highly rated Japanese food?”.

2. DATA

In order to answer the above questions, data on New York City neighborhoods and boroughs, including boundaries, latitude, longitude, restaurants and restaurants ratings are required.

New York City data containing the neighborhoods and boroughs, latitudes, and longitudes will be obtained from the data source: https://cocl.us/new_york_dataset

All data related to locations and quality of Japanese restaurants will be obtained via the FourSquare API, using the Requests library in Python.

3. METHODS

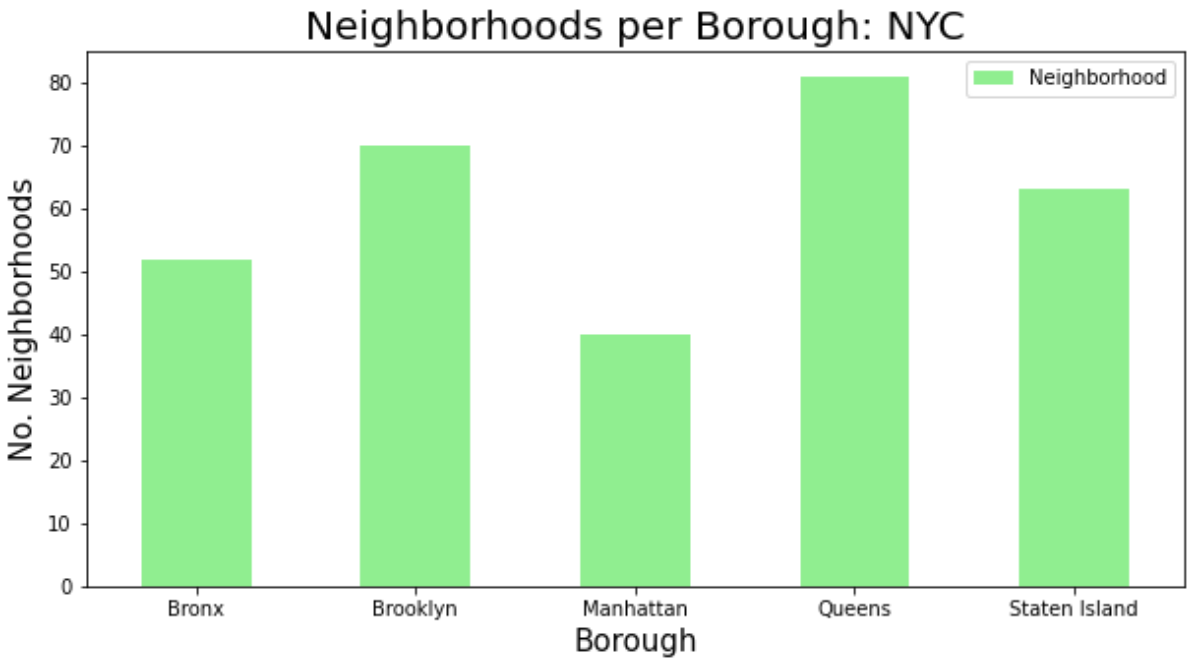
Data will be collected from https://cocl.us/new_york_dataset, cleaned and processed into a dataframe. FourSquare will be used to locate all venues and then filtered by Japanese restaurants. Users ratings will be counted and added to the dataframe.

After the data is preprocessed, It will be sorted based on ratings. Finally, It will be visualized using graphics from Python libraries and also divided into different clusters, using machine learning K-Means algorithm, from scikit-learn library.

