New Seafood Restaurant in Downtown Toronto

1. **Introduction**

   Toronto is the capital city of the Canadian province of Ontario. It is the most populous city in Canada and the fourth most populous city in North America. Toronto is an international centre of business, finance, arts, and culture, and is recognized as one of the most multicultural and cosmopolitan cities in the world.

   Surveys illustrate that in the past few years there has been an increased demand for seafood in North America. Consequently, it would seem to be a good choice to open up a seafood restaurant in the core of Toronto city. In this regard, a well-known seafood restaurant has contacted us, looking to open a new branch in Downtown Toronto. They are looking for guidance on which neighborhood to open the restaurant.

   The question to be answered is, which neighborhoods in Downtown Toronto would represent the best option. We will study the success of the existing seafood restaurants in the Downtown Toronto area, using the information obtained through the Foursquare API to find out which neighborhoods are craving more for seafoods these days.

2. **Data Collection**

   This project will utilize publicly available data from Wikipedia and Foursquare. The data from Wikipedia and Foursquare will be explored and analyzed by considering the restaurant venues in Downtown Toronto. The restaurants from the core of the city will be reviewed in terms of the types or categories of restaurants within a specific radius.

   All Toronto neighborhood details along with their postal codes are available here: https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M

   The latitude and longitude of Toronto neighborhoods are available here: http://cocl.us/Geospatial_data.

   With the Foursquare API, the geographical location for restaurant venues in the Downtown Toronto would be obtained. The restaurants will provide the categories needed for the analysis and these will be used to determine the viability of the selected locations for the restaurant.

The data will be utilized to come up with a frequency analysis for a seafood restaurant in Downtown Toronto, and to come up with the best choices of neighborhoods.

3. **Retrieving, Cleaning, Analysing and Visualizing Data**

First of all, from the aforementioned Wikipedia page, all Toronto neighborhoods where retrieved and imported to a pandas data frame. This data frame contains the all the postal codes, boroughs and the neighborhoods. All the rows that the borough column were "Not assigned" were removed from the data frame. Meanwhile, if a cell has a borough but a "Not assigned" neighborhood column, the neighborhood will be the same as the borough. On the other hand, more than one neighborhood can exist in on postal code area, so for the common held postal codes, the neighborhood column were combined and separated with a comma. Similarly, the geographical coordination's of each postal code were provided in a csv file that were imported to a pandas data frame. These two data frames were merged and eventually a new data frame that contains all the latitude and longitude of the neighborhoos along with the boroughs and postal codes was created. This data frame demonstrates that there are 10 boroughs and 103 neighborhoos in Toronto. As the investor is interested in opening a Seafood restaurant in downtown Toronto, a new data frame was created and only the downtown borough was kept. Using the geopy library, the below map was for the downtown Toronto with all the neighborhoods superimposed on top.
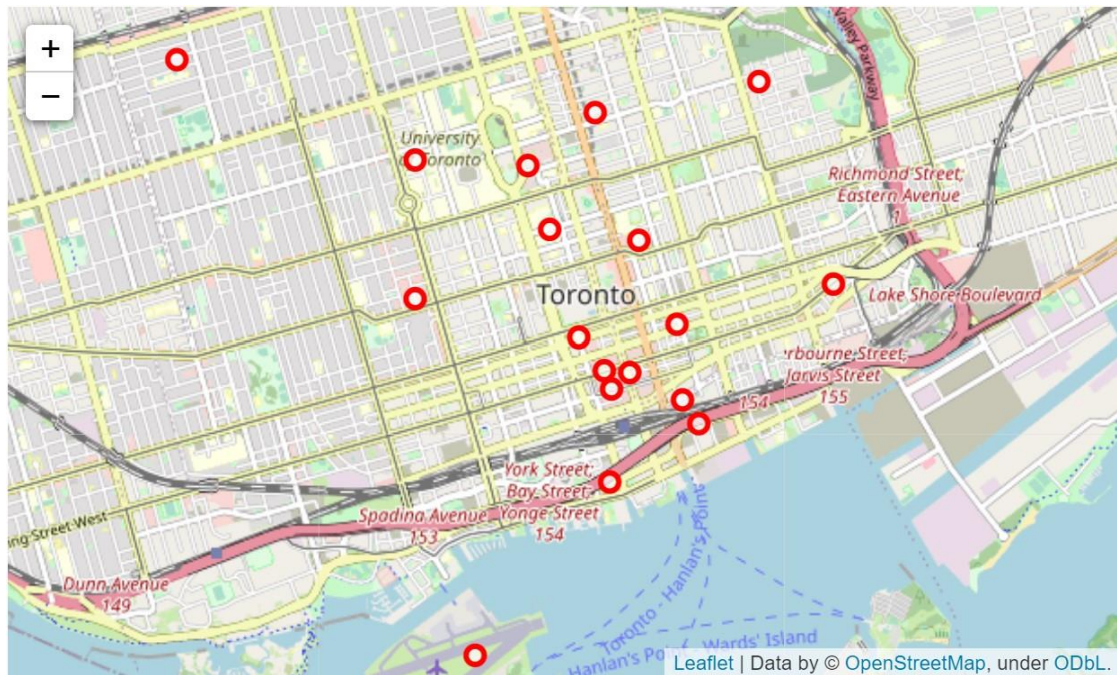

