

CAPSTONE PROJECT

Battle of the Neighborhoods

A. Introduction

The recent upheaval and political unrest in Hong Kong have provided impetus for Hong Kong Citizens to consider migration to Canada. A Hong Kong family intends to migrate to Toronto, Canada and has approached my consultancy firm to perform analysis on the neighborhoods around City of Toronto, with a preference for Scarborough Borough. Objectives and briefs provided include optimum living standards and an environment which caters to quality of life. The family also intends to run their own retail business/store once they settle-in and has asked for a search into the existing nature of business being conducted around the neighborhoods.

This project will explore the similarities or dissimilarities between neighborhoods in some of the neighborhood clusters in Scarborough, and determine which neighborhood best fit their objectives for migration.

City of Toronto, Canada



B. DATA

The data used for this project will be acquired from Wikipedia website pages. The datasets consist of the postal codes, neighborhood names, latitude, and longitude information for each neighborhood. Foursquare API search feature will be used to collect neighborhood venue information. Details on local venues and nature of amenities will provide insight into and qualities of the lifestyle of the neighborhoods. Foursquare and various python packages will be used to create maps and machine learning models to further facilitate our neighborhood battle project.

The following datasets from these websites were downloaded for analysis purposes :

1. Toronto Neighborhoods – https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M
2. Toronto Latitude and Longitude – http://cocl.us/Geospatial_data

C. Methodology

1. Using Geopy and Folium library to visualize neighborhood cluster distribution of Scarborough over an interactive leaflet map.
2. HTTP requests are made using Foursquare API with codes of the Borough's neighborhoods. This allows for pulling of location information (for example Latitude and Longitude)
3. Foursquare API search feature is enabled to collect details on nearby places of the neighborhoods. Due to http request limitations, the number of places per neighborhood parameter has been reasonably set to 30 and the radius parameter set at 100.
4. Extensive comparative analysis of neighborhoods within Scarborough is carried out to derive insights about their characteristics. These are made possible by using python's scientific libraries Pandas, NumPy and Scikit-learn.
5. Unsupervised machine learning algorithm K-mean clustering is applied to form the clusters for different categories of places residing in and around the neighborhoods. The "Top Ten Most Common Venues" in these neighborhoods are also analysed individually and collectively to derive conclusions for the client.

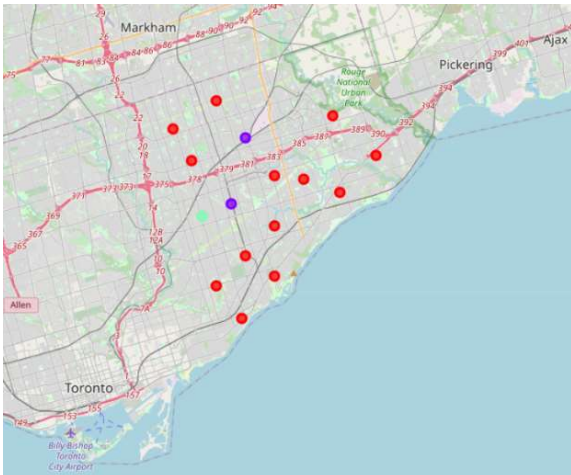
D. Libraries and Packages

- Pandas – library for Data Analysis
- NumPy – Library to handle data in a vectorized manner
- JSON – Library to handle JSON files
- Geopy – To retrieve Location Data
- Requests – Library to handle http requests
- Matplotlib – Python Plotting Module
- SKlearn – Python machine learning Library
- Folium – Map rendering Library

E. Results

Scarborough Borough in Toronto, Canada

K-means is used to group the neighborhoods in Scarborough into 3 clusters. Cluster_0 has 16 neighborhoods, Cluster_1 has 2 neighborhoods and Cluster_2 has 1 neighborhood.



