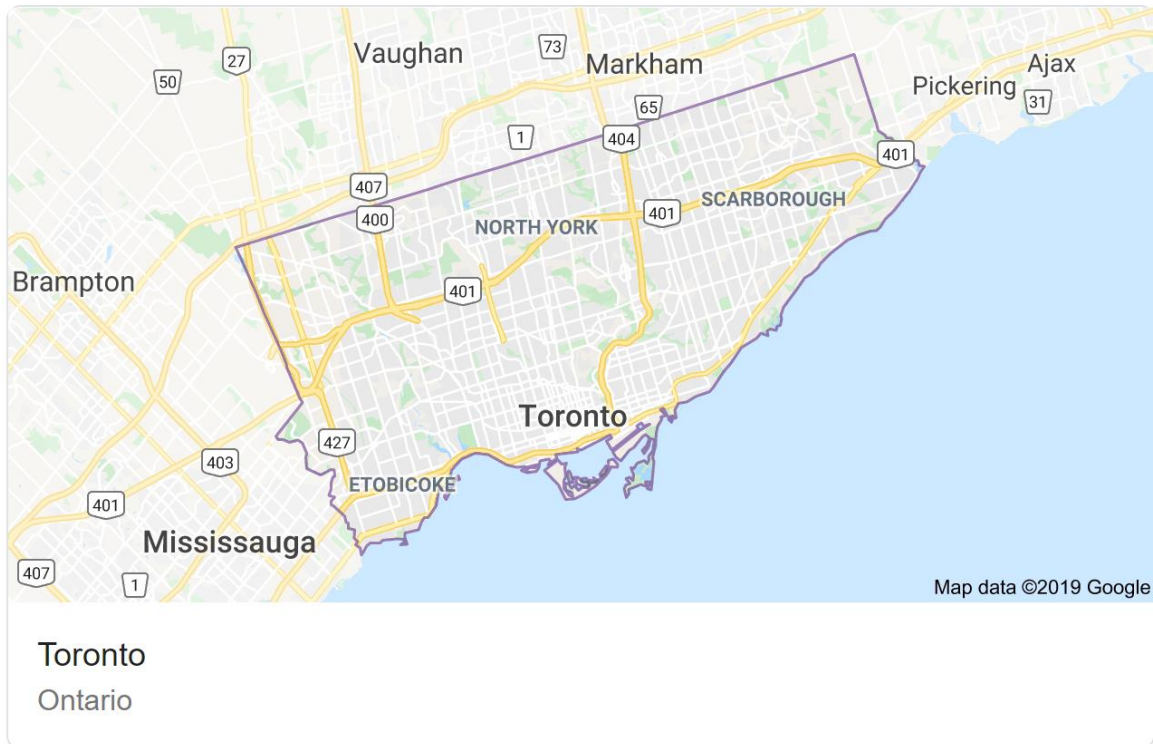


CAPSTONE PROJECT

1. Introduction

In Toronto, getting a spot in daycare for your child can be extremely hard. “Get on a daycare list while you’re pregnant,” is something you hear from everyone when you’re expecting. For popular daycares, getting on the list is not enough as it may take up to a year to eventually fit your child in. The situation of not having enough daycare spots have been aggravated by a recent unexpected “baby boom” in Canada.

Our client Cynthia decides to seize this opportunity and open a daycare business in GTA. Since she lives in Toronto, she will be focusing on potential location in that target area. As a consulting firm, our goal is to help Cynthia find the best location that maximizes the probability of success.



