OPTIMAL LOCATION FOR A NEW RESTAURANT IN TORONTO

WHY TORONTO?

- The city of Toronto, as the most populous city in Canada, is very multicultural and provides many opportunities for business.
- However, it can be very competitive at the same time to start a new business. It is very important to analyze the market and the environment of Toronto before any business decision. There are many types of restaurants in every neighbourhood in Toronto, such as French, Italian, Japanese, etc.
- This project will provide insights to stakeholders about which neighbourhood is the best location to open a new restaurant and to gain the highest return in Toronto.

DATA ACQUISITION

- For the Toronto neighborhood data, a Wikipedia page exists that has all the information we need to explore and cluster the neighborhoods in Toronto: https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M
- For the geographical coordinates of each postal code: http://cocl.us/Geospatial_data
- For the number of restaurants and their type and location in every neighborhood will be obtained using Foursquare API: https://foursquare.com/explore?mode=url&ne=44.418088%2C-78.362732&q=Restaurant&sw=42.742978%2C-80.554504

DATA PROCESSING

- Postal code data of Toronto city will be scraped from Wikipedia and is transformed into a dataframe. The data file that contains the geographical coordinates of Toronto neighbourhood will be also transformed into a pandas dataframe.
- These 2 data frames will be merged together with details of post code, borough, neighbourhood, latitude and longitude. These data will be used to get venues data from Foursquare in order to explore neighbourhood in city of Toronto.
- We will also use Geopy and Folium libraries to create a map of Toronto with neighbourhood shown on top.

NEIGHBORHOODS IN THE CITY OF TORONTO

- Filter the data and select only boroughs and neighborhoods in the city of Toronto. Then transform the data into a dataframe like below.
- **For simplicity purpose, not all the rows in the data frame will be shown. Focus on how the results have been generated.*

	Postcode	Borough	Neighbourhood	Latitude	Longitude
67	M4E	East Toronto	The Beaches	43.676357	-79.293031
71	M4K	East Toronto	The Danforth West	43.679557	-79.352188
72	M4K	East Toronto	Riverdale	43.679557	-79.352188
73	M4L	East Toronto	The Beaches West	43.668999	-79.315572
74	M4L	East Toronto	India Bazaar	43.668999	-79.315572
75	M4M	East Toronto	Studio District	43.659526	-79.340923
76	M4N	Central Toronto	Lawrence Park	43.728020	-79.388790
77	M4P	Central Toronto	Davisville North	43.712751	-79.390197
78	M4R	Central Toronto	North Toronto West	43.715383	-79.405678
79	M4S	Central Toronto	Davisville	43.704324	-79.388790

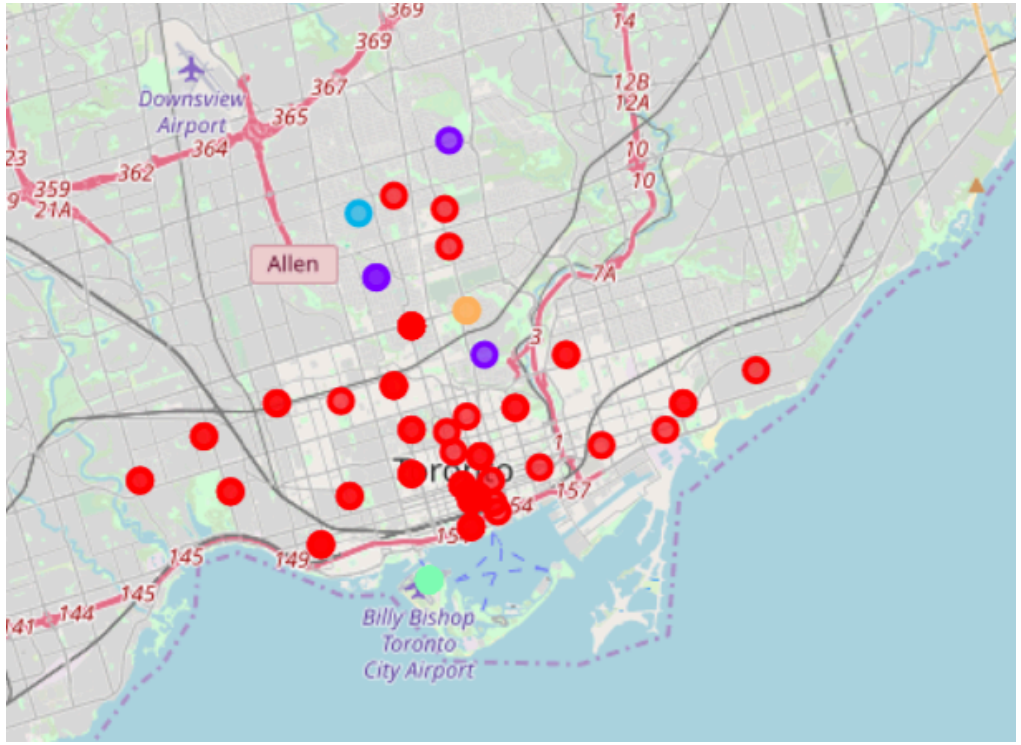
126	M5V	Downtown Toronto	South Niagara	43.628947	-79.394420
127	M5W	Downtown Toronto	Stn A PO Boxes 25 The Esplanade	43.646435	-79.374846
128	M5X	Downtown Toronto	First Canadian Place	43.648429	-79.382280
129	M5X	Downtown Toronto	Underground city	43.648429	-79.382280
135	M6G	Downtown Toronto	Christie	43.669542	-79.422564
136	M6H	West Toronto	Dovercourt Village	43.669005	-79.442259
137	M6H	West Toronto	Dufferin	43.669005	-79.442259
138	M6J	West Toronto	Little Portugal	43.647927	-79.419750
139	M6J	West Toronto	Trinity	43.647927	-79.419750
140	M6K	West Toronto	Brockton	43.636847	-79.428191
141	M6K	West Toronto	Exhibition Place	43.636847	-79.428191