4. RESULTS

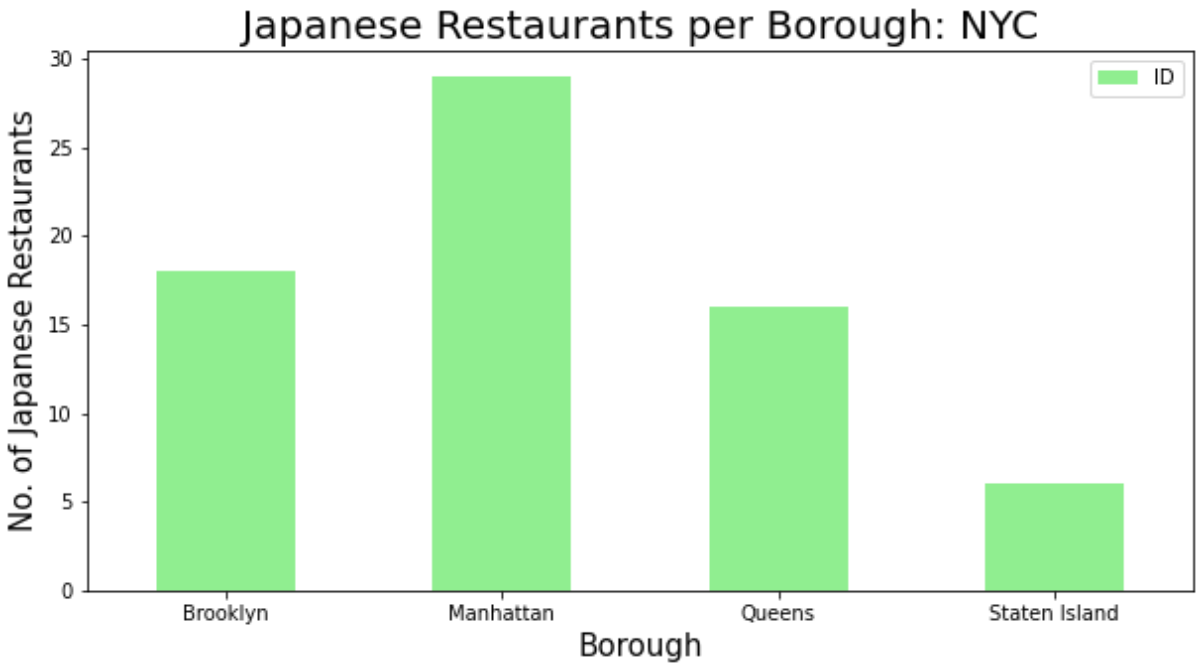
After using the Requests library to retrieve New York city data from the URL, the data was visualized in a bar graphic and in a pandas dataframe.

Index	Borough	Neighborhood	Latitude	Longitude
0	Bronx	Wakefield	40,89471	-73,8472
1	Bronx	Co-op City	40,87429	-73,8299
2	Bronx	Eastchester	40,88756	-73,8278
3	Bronx	Fieldston	40,89544	-73,9056
4	Bronx	Riverdale	40,89083	-73,9126
5	Bronx	Kingsbridge	40,88169	-73,9028



Using the Foursquare API, It was able to retrieve data from 69 Japanese Restaurants in New York City, as shown in the table and figures below.

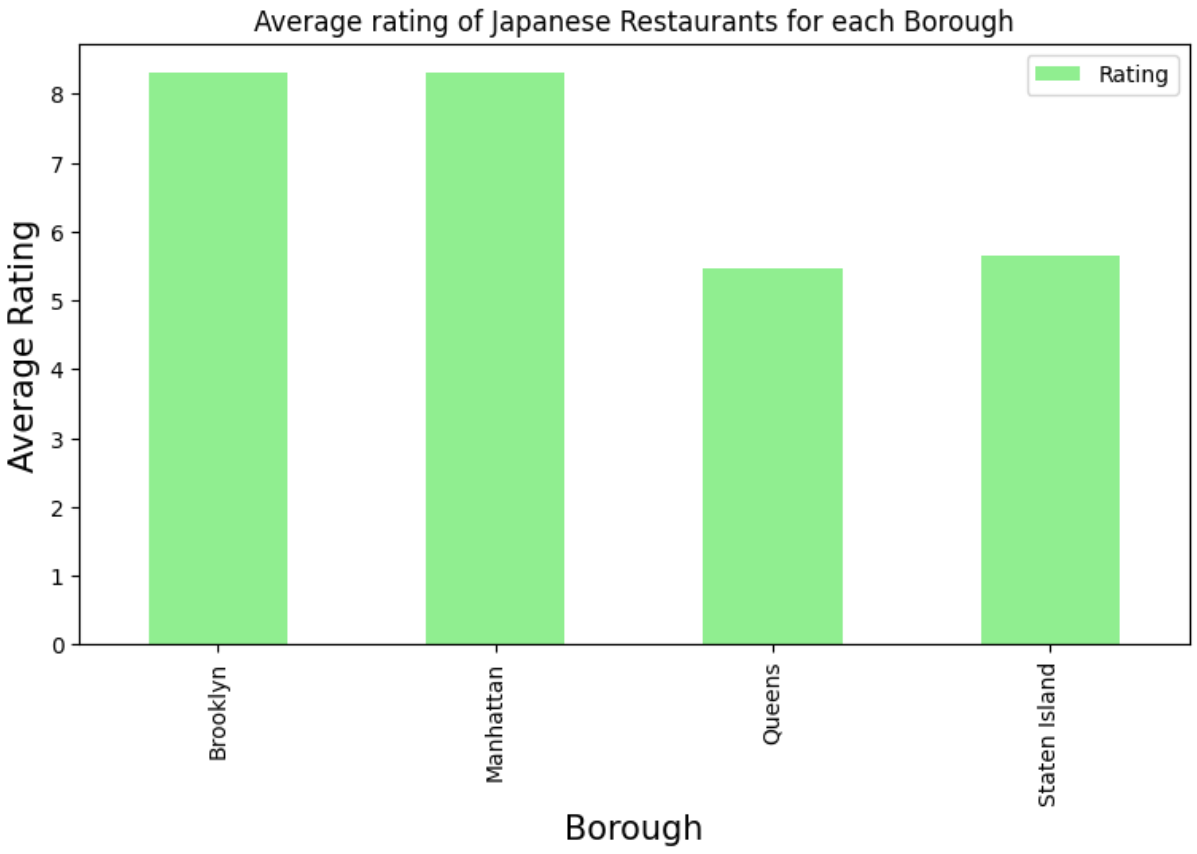
Index	Borough	Neighborhood	ID	Name
0	Brooklyn	Kensington	4d5c12a01e43236a87eb1583	Sake Sushi
1	Brooklyn	Prospect Heights	5cb5e5f9a35f4600255406c6	Maison Yaki
2	Brooklyn	Williamsburg	51f9b7b3498eefe896caeb23	Shalom Japan
3	Brooklyn	Bedford Stuyvesant	5b3bcb69bfc6d0002ca9bf17	Warude
4	Brooklyn	Brooklyn Heights	479ccb47f964a5206b4d1fe3	Iron Chef House
5	Brooklyn	Cobble Hill	48a41073f964a52091511fe3	Hibino



