

Title: Choosing a location to open a coffee shop in Toronto

1. Introduction about a business problem and people interested in this project

According to a recent study reported by telegraph, Canada's place is at number 10 among twenty countries in the world that drink more coffee per capita. Also, the Coffee Association of Canada stated that 2/3 of Canadians enjoy at least one cup a day with the average at 3.2 cups/day in 2018 (see at <https://coffeebi.com/2019/02/18/the-canadian-coffee-consumption-2019/>). As a results, businessmen will be interest in invest their money on coffee in Canada.

Based on this trend above, a businessman from Toronto, Canada, who love drinking coffee would like to open a coffee shop in his city. Similar to the national scale, people in Toronto consume a lot of coffee (see at <https://www.cbc.ca/news/business/canada-coffee-tim-hortons-1.3745971>). However, there are two questions are raised as: (1) Which neighbourhood will be chosen?; and (2) After choosing a neighbourhood, which specific location should be chosen to open the coffee shop. The businessman need to answer these two questions to go ahead his plan for opening the coffee shop. Indeed, he needs to consider the following things:

- In general, do people in Toronto like coffee and what are their habits for drinking coffee?
- At the smaller scale, which neighbourhood in Toronto seems to consume highest coffee production? Then, he should identify the potential place for opening the coffee shop.

2. Data will be used to solve the problem and the source of the data

For the Toronto neighbourhood data, a Wikipedia page (https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M) exists that has all the information we need to explore and cluster the neighbourhoods in Toronto.

Using the Foursquare location data to find out the top most common venues for each neighbourhood in Toronto with their frequencies. In addition, all information about venues such as coordination, ratings ... can be obtained by Foursquare location data.

3. Methodology

To identify the most potential location for open a coffee shop in Toronto, there are some following methodologies and assumptions below.

- If coffee shop is on the list of the top most common venues for at least one neighbourhood, opening a coffee shop in Toronto seems to be feasible.
- If coffee shop is the top most common venues for several neighbourhoods, we need to find out which neighbourhood can be the best one. In order to obtain this, we should develop a model based on the data and initial results above. A simple model can be built by taking into account with the frequency of café, which is an alternative for consumers to drink a cup of coffee. The critical value is a deduction between frequency of coffee shop and frequency of café (frequency of coffee shop minus frequency of café). The reason for that is that café can be an alternative for people enjoying a cup of coffee.
- After choosing a neighbourhood, which specific location should be considered? A criteria for choosing a location can be is an area where there are as many as venues relating coffee. The reasons for that it is easier for more people to recognise/notice a new coffee shop when they visit the existing famous coffee venues or search these shops online. However, this assumption will cause a main drawback, which is how to attract consumers of the existing good shops to buy product in the new shop. The quality and prices of coffee in the new shop can overcome this drawback. However, the quality and prices of the new shop is out of scope for this assignment, and normally this is a responsibility of the new shop owner, not by a data scientist.

4. Results

Table 1 shows neighbourhoods in Toronto where coffee