OF VENUES WITHIN 500M OF EACH NEIGHBORHOOD

	Neighborhood Latitude	Neighborhood Longitude	Venu	Venue Latitude	Venue Longitude	Venue Category
Neighborhood						
Adelaide	100	100	100	100	100	100
Bathurst Quay	16	16	16	16	16	16
Berczy Park	57	57	57	57	57	57
Brockton	22	22	22	22	22	22
Business Reply Mail Processing Centre 969 Eastern	18	18	18	18	18	18
CN Tower	16	16	16	16	16	16
Cabbagetown	44	44	44	44	44	44
Central Bay Street	79	79	79	79	79	79
Chinatown	87	87	87	87	87	87
Christie	17	17	17	17	17	17
Church and Wellesley	85	85	85	85	85	85
Commerce Court	100	100	100	100	100	100
Davisville	38	38	38	38	38	38
Davisville North	9	9	9	9	9	9
Deer Park	15	15	15	15	15	15
Design Exchange	100	100	100	100	100	100
University of Toronto	39	39	39	39	39	39

- 4 boroughs and 74 neighborhoods inside the city of Toronto.
- In neighbourhoods such as Adelaide, Yorkville, Commerce court, and Design Exchange which have significantly higher restaurant density, there is probably a higher demand for a new restaurant, regardless of the competition between similar types of restaurants.
- In neighbourhoods such as University of Toronto, the restaurant density is low, which means lower market saturation. It is also a very potential location for a new restaurant because there are so many students who probably don't have time to cook and need to eat out.

CLUSTERING NEIGHBOURHOOD



- K-Cluster algorithm is used to come up with 5 different clusters in Toronto with similar set of Venues, with an assumption of 5 clusters.
- Cluster 0 and Cluster 2 have higher number of restaurants than rest of the clusters.

ANALYZE EACH NEIGHBORHOOD

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd 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	Adelaide	Coffee Shop	Restaurant	Café	Bar	Thai Restaurant	Sushi Restaurant	Lounge	Asian Restaurant	Breakfast Spot	Burger Joint
1	Bathurst Quay	Airport Service	Airport Lounge	Airport Terminal	Plane	Bar	Coffee Shop	Rental Car Location	Sculpture Garden	Boat or Ferry	Boutique
2	Berczy Park	Coffee Shop	Seafood Restaurant	Café	Beer Bar	Cheese Shop	Farmers Market	French Restaurant	Cocktail Bar	Restaurant	Bakery
3	Brockton	Café	Breakfast Spot	Bakery	Coffee Shop	Convenience Store	Furniture / Home Store	Restaurant	Japanese Restaurant	Stadium	Italian Restaurant
4	Business Reply Mail Processing Centre 969 Eastern	Light Rail Station	Yoga Studio	Spa	Auto Workshop	Brewery	Burrito Place	Comic Shop	Farmers Market	Fast Food Restaurant	Garden
5	CN Tower	Airport Service	Airport Lounge	Airport Terminal	Plane	Bar	Coffee Shop	Rental Car	Sculpture Garden	Boat or Ferry	Boutique

- Get the 10 most common venues in each neighborhoods
- Neighborhoods that have higher number of restaurant within the 10 most popular venues are:
  - Adelaide,
  - Central Bay Street
  - Chinatown
  - Commerce court
  - First Canadian Place
  - Grange Park
  - Underground City
  - TD Center

Higher restaurant density may indicate a higher flow rate of people and a higher demand for a new restaurant.

CONCLUSION AND FUTURE DIRECTIONS

- Provided initial insights on the optimal locations for a new restaurant.
- Accuracy of the models has room for improvement.
- Collect and analyze more data including:
    - Demographics
    - Availability of schools, gyms and office buildings in neighbourhoods
    - Income of residents in neighbourhoods