2. Business problem

Given the large initial investment, a scoring model is rigorously designed. Similar to retail business, the ideal location is featured with “High Demand with Low Competition” for daycare facility. The following factors are considered:

- **Low Completion:** Number of Existing daycare/Preschool facilities
Boroughs with higher number of existing daycare/preschool facilities should be avoided due to higher competition.
- **High Demand:** Number of Elementary School
Boroughs with larger number of Elementary School indicates a higher demand for childcare service.
- **Safety concerns:** 1) Number of Industrial Estate 2) Number of Gas station
Safety is number one priority for daycare facility. An ideal location should be far from industrial estate or busy street intersections (usually where the gas stations are located)

3. Data

To find the best location for daycare facility, the following sources of information will be leveraged:

- Location Data:
 - Toronto Postal Codes:
https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M
 - Geo Location (latitude, longitude)
- Venues Data From Foursquare:
<https://developer.foursquare.com/docs/resources/categories>
 - Preschool - 52e81612bcb57f1066b7a45
 - Elementary School - 4f4533804b9074f6e4fb0105
 - Industrial Estate - 56aa371be4b08b9a8d5734d7
 - Gas station - 4bf58dd8d48988d113951735

4. Methodology

The postal codes are first imported to Panda using BeautifulSoup4 from Wikipedia. After cleaning process, the data frame has 4 boroughs and 38 neighborhoods. The Geo Location is then retrieved for each neighborhood using Geocoder and is mapped to each of them.

Folium is imported and each neighborhood is represented by a blue dot in the map.

For each neighborhood, we look for the information of preschool, elementary schools, industry sites and gas stations from Foursquare (venues)

For each neighborhood we group and count each one of the 4 categories

We define weights for each category, depending on the recurrence

- Preschool: -10 points
- Elementary Schools: 5 point
- Industry site: -5 points
- Gas station: -5 points

For each neighborhood, we calculate a final score and sort the data by final score in a descending order.

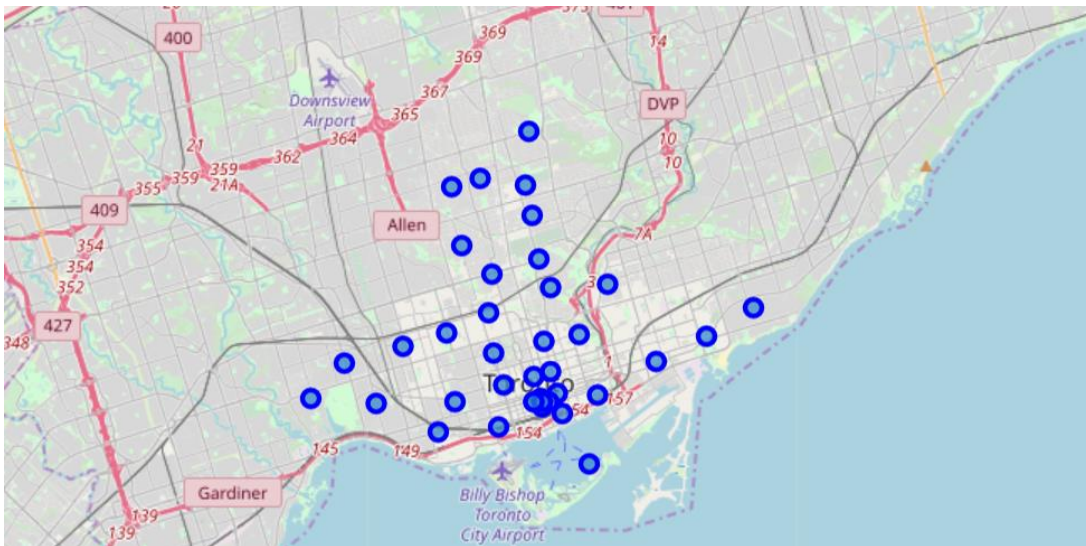
Finally, the place with the highest score will be recommended to our client Cynthia.

5. Results

The neighborhoods of Toronto with location data are summarized in the format as the following table.

| | PostalCode | Borough | Neighbourhood | Latitude | Longitude |
|---|------------|------------------|--------------------------|-----------|------------|
| 0 | M5A | Downtown Toronto | Harbourfront,Regent Park | 43.650295 | -79.359166 |
| 1 | M5B | Downtown Toronto | Ryerson,Garden District | 43.657363 | -79.378180 |
| 2 | M5C | Downtown Toronto | St. James Town | 43.651210 | -79.375481 |
| 3 | M4E | East Toronto | The Beaches | 43.676531 | -79.295425 |
| 4 | M5E | Downtown Toronto | Berczy Park | 43.645160 | -79.373675 |

The 37 neighborhoods are presented in the below chart.



