Analyzing and Ranking the Turkish Cuisine Restaurants in NYC

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1. Introduction

New York City is one of the largest and most ethnically diverse metropolises in the world. With an estimated 2018 population of 8,398,748 distributed over a land area of about 302.6 square miles (784 km2), New York is also the most densely populated major city in the United States. As the largest city in the United States, it attracts regular international immigration. Approximately 37% of the city's population is foreign born, and more than half of all children are born to mothers who are immigrants. In New York, no single country or region of origin dominates. The ten largest sources of foreign-born individuals in the city as of 2011 were the Dominican Republic, China, Mexico, Guyana, Jamaica, Ecuador, Haiti, India, Russia, and Trinidad and Tobago, while the Bangladeshi-born immigrant population has become one of the fastest growing in the city, counting over 74,000 by 2011.

1.1. Background: Turkish Migration to NYC

The Turkish migration flow to the U.S. is relatively small, with an estimated 400,000 long term emigrants settled in the U.S. between the early 19th century and the early 21st century, and less than 100,000 foreign born Turks in the U.S. today. Since the 1980s, the flow of Turkish immigrants to the United States has included an increasing number of students and professionals as well as migrants who provide unskilled and semi-skilled labor. Thus, in recent years, the highly skilled and educated profile of the Turkish American community has changed with the arrival of unskilled or semi-skilled Turkish labor workers. The unskilled or semi-skilled immigrants usually work in restaurants, gas stations, hair salons, construction sites, and grocery stores, although some of them have obtained American citizenship or green cards and have opened their own ethnic businesses.

The largest concentrations of Turkish Americans are found scattered throughout New York City, Long Island, New Jersey, Connecticut, and other suburban areas. They generally reside in specific cities and neighborhoods including Brighton Beach in Brooklyn, Sunnyside in Queens, and in the cities of Paterson and Clifton in New Jersey. According to the U.S. Census Bureau, in 2000, Americans of Turkish origin mostly live in the State of New York followed by, California, New Jersey, Florida, Texas, Virginia, Illinois, Massachusetts, Pennsylvania, and Maryland.

The top US communities with the highest percentage of people claiming Turkish ancestry in 2000 are:

1.2. Problem: Rising Interest vs Availability of Turkish Cuisine in NYC

As small it may be, the Turkish communities in foreign countries tend to stay loyal to their own cuisine. Prior to the 1980s, the Turkish immigrants in United States used to prepare their own Turkish cuisine food items at their homes and on family, friend gatherings. As the flow of immigration increased after 1980s and especially after 2000s, we have seen increasing number of Turkish cuisine restaurants starting to open in its diverse jewel, New York City.

Data might contribute to determining where Turkish cuisine restaurants are concentrated on which neighborhoods and whether there are neighborhoods that are lacking Turkish cuisine restaurants. Thus, we will be able to provide information on where to stay if they would prefer Turkish cuisine. Additionally, the outcome would provide some information on where to invest to open a Turkish cuisine restaurant by outlining scarcity of such businesses. In this project, we will analyze, list and visualize major parts of New York City that has nice Turkish restaurants and provide insights on the findings.

1.3. Key objectives of analyzing the data set

- On which neighborhoods are the best Turkish restaurants?
- Which neighborhoods lack Turkish cuisine?
- Where to stay to get close to Turkish restaurants?

2. Data Acquisition and Processing

2.1. Data sources

We will use the following data for this project

- Boroughs, Neighborhoods data of New York City as well as their latitudes and longitudes.
    - Source : https://cocl.us/new_york_dataset
- Turkish resturants in each neighborhood of NYC.
    - Source : Fousquare API
- GeoSpace data
    - Source : https://data.cityofnewyork.us/City-Government/Borough-Boundaries/tqmj-j8zm

2.2. Libraries that will be used

- Pandas and Numpy for handling the data
- Geopy to find coordinates of New York City
- Request for using Foursquare API
- Folium to visualize the results on the map