City of Toronto, Scarborough Borough

Using K-Means to cluster neighborhood and thereafter using the cluster to identify Top Common Venues in the neighborhoods

Toronto 10 Boroughs 103 Neighborhoods

Scarborough 83 Distinct Venues 56 Categories

The geographical coordinate of Toronto, Canada are 43.6534817, -79.3839347

The geographical coordinate of Scarborough, CA are 43.773077, -79.257774.

Ten Most Common Venues Amongst the Neighborhoods

	Neighborhood	1th Most Common Venue	2th Most Common Venue	3th Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Agincourt	Skating Rink	Breakfast Spot	Latin American Restaurant	Lounge	Vietnamese Restaurant	Convenience Store	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint
1	Birch Cliff, Cliffside West	College Stadium	General Entertainment	Skating Rink	Farm	Café	Vietnamese Restaurant	Gym	Grocery Store	Gas Station	Fried Chicken Joint
2	Cedarbrae	Hakka Restaurant	Thai Restaurant	Athletics & Sports	Bakery	Bank	Gas Station	Fried Chicken Joint	Caribbean Restaurant	Department Store	Gym
3	Clarks Corners, Tam O'Shanter, Sullivan	Pizza Place	Noodle House	Intersection	Chinese Restaurant	Fast Food Restaurant	Italian Restaurant	Fried Chicken Joint	Bank	Gas Station	Thai Restaurant
4	Cliffside, Cliffforest, Scarborough Village West	American Restaurant	Intersection	Motel	Convenience Store	Gym	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint	Fast Food Restaurant
5	Dorset Park, Wexford Heights, Scarborough Town...	Indian Restaurant	Vietnamese Restaurant	Thrift / Vintage Store	Brewery	Light Rail Station	Chinese Restaurant	Pet Store	Department Store	Grocery Store	General Entertainment
6	Golden Mile, Clairlea, Oakridge	Bus Line	Bakery	Ice Cream Shop	Metro Station	Bus Station	Park	Soccer Field	Bar	Department Store	Grocery Store
7	Guildwood, Morningside, West Hill	Restaurant	Breakfast Spot	Medical Center	Electronics Store	Rental Car Location	Mexican Restaurant	Intersection	Bank	Fried Chicken Joint	Convenience Store
8	Kennedy Park, Ionview, East Birchmount Park	Hobby Shop	Department Store	Bus Station	Chinese Restaurant	Coffee Shop	Discount Store	Hakka Restaurant	Gym	Grocery Store	General Entertainment
9	Malvern, Rouge	Fast Food Restaurant	Vietnamese Restaurant	Thrift / Vintage Store	Hakka Restaurant	Gym	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint	Farm
10	Milliken, Agincourt North, Steeles East, L'Amo...	Park	Playground	Coffee Shop	Gym	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint	Fast Food Restaurant	Farm
11	Rouge Hill, Port Union, Highland Creek	Bar	Vietnamese Restaurant	Convenience Store	Hakka Restaurant	Gym	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint	Fast Food Restaurant
12	Scarborough Village	Playground	Vietnamese Restaurant	College Stadium	Gym	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint	Fast Food Restaurant	Farm
13	Steeles West, L'Amoreaux West	Fast Food Restaurant	Chinese Restaurant	Noodle House	Pizza Place	Indian Restaurant	Coffee Shop	Gym	Pharmacy	Grocery Store	Breakfast Spot
14	Wexford, Maryvale	Bakery	Smoke Shop	Breakfast Spot	Middle Eastern Restaurant	Vietnamese Restaurant	Convenience Store	Gym	Grocery Store	General Entertainment	Gas Station
15	Woburn	Coffee Shop	Korean Restaurant	Vietnamese Restaurant	Convenience Store	Gym	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint	Fast Food Restaurant