Figure 1 Downtown Toronto area and all the neighborhoos

Now that all the neighborhoods in downtown Toronto are defined, the top 100 venues within 500(m) radius for each neighborhood could be obtained from the

Foursquare API. The data gained from the Foursquare API is in JSON format, the data should be retrieved, cleaned and structured from the JSON format to a pandas data frame. This new data frame contains all venues in 500(m) radius along with their latitude and longitude for each neighborhood in downtown Toronto. Due to the fact that only venues that are in the restaurant category should be considered in this research, all the unnecessary venues were removed from the data frame. Also, all the restaurants that their type of cuisine were not mentioned were removed.

A great analysis could be, the type of restaurants each neighborhood contains and their frequency in each neighborhood. In this regard, one hot encoding method was applied and after that the data frame was grouped among the neighborhoods. The result was the below data frame that contains each neighborhood and the frequency of each restaurant in that neighborhood.

	Neighborhood	American Restaurant	Asian Restaurant	Belgian Restaurant	Brazilian Restaurant	Caribbean Restaurant	Chinese Restaurant	Colombian Restaurant	Comfort Food Restaurant	Doner Restaurant	Dumpling Restaurant	Eastern European Restaurant	Ethi Resta
0	Berczy Park	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.100000	0.000000	0.000000	0.100000	0.00
1	Central Bay Street	0.000000	0.000000	0.000000	0.00	0.000000	0.066667	0.000000	0.000000	0.000000	0.000000	0.000000	0.00
2	Christie	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00
3	Church and Wellesley	0.043478	0.000000	0.000000	0.00	0.043478	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.04
4	Commerce Court, Victoria Hotel	0.173913	0.043478	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00
5	First Canadian Place, Underground city	0.115385	0.115385	0.000000	0.00	0.000000	0.000000	0.038462	0.000000	0.000000	0.000000	0.000000	0.00
6	Garden District, Ryerson	0.000000	0.000000	0.000000	0.00	0.000000	0.050000	0.000000	0.000000	0.000000	0.000000	0.000000	0.05
7	Harbourfront East, Union Station, Toronto Islands	0.000000	0.000000	0.000000	0.00	0.000000	0.100000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00
8	Kensington Market, Chinatown, Grange Park	0.000000	0.000000	0.055556	0.00	0.111111	0.000000	0.000000	0.055556	0.055556	0.055556	0.000000	0.00
9	Queen's Park, Ontario Provincial Government	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00
10	Regent Park, Harbourfront	0.000000	0.500000	0.000000	0.00	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00
11	Richmond, Adelaide, King	0.100000	0.050000	0.000000	0.05	0.000000	0.000000	0.050000	0.000000	0.000000	0.000000	0.000000	0.00
12	St. James Town	0.150000	0.050000	0.050000	0.00	0.000000	0.000000	0.000000	0.050000	0.000000	0.000000	0.000000	0.00
13	St. James Town, Cabbagetown	0.000000	0.000000	0.000000	0.00	0.125000	0.125000	0.000000	0.000000	0.000000	0.000000	0.000000	0.00
14	Stn A PO Boxes	0.052632	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.052632	0.000000	0.000000	0.052632	0.00
15	Toronto Dominion Centre, Design Exchange	0.130435	0.086957	0.000000	0.00	0.000000	0.043478	0.000000	0.000000	0.000000	0.000000	0.000000	0.00
16	University of Toronto, Harbord	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	0.166667	0.000000	0.000000	0.000000	0.00

Figure 2 The frequency of each restaurant type in each neighborhood

Now a new data frame was created that contained the top three most common venues in each neighborhood.