3. Methodology

In this section,

- We will collect the New York City data from https://cocl.us/new_york_dataset
- Using Foursquare API, we will list all venues for each neighborhood
- We will filter out the venues that are Turkish restaurants
- We will find the ratings, tips and like count for these restaurants using Foursquare API and sort by ratings
- We will visualize the ranked neighborhoods using Folium

The New York City data json file was downloaded from the Cognitive Class New York data link using a separately written function. This function imports the json file, processes the column names and loops through the json file to append borough, neighborhood, latitude and longitude data into a dataframe. The resulting dataframe contained 5 boroughs, 306 neighborhoods. Boroughs and neighborhoods were correctly identified as string and latitude/longitude data was again correctly identified as float. An initial bar chart can be seen below outlining boroughs and number of neighborhoods in each borough (Figure 1).
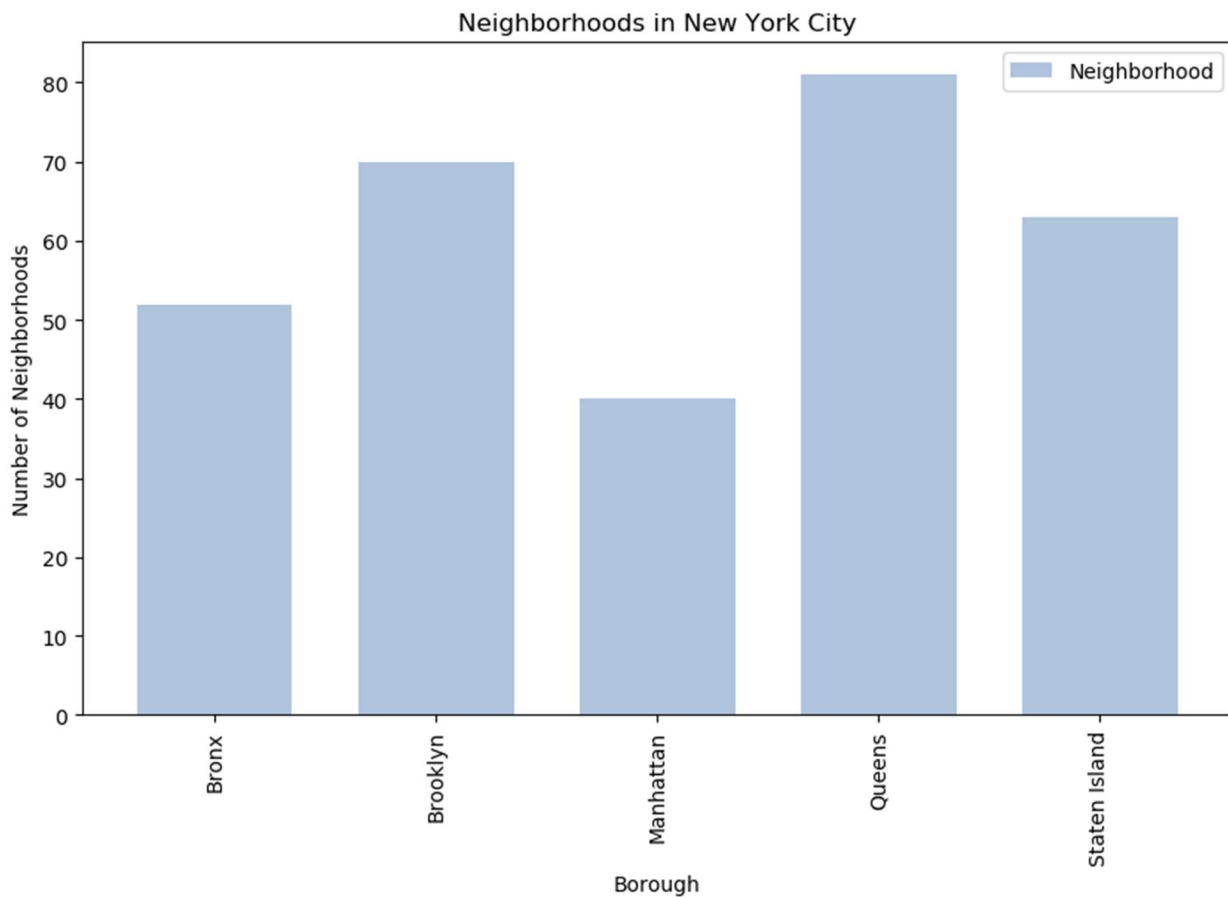

Figure 1. Bar chart of the distribution of the neighborhoods per borough in New York City

Next step was to retrieve the Turkish restaurants from the data set using Foursquare API. For this purpose, a get_venues function was used and "Category" field was matched with "Turkish Restaurant" value on the json file retrieved using Foursquare API. The function output only 27 restaurants that matched "Turkish Restaurant" tag and these were distributed between Brooklyn, Queens, Manhattan and Staten Island boroughs. Brooklyn

had 8 restaurants out of the 27 in NYC followed by 6 in Queens, 3 in Manhattan and 1 in Staten Island. The following chart outlines the distribution of the Turkish restaurants along the boroughs (Figure 2).
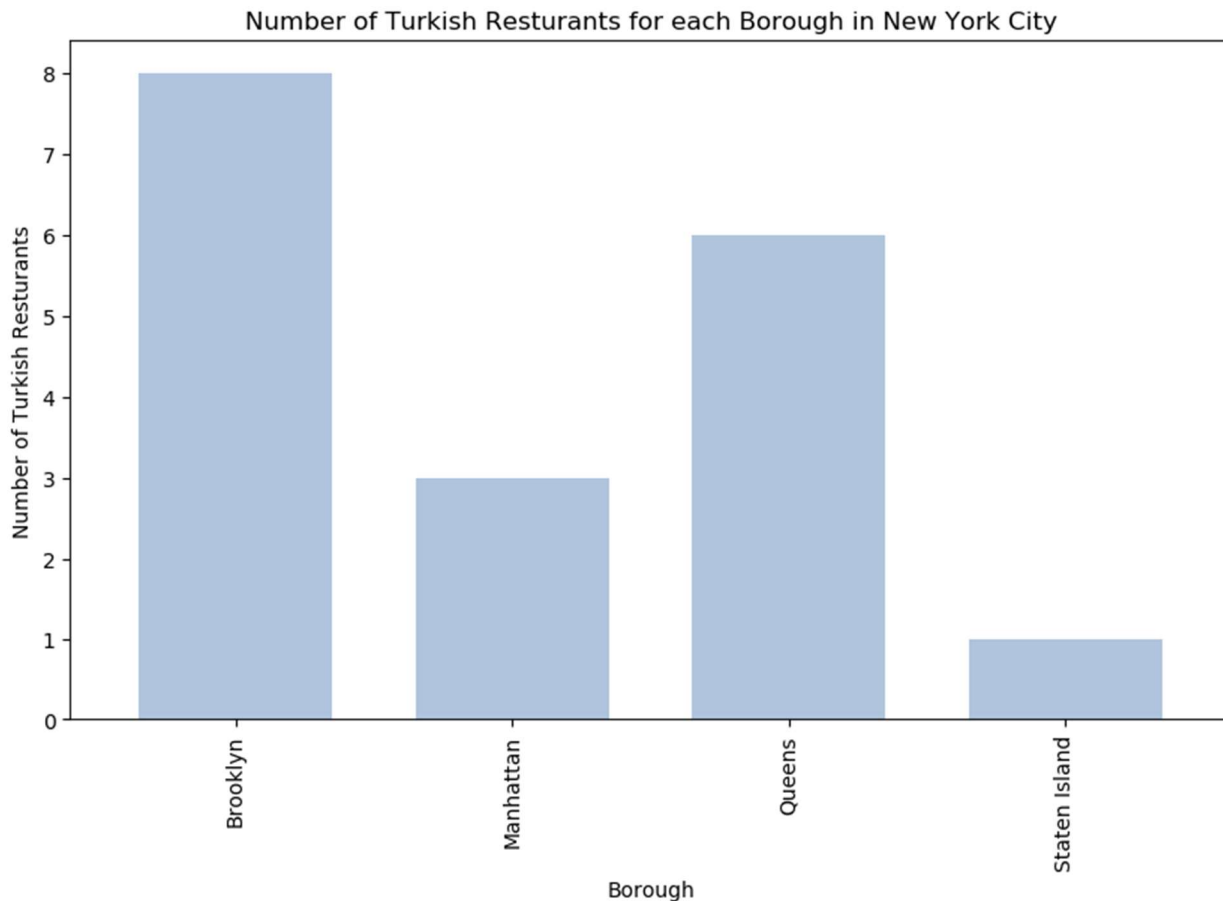

Figure 2. Bar chart of the distribution of the Turkish restaurants per borough in New York City

In order to get the venue ratings, another function called get_venue_details was used. The function was looped through the Turkish restaurants dataframe formed in the previous step. During the processing, a zero value was assigned to the restaurants that doesn't have ratings data. This ensured that any newly opened restaurant or the ones without any ratings would be identified easily. For each restaurant, features such as Name, Likes, Tips and Ratings were added to a stats dataframe on this step. When looked into the dataframe info, the Likes and Tips columns were shown as string type which needed to be converted into float to ensure proper processing. The top 5 restaurants ordered by index in the resulting dataframe can be seen below (Figure 3).

	Borough	Neighborhood	ID	Name	Likes	Rating	Tips
0	Brooklyn	Bay Ridge	579d3e7c498effa33c0450af	Istanbul Bay	24	8.2	4
1	Brooklyn	Gravesend	51a2a2a3498e0d5d337f137b	Wood Spoon	5	7.1	3
2	Brooklyn	Sheepshead Bay	4fcbfc92e4b088c92e7e97ad	Opera Cafe Lounge	255	8.2	53
3	Brooklyn	Sheepshead Bay	4b1d5405f964a520d70e24e3	Liman Restaurant	93	8.4	37
4	Brooklyn	Sheepshead Bay	53800e9c498e1b7adfbaaf5d	Rocca Cafe & Lounge	113	7.5	19

Figure 3. Top five Turkish restaurants of the Turkish restaurants in NYC dataframe

As the final step of processing, top restaurants with most likes, most tips and max rating were identified. Beyoglu restaurant in Manhattan took the first place on tips and likes while highest rated restaurant was Sip Sak in Turtle Bay that was rated a cool 9.0

```
Restaurant with most likes:
 Borough                     Manhattan
Neighborhood           Upper East Side
ID              49eb9b35f964a52001671fe3
Name                          Beyoglu
Likes                             416
Rating                            8.2
Tips                              178
Name: 14, dtype: object

Restaurant with max rating:
 Borough                     Manhattan
Neighborhood              Turtle Bay
ID              50fc9a88e4b04cfffaebe2cf
Name                          Sip Sak
Likes                             280
Rating                              9
Tips                              100
Name: 23, dtype: object

Restaurant with most tips:
 Borough                     Manhattan
Neighborhood           Upper East Side
ID              49eb9b35f964a52001671fe3
Name                          Beyoglu
Likes                             416
Rating                            8.2
Tips                              178
Name: 14, dtype: object
```

4.0 Visualization

4.1. Initial Preparation

First step in visualization was preparation. We've looked at maximum average rating of Turkish restaurants by neighborhoods and boroughs. First step was to look at the average ratings of the Turkish restaurants per neighborhood. The dataframe that shows top 10 neighborhoods with maximum average ratings can be seen on the right. From this quick glimbse, it looks like Turkish restaurants in NYC are rated favorably as the lowest average rated neighborhood is Upper West Side with an 8.0 rating.

	Neighborhood	Average Rating
14	Turtle Bay	9.0
8	Ocean Parkway	8.9
7	Manhattan Terrace	8.9
9	Ravenswood	8.6
11	Steinway	8.6
15	Upper East Side	8.2
3	Dyker Heights	8.2
1	Bay Ridge	8.2
4	Forest Hills Gardens	8.1
16	Upper West Side	8.0

Figure 4. Maximum average ratings of Turkish restaurants by neighborhood

When we look at the maximum average ratings of Turkish restaurants per Borough, we see that Staten Island comes out as zero. As can be remembered from the description above, restaurants without ratings were assigned zero values. Due to this reason we've dropped Staten Island from the New York borough stats dataframe. The average rating per borough and the Turkish restaurant stats dataframes' before and after views can be seen below.

	Borough	Average Rating
1	Manhattan	8.400000
2	Queens	8.077778
0	Brooklyn	8.035714
3	Staten Island	0.000000

Figure 5. Maximum average ratings of Turkish restaurants by borough

Turkish restaurant stats dataframe, sorted inversely by rating before the drop:

	Borough	Neighborhood	ID	Name	Likes	Rating	Tips
22	Staten Island	Dongan Hills	0	0	0.0	0.0	0.0
1	Brooklyn	Gravesend	51a2a2a3498e0d5d337f137b	Wood Spoon	5.0	7.1	3.0
11	Brooklyn	Bath Beach	4aef96d2f964a5206fd921e3	Istanbul Turkish Fast Food & Restaurant	69.0	7.4	39.0
4	Brooklyn	Sheepshead Bay	53800e9c498e1b7adfbaaf5d	Rocca Cafe & Lounge	113.0	7.5	19.0
9	Brooklyn	Manhattan Beach	53800e9c498e1b7adfbaaf5d	Rocca Cafe & Lounge	113.0	7.5	19.0

Turkish restaurant stats dataframe, sorted inversely by rating after the drop:

	Borough	Neighborhood	ID	Name	Likes	Rating	Tips
1	Brooklyn	Gravesend	51a2a2a3498e0d5d337f137b	Wood Spoon	5.0	7.1	3.0
11	Brooklyn	Bath Beach	4aef96d2f964a5206fd921e3	Istanbul Turkish Fast Food & Restaurant	69.0	7.4	39.0
4	Brooklyn	Sheepshead Bay	53800e9c498e1b7adfbaaf5d	Rocca Cafe & Lounge	113.0	7.5	19.0
9	Brooklyn	Manhattan Beach	53800e9c498e1b7adfbaaf5d	Rocca Cafe & Lounge	113.0	7.5	19.0
26	Queens	Sunnyside Gardens	4b08b328f964a520021123e3	Turkish Grill	51.0	7.7	25.0

While it's advisable to keep as much data as possible in these kind of smaller data sets, removing an entry without any data to contribute our analysis is logical. As can be seen above, the Staten Island entry had no information apart from the borough and neighborhood and our function replaced all unavailable fields with zeros, essentially allowing us to identify this unnecessary entry with a simple sort method.

Next step in preparation before visualization was to identify if there are any lower rated boroughs. Again, in such a small dataset, it's advisable not to remove too much data but if there were boroughs with ratings such as 1 or 2, it wouldn't add any significance to our analysis and would act as an outlier. For this purpose, we plot the average rating of Turkish restaurants for each borough.
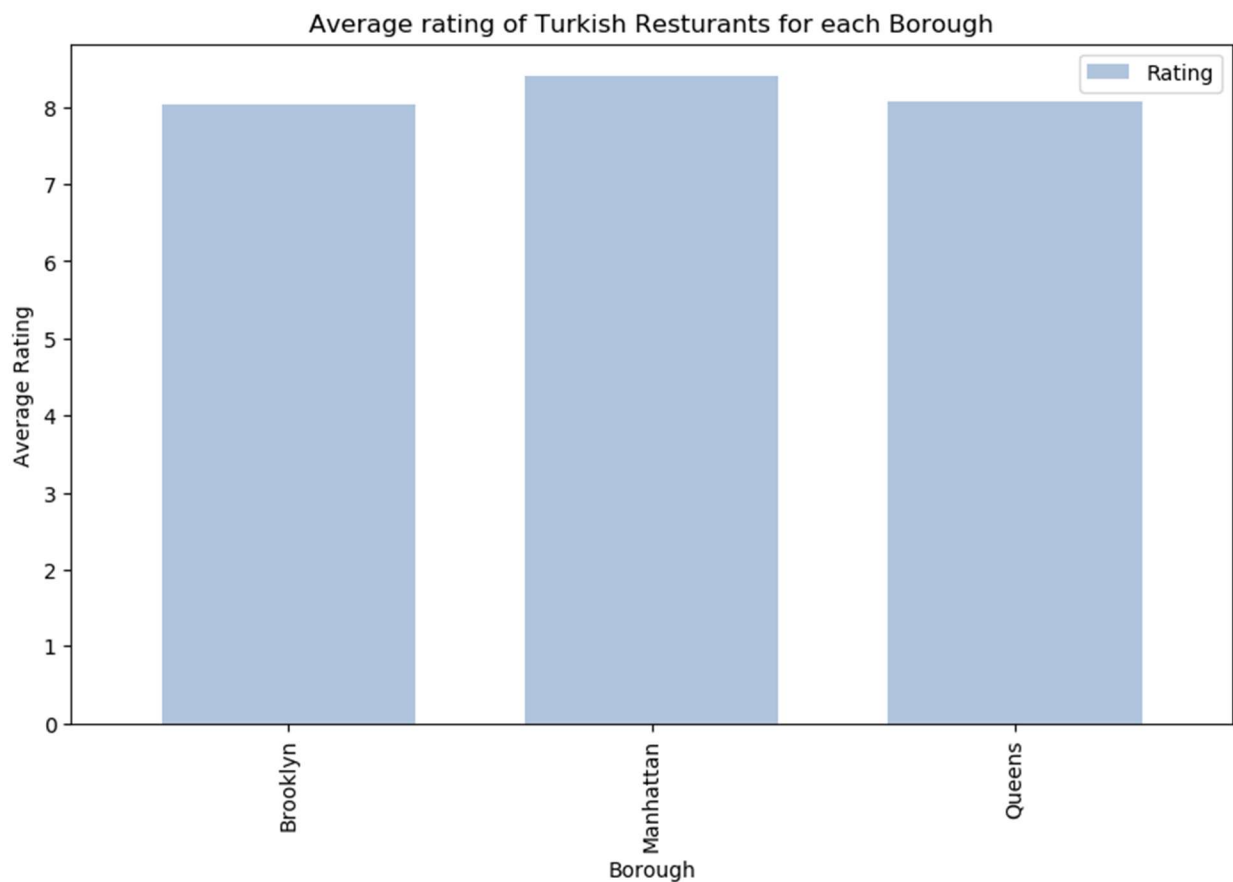

Figure 5. Average ratings of Turkish restaurants for each borough

As can be seen from the bar chart above, the average ratings are considerably high, so we don't necessarily need to filter out low rated restaurants. Merging this dataset with the original NYC dataset yields the NY neighborhood stats dataset that we'll use for mapping. The first five entries of this dataset can be seen below.

	Borough	Neighborhood	Latitude	Longitude	Average Rating
0	Brooklyn	Bath Beach	40.599519	-73.998752	7.4
1	Brooklyn	Bay Ridge	40.625801	-74.030621	8.2
2	Staten Island	Dongan Hills	40.588673	-74.096399	0.0
3	Brooklyn	Dyker Heights	40.619219	-74.019314	8.2
4	Queens	Forest Hills Gardens	40.714611	-73.841022	8.1

Figure 6. Merged New York dataset with boroughs, neighborhoods, coordinates and average rating

4.2. Folium Maps

Here we'll showcase two New York maps. First will visualize the locations of Turkish restaurants in our dataset with labels showing the neighborhood, borough and rating fields.

Figure 7. Folium map showing the Turkish restaurants on a New York City map.

The map above correctly points out where each restaurant is located. We can see that the borough with the most restaurants, Brooklyn, has all of them located near seaside. Same situation is obvious with Staten Island. Looks like the restaurants are clustered in two areas, one at or close to downtown NYC and Manhattan, other is near the sea.
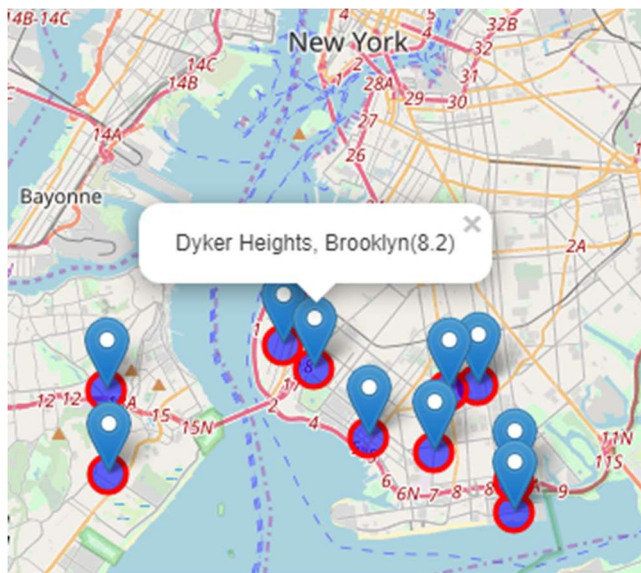

Figure 8. Smaller section of Folium map showing the label details

Next map is the visualization of boroughs based on ratings. It is a Choropleth map that places and overlay on the New York City map to show which borough's average ratings of Turkish restaurants are higher.
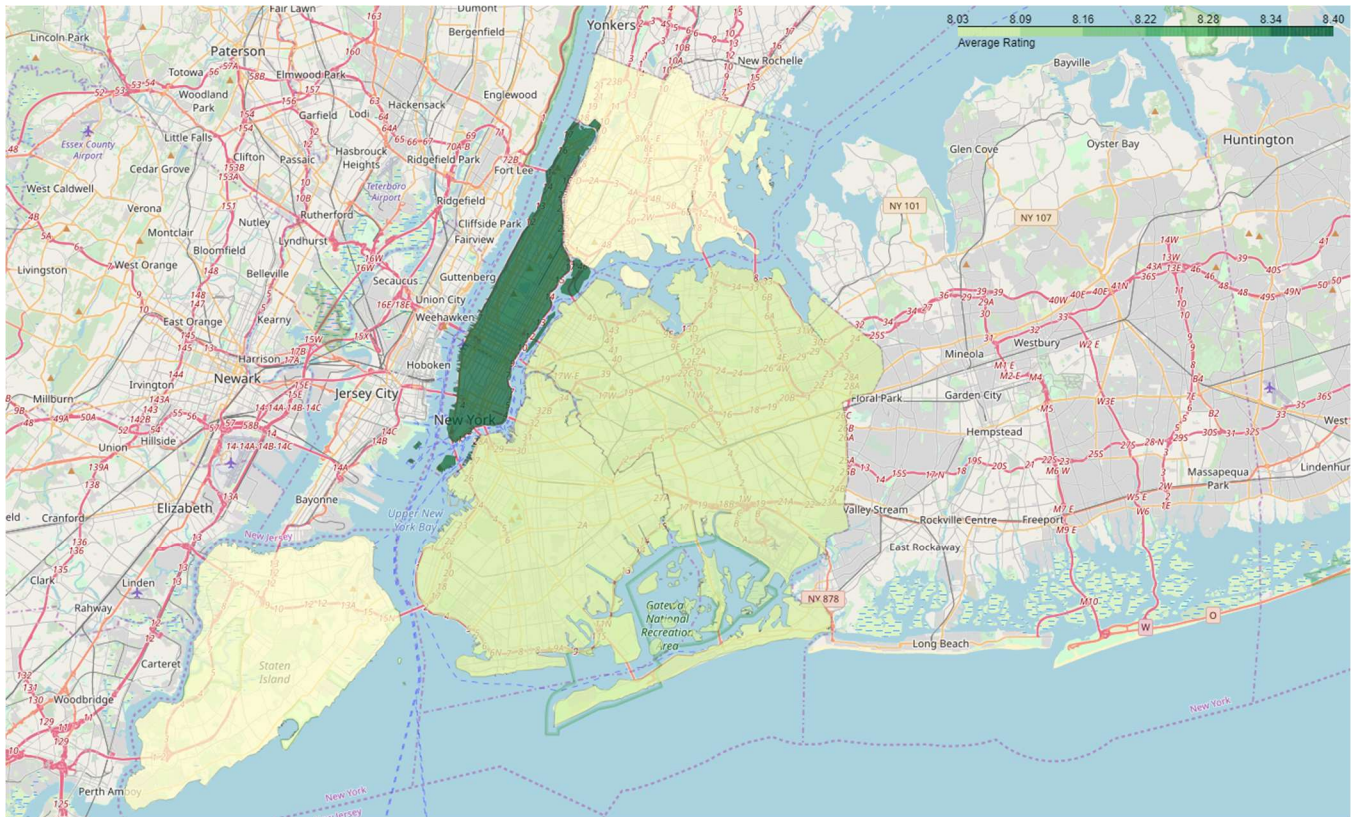

Figure 9. New York City choropleth map showing the average ratings of Turkish restaurants by boroughs

Results

In this study, we analyzed the Turkish restaurants in one of the most cosmopolitan cities of United States, New York City. The analysis used New York geolocation data and identified Turkish restaurants using Foursquare API. Further analysis was performed on the concentration of the Turkish restaurants on New York's boroughs and neighborhoods as well as the ratings of the identified restaurants.

Our analysis shows that even if there's an increasing number of Turkish people migrating into the United States and especially New York City, the number of Turkish restaurants within the City boundaries are very limited. The number of restaurants identified as Turkish cuisine only came up to be 27 and out of the 27, Brooklyn had the most with 8 restaurants. As can be seen from the map, most restaurants with Turkish cuisine are located near seaside neighborhoods. There are 10 of these restaurants that are distributed between Brooklyn and Staten Island. Manhattan, as the most touristic boroughs of all, has only 3 restaurants that serve Turkish cuisine. On the other hand, the Turkish restaurants at Manhattan are rated considerably higher at 8.40 over 10 compared to 8.07 for Queens and 8.03 for Brooklyn. Overall, this analysis shows that most Turkish restaurants are located close to residential boroughs like Brooklyn, Queens and Staten Island than commercial ones like Manhattan.

Conclusion

We can say that if you'd like to have dinner or lunch at a Turkish restaurant while visiting New York City, you're best off staying either in Brooklyn or Queens. These two neighborhoods host 12 of the 27 Turkish restaurants in New York City and their ratings are above 8 from a scale of 10. Out of the five boroughs in NYC, Bronx doesn't have any Turkish restaurants while Manhattan has the best rated Turkish restaurants which means you'd probably wait in line for a bit more in Manhattan to have a highly rated meal at a Turkish restaurant.

Our analysis also shows some limitations such as the number of restaurants with dedicated Turkish cuisine in New York City. In a city of 8.4 million people that hosts 33 million tourists each year, 27 Turkish restaurants are significantly low in number. This outlines the problem of awareness of the cuisine as well as the investment decisions of the people who decide to open a restaurant in NYC.

From the data availability side, we're reliant on Foursquare and their users' identification of the restaurants. It's possible that there may be more restaurants that were found by Turkish people, that serves Turkish food as well as other types of food. For example, we'd be unable to identify a pizza place that also serves traditional Turkish food unless this place is described as a pizza place.

Overall, we can say that there are few dedicated Turkish food serving restaurants in New York City. The ones that are available are either located at seaside Brooklyn and Staten Island or located within the city in Manhattan or Brooklyn. If you are in search of Turkish food in New York City, these are the obvious choices unless you'd like to go adventuring to find out if there are other restaurants that serve Turkish food as well.