The preschool, elementary school, the industry site and the gas stations are retrieved from Foursquare. Taking gas stations for example:



The detailed venues information are mapped to the neighborhoods.

| | PostalCode | Borough | Localidad | Latitude | Longitude | preschool | elementary | industry | gas |
|----|------------|------------------|---|-----------|------------|-----------|------------|----------|------|
| 0 | M5A | Downtown Toronto | Harbourfront,Regent Park | 43.650295 | -79.359166 | 2.0 | 34.0 | 1.0 | 6.0 |
| 1 | M5B | Downtown Toronto | Ryerson,Garden District | 43.657363 | -79.378180 | 2.0 | 44.0 | 1.0 | 11.0 |
| 2 | M5C | Downtown Toronto | St. James Town | 43.651210 | -79.375481 | 2.0 | 38.0 | 1.0 | 10.0 |
| 3 | M4E | East Toronto | The Beaches | 43.676531 | -79.295425 | 2.0 | 23.0 | 0.0 | 7.0 |
| 4 | M5E | Downtown Toronto | Berczy Park | 43.645160 | -79.373675 | 1.0 | 31.0 | 1.0 | 6.0 |
| 5 | M5G | Downtown Toronto | Central Bay Street | 43.656091 | -79.384930 | 2.0 | 43.0 | 1.0 | 7.0 |
| 6 | M6G | Downtown Toronto | Christie | 43.668781 | -79.420710 | 0.0 | 49.0 | 1.0 | 6.0 |
| 7 | M5H | Downtown Toronto | Adelaide,King,Richmond | 43.649700 | -79.382582 | 1.0 | 32.0 | 1.0 | 8.0 |
| 8 | M6H | West Toronto | Dovercourt Village,Dufferin | 43.665087 | -79.438705 | 0.0 | 47.0 | 1.0 | 7.0 |
| 9 | M5J | Downtown Toronto | Harbourfront East,Toronto Islands,Union Station | 43.630210 | -79.362433 | 0.0 | 19.0 | 1.0 | 1.0 |
| 10 | M6J | West Toronto | Little Portugal,Trinity | 43.648525 | -79.417757 | 0.0 | 41.0 | 1.0 | 5.0 |
| 11 | M4K | East Toronto | The Danforth West,Riverdale | 43.683178 | -79.355105 | 2.0 | 45.0 | 0.0 | 5.0 |
| 12 | M5K | Downtown Toronto | Design Exchange,Toronto Dominion Centre | 43.647100 | -79.381531 | 1.0 | 32.0 | 1.0 | 8.0 |
| 13 | M6K | West Toronto | Brockton,Exhibition Place,Parkdale Village | 43.639410 | -79.424362 | 0.0 | 37.0 | 1.0 | 1.0 |
| 14 | M4L | East Toronto | The Beaches West,India Bazaar | 43.667965 | -79.314667 | 2.0 | 28.0 | 0.0 | 4.0 |
| 15 | M5L | Downtown Toronto | Commerce Court,Victoria Hotel | 43.648395 | -79.378865 | 1.0 | 32.0 | 1.0 | 8.0 |
| 16 | M4M | East Toronto | Studio District | 43.660629 | -79.334855 | 2.0 | 34.0 | 0.0 | 10.0 |
| 17 | M4N | Central Toronto | Lawrence Park | 43.728420 | -79.387133 | 0.0 | 42.0 | 0.0 | 0.0 |
| 18 | M5N | Central Toronto | Roselawn | 43.711941 | -79.419120 | 0.0 | 42.0 | 0.0 | 2.0 |
| 19 | M4P | Central Toronto | Davisville North | 43.712755 | -79.388514 | 1.0 | 43.0 | 0.0 | 4.0 |
| 20 | M5P | Central Toronto | Forest Hill North,Forest Hill West | 43.694785 | -79.414405 | 1.0 | 47.0 | 0.0 | 5.0 |
| 21 | M6P | West Toronto | High Park,The Junction South | 43.659935 | -79.463019 | 0.0 | 40.0 | 1.0 | 10.0 |
| 22 | M4R | Central Toronto | North Toronto West | 43.714523 | -79.406960 | 0.0 | 40.0 | 0.0 | 2.0 |
