**Introduction**

In this project, we will try to find a location in Toronto for a new sushi restaurant. Toronto is the financial capital of Canada and has lots of venues. This project will provide information for a restaurant owner who wants to open a new sushi restaurant in Toronto. Specifically, on one hand, we are looking for places where there are not many restaurants around, especially Japanese restaurants. On the other hand, we want the new place close to other venues, like movie theaters, gyms, etc. We will use a large amount of data and a variety of analytic methods to explore neighborhoods in Toronto and find out the best locations for a new sushi restaurant.

**Data**

We will use the geographical data of Toronto scraped from the Wikipedia website (https://en.wikipedia.org/wiki/List\_of\_postal\_codes\_of\_Canada:\_M) and a csv file (http://cocl.us/Geospatial\_data), which were used in the previous module 3. We will also obtain the information about venues in Toronto from Foursquare API (https://foursquare.com).

**Method**

1. Generate the geographical data of Toronto

We first generate a dataframe containing geographical data of Toronto. Specifically, we obtained a table of postcodes of different neighborhoods in Toronto by scraping the Wikipedia website mentioned above. We cleaned the table by removing not assigned boroughs, combining neighborhoods with the same postcode, and assigning the corresponding boroughs to not assigned neighborhoods. Thus, we created a table showing 103 neighborhoods with distinct postcodes in Toronto. Next, we utilized a csv file mentioned above, which displayed geographical coordinates of each postcode. We merged the postcode dataframe and the coordinate dataframe, which generated the final geographical data of Toronto. A representative table is shown below.

A screenshot of a cell phone

Description automatically generated

1. Obtain venue information from Foursquare

Using the coordinates for each postcode in the above table, we obtained the top 100 venues within 500 meters from Foursquare API. As shown below, the table contains the information for each venue, including its name, its coordinates (latitude and longitude), and its category. In addition, the table also shows the neighborhood information for each venue, including its postcode, its borough, its neighborhood, and its coordinates. In total, 3850 venues were extracted for 100 postcodes.

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1. Count restaurants and other venues in each postcode

We used one hot encoding to calculate the number of Japanese restaurants (sushi restaurants, ramen restaurants, Japanese restaurants), the number of all restaurants, and the number of other venues for each postcode. Then we calculated a venue score for each postcode based on the weighted counts of venues. Specifically, we gave the number of Japanese restaurants a -3 score, since we definitely don’t want to start the new sushi restaurant around any existing Japanese restaurants. We assigned the number of all restaurants a -2 score. The number of other venues is weighted a +1 score because we want the new restaurant close to the places people often visit. We ranked the postcodes based on the venue scores, as shown in the representative table below.

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1. Draw a map showing the top ranked neighborhoods

We drew a map around Toronto to visualize the 5 best neighborhoods and the 5 worst neighborhoods for starting a new sushi restaurant.

**Results**

As shown in the picture below, the 5 top ranked neighborhoods are Fairview, Henry Farm, Oriole (M2J), Harbourfront East, Toronto Islands, Union Station (M5J), Davisville North (M4P), Lawrence Heights, Lawrence Manor (M6A), Ryerson, and Garden District (M5B), indicating by the red circles. The 5 bottom ranked neighborhoods are Adelaide, King, Richmond (M5H), Upper Rouge (M1X), Albion Gardens, Beaumond Heights, Humbergate, Jamestown, Mount Olive, Silverstone, South Steeles, Thistletown (M9V), High Park, The Junction South (M6P), and Bedford Park, Lawrence Manor East (M5M), indicating by the blue circles.

A picture containing text, map

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**Discussion**

The red circles in the geographical map showed 5 best ranked neighborhoods, which have the lowest number of restaurants, especially Japanese restaurants, as well as the highest number of other venues. On the other hand, the blue circles showed 5 neighborhoods where we don’t want to open a sushi restaurant around, because there are at least one Japanese restaurant or very few other venues. We noticed that two red circles (M5J, M5B) are very close to a blue circle (M5H). Thus these two neighborhoods (Harbourfront East, Toronto Islands, Union Station and Ryerson, and Garden District) might not be a good option either.

**Conclusion**

In conclusion, there are 3 neighborhoods in which we will suggest to open a new sushi restaurants. They are Fairview, Henry Farm, Oriole (M2J), Davisville North (M4P), Lawrence Heights, and Lawrence Manor (M6A).