After retrieving data from japanese, data from likes and ratings were obtained also via Foursquare API, and the results were grouped by neighborhoods and borougs, as shown in the tables and chart below.

Neighborhood	Average Rating
East Village	9.25
Cobble Hill	9.10
North Side	9.00
Park Slope	8.90
Downtown	8.90
Soho	8.80
Lindenwood	8.80
Chelsea	8.80
Boerum Hill	8.70
Fort Greene	8.60

Borough	Average Rating
Manhattan	8.310.526
Brooklyn	8.306.667
Staten Island	5.660.000
Queens	5.472.727



Afterwards, the dataset was merged with the latitude/longitude data and finally plotted in a map, using the Folium library.

Borough_x	Neighborhood	Latitude	Longitude	Rating
Brooklyn	Kensington	40.642.382	-73.980.421	7.9
Brooklyn	Prospect Heights	40.676.822	-73.964.859	8.1
Brooklyn	Williamsburg	40.707.144	-73.958.115	8.2
Brooklyn	Bedford Stuyvesant	40.687.232	-73.941.785	8.2
Brooklyn	Brooklyn Heights	40.695.864	-73.993.782	8.1
Brooklyn	Cobble Hill	40.687.920	-73.998.561	9.1
Brooklyn	Carroll Gardens	40.680.540	-73.994.654	7.8

Finally, the K-means algorithm was set to three clusters, that divided the data into three groups:

- **Cluster 0:** Mostly restaurants located in Brooklyn and Manhattan and that had the best ratings, from 7.9 to 9.3;
- **Cluster 1:** Restaurants with no rating, located basically in Queens;
- **Cluster 2:** Restaurants with ratings varying from 6.2 and 7.6, mostly located in Queens and Staten Island.

The following map shows the restaurants locations according to each cluster. The black spots are cluster 0, the red spots are cluster 1 and the blue are cluster 2.

5. CONCLUSIONS

In this project, It was possible to create a project that used most of the tools and methods that were studied during the course. I was able to identify a business problem, to specify the data required, to extract, prepare and visualize the data, to visualize the results and also to perform a machine learning clustering method, using K-Means and dividing the data into 3 clusters, based on their similarities, that was basically the rating each restaurant had.

The Manhattan and Brooklyn boroughs were clearly the regions with the higher rated japanese restaurants, labeled as Cluster 0 after KMeans algorithm were implemented. So, If one were to look for a good japanese restaurant, I'd recommend any neighborhood of these areas.

In other words, If a person is looking for a place to open a new Japanese restaurant, I'd recommend the boroughs of Queens or Staten Island, because besides having a small number of restaurants, the existing ones are low rated, which means these areas have potentially less competition. It's necessary to study more features, such as infrastructure, transports and wage rates of these regions, to be able to build a more robust and trustworthy model.