| 23 | M5R | Central Toronto | The Annex,North Midtown,Yorkville | 43.674840 | -79.403768 | 1.0 | 48.0 | 1.0 | 5.0 |
| 24 | M6R | West Toronto | Parkdale,Roncesvalles | 43.647870 | -79.449776 | 0.0 | 39.0 | 1.0 | 6.0 |
| 25 | M4S | Central Toronto | Davisville | 43.703395 | -79.385964 | 2.0 | 45.0 | 0.0 | 6.0 |
| 26 | M5S | Downtown Toronto | Harbord,University of Toronto | 43.663110 | -79.401801 | 1.0 | 48.0 | 1.0 | 4.0 |
| 27 | M6S | West Toronto | Runnymede,Swansea | 43.649620 | -79.476141 | 0.0 | 36.0 | 2.0 | 3.0 |
| 28 | M4T | Central Toronto | Moore Park,Summerhill East | 43.690685 | -79.382946 | 2.0 | 47.0 | 0.0 | 2.0 |
| 29 | M5T | Downtown Toronto | Chinatown,Grange Park,Kensington Market | 43.653530 | -79.397233 | 1.0 | 44.0 | 1.0 | 7.0 |
| 30 | M4V | Central Toronto | Deer Park,Forest Hill SE,Rathnelly,South Hill,... | 43.686074 | -79.402265 | 1.0 | 47.0 | 1.0 | 4.0 |
| 31 | M5V | Downtown Toronto | CN Tower,Bathurst Quay,Island airport,Harbourf... | 43.640815 | -79.399538 | 0.0 | 29.0 | 1.0 | 7.0 |
| 32 | M4W | Downtown Toronto | Rosedale | 43.682205 | -79.377945 | 2.0 | 47.0 | 0.0 | 3.0 |
| 33 | M5W | Downtown Toronto | Stn A PO Boxes 25 The Esplanade | 43.648690 | -79.385440 | 1.0 | 32.0 | 1.0 | 7.0 |
| 34 | M4X | Downtown Toronto | Cabbagetown,St. James Town | 43.668160 | -79.366602 | 2.0 | 43.0 | 1.0 | 3.0 |
| 35 | M5X | Downtown Toronto | First Canadian Place,Underground city | 43.648280 | -79.381461 | 1.0 | 32.0 | 1.0 | 8.0 |
| 36 | M4Y | Downtown Toronto | Church and Wellesley | 43.666585 | -79.381302 | 2.0 | 48.0 | 1.0 | 6.0 |
| 37 | M7Y | East Toronto | Business Reply Mail Processing Centre 969 Eastern | 43.648690 | -79.385440 | 1.0 | 32.0 | 1.0 | 7.0 |

We finally apply the weight and score each neighborhood. As shown, the Lawrence Park and Christie are the winners.

| | Localidad | Score |
|----|---|-------|
| 17 | Lawrence Park | 210.0 |
| 6 | Christie | 210.0 |
| 28 | Moore Park,Summerhill East | 205.0 |
| 26 | Harbord,University of Toronto | 205.0 |
| 30 | Deer Park,Forest Hill SE,Rathnelly,South Hill,... | 200.0 |
| 20 | Forest Hill North,Forest Hill West | 200.0 |
| 18 | Roselawn | 200.0 |
| 23 | The Annex,North Midtown,Yorkville | 200.0 |
| 32 | Rosedale | 200.0 |
| 8 | Dovercourt Village,Dufferin | 195.0 |
| 22 | North Toronto West | 190.0 |

6. Discussion

The analysis discussed above simplifies the decision process in real world of opening a daycare as the business requires large initial capital injection. Some key factors are not covered, i.e. the distribution of age group and family income of each neighborhood. For example, if the neighborhood consists of high percentage of young couples with decent income, it's probably a good location if the competition not fierce. However, it does give us preliminary preferred locations so that we narrow down our long list before digging into the detail of each neighborhood.