Cluster_0

	Borough	Longitude	Cluster Labels	1th Most Common Venue	2th Most Common Venue	3th Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Scarborough	-79.194353	0	Fast Food Restaurant	Vietnamese Restaurant	Thrift / Vintage Store	Hakka Restaurant	Gym	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint	Farm
1	Scarborough	-79.160497	0	Bar	Vietnamese Restaurant	Convenience Store	Hakka Restaurant	Gym	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint	Fast Food Restaurant
2	Scarborough	-79.188711	0	Restaurant	Breakfast Spot	Medical Center	Electronics Store	Rental Car Location	Mexican Restaurant	Intersection	Bank	Fried Chicken Joint	Convenience Store
3	Scarborough	-79.216917	0	Coffee Shop	Korean Restaurant	Vietnamese Restaurant	Convenience Store	Gym	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint	Fast Food Restaurant
4	Scarborough	-79.239476	0	Hakka Restaurant	Thai Restaurant	Athletics & Sports	Bakery	Bank	Gas Station	Fried Chicken Joint	Caribbean Restaurant	Department Store	Gym
5	Scarborough	-79.239476	0	Playground	Vietnamese Restaurant	College Stadium	Gym	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint	Fast Food Restaurant	Farm
6	Scarborough	-79.262029	0	Hobby Shop	Department Store	Bus Station	Chinese Restaurant	Coffee Shop	Discount Store	Hakka Restaurant	Gym	Grocery Store	General Entertainment
7	Scarborough	-79.264577	0	Bus Line	Bakery	Ice Cream Shop	Metro Station	Bus Station	Park	Soccer Field	Bar	Department Store	Grocery Store
8	Scarborough	-79.239476	0	American Restaurant	Intersection	Motel	Convenience Store	Gym	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint	Fast Food Restaurant
9	Scarborough	-79.264848	0	College Stadium	General Entertainment	Skating Rink	Farm	Café	Vietnamese Restaurant	Gym	Grocery Store	Gas Station	Fried Chicken Joint
13	Scarborough	-79.304302	0	Pizza Place	Noodle House	Intersection	Chinese Restaurant	Fast Food Restaurant	Italian Restaurant	Fried Chicken Joint	Bank	Gas Station	Thai Restaurant
14	Scarborough	-79.284577	0	Park	Playground	Coffee Shop	Gym	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint	Fast Food Restaurant	Farm
15	Scarborough	-79.318389	0	Fast Food Restaurant	Chinese Restaurant	Noodle House	Pizza Place	Indian Restaurant	Coffee Shop	Gym	Pharmacy	Grocery Store	Breakfast Spot

Cluster_1

	Borough	Longitude	Cluster Labels	1th Most Common Venue	2th Most Common Venue	3th Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
10	Scarborough	-79.273304	1	Indian Restaurant	Vietnamese Restaurant	Thrift / Vintage Store	Brewery	Light Rail Station	Chinese Restaurant	Pet Store	Department Store	Grocery Store	General Entertainment
12	Scarborough	-79.262029	1	Skating Rink	Breakfast Spot	Latin American Restaurant	Lounge	Vietnamese Restaurant	Convenience Store	Grocery Store	General Entertainment	Gas Station	Fried Chicken Joint

Cluster_2

	Borough	Longitude	Cluster Labels	1th Most Common Venue	2th Most Common Venue	3th Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
11	Scarborough	-79.295849	2	Bakery	Smoke Shop	Breakfast Spot	Middle Eastern Restaurant	Vietnamese Restaurant	Convenience Store	Gym	Grocery Store	General Entertainment	Gas Station

F. Conclusions

Our recommendations to the Hong Kong family are as follows :

- Based on the results reflected in Section (E), the family should endeavour to reside in Cluster_0 of Scarborough, where amenities are more readily available. This will allow them to pursue their optimum lifestyle.
- In terms of retail business/store, based on information collated from “10 Most Common Venues”, there seems to be a lack of pharmacy and medical center around the neighborhoods. This is an area of business which the Hong Kong family may want to consider.