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue
0	Berczy Park	Seafood Restaurant	Comfort Food Restaurant	Greek Restaurant
1	Central Bay Street	Italian Restaurant	Indian Restaurant	Chinese Restaurant
2	Christie	Italian Restaurant	Greek Restaurant	Gluten-free Restaurant
3	Church and Wellesley	Sushi Restaurant	Japanese Restaurant	Fast Food Restaurant
4	Commerce Court, Victoria Hotel	American Restaurant	Seafood Restaurant	Italian Restaurant
5	First Canadian Place, Underground city	Japanese Restaurant	American Restaurant	Asian Restaurant
6	Garden District, Ryerson	Japanese Restaurant	Middle Eastern Restaurant	Fast Food Restaurant
7	Harbourfront East, Union Station, Toronto Islands	Italian Restaurant	Indian Restaurant	Vegetarian / Vegan Restaurant
8	Kensington Market, Chinatown, Grange Park	Vietnamese Restaurant	Mexican Restaurant	Vegetarian / Vegan Restaurant
9	Queen's Park, Ontario Provincial Government	Sushi Restaurant	Italian Restaurant	Japanese Restaurant
10	Regent Park, Harbourfront	Asian Restaurant	French Restaurant	Vietnamese Restaurant
11	Richmond, Adelaide, King	Thai Restaurant	American Restaurant	Sushi Restaurant
12	St. James Town	American Restaurant	Moroccan Restaurant	Italian Restaurant
13	St. James Town, Cabbagetown	Italian Restaurant	Indian Restaurant	Thai Restaurant
14	Stn A PO Boxes	Seafood Restaurant	Italian Restaurant	Japanese Restaurant
15	Toronto Dominion Centre, Design Exchange	American Restaurant	Seafood Restaurant	Italian Restaurant
16	University of Toronto, Harbord	Japanese Restaurant	Italian Restaurant	French Restaurant

Figure 3 Top three most common venues in each neighborhood

In this stage, the power of machine learning comes in hand and the neighborhoods could be clustered based on their restaurant category frequency. The below map indicates the downtown Toronto neighborhoods clustered based on their venues category.
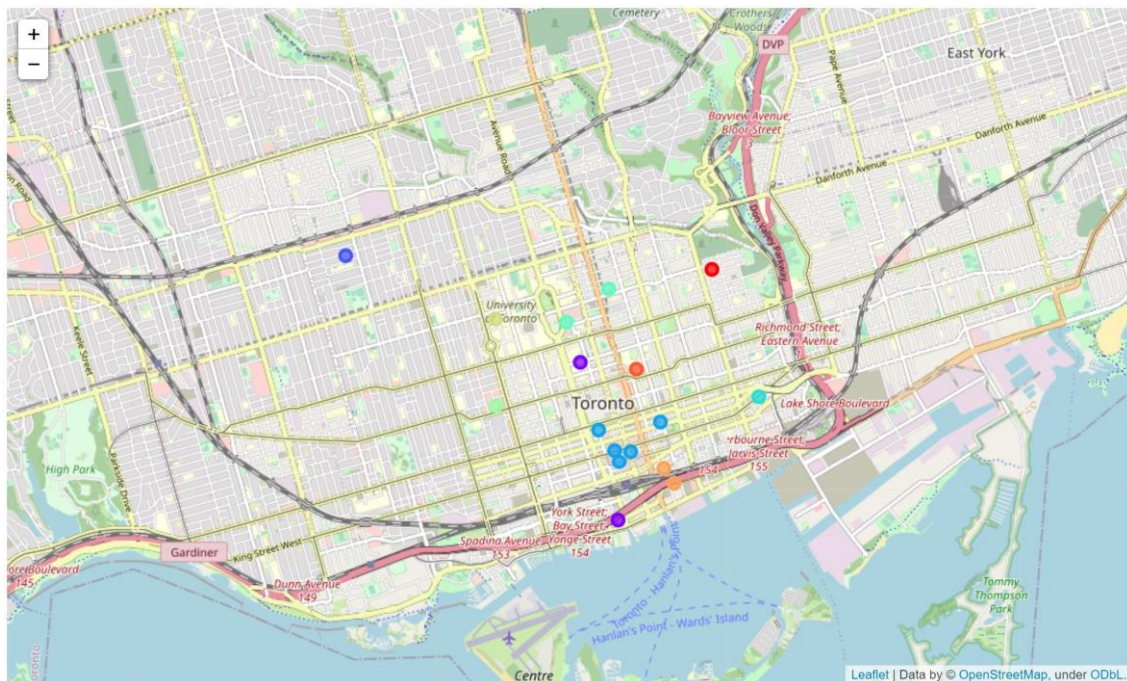

Figure 4 Downtown Toronto Neighborhoos Clustered based on their restaurant category

4. Result

- There are 19 neighborhoods in downtown Toronto but only 17 of them contain at least 1 restaurant in 500(m) radius.
- There are 251 venues in downtown Toronto, categorized in 40 different types.
- Figure 3 indicates the top 3 most common venues in each neighborhood.
- Figure 4 indicates the clustered neighborhoods.
- Seafood restaurants are the number one most common venues in "Berczy Park" and "Stn A PO Boxes".
- Seafood are also very popular in "Toronto Dominion Centre, Design Exchange" and "Commerce Court, Victoria Hotel" as they are the second most common venues in these neighborhoods.

5. Conclusion

In this study, the most common neighborhoods for opening a Seafood restaurant were analysed. As a result, we recommend our business partners to open their restaurant in one of these two neighborhoods "Berczy Park" and "Stn A PO Boxes" as people in these areas number one choice are seafoods and a high quality seafood restaurant could join the competition for drawing people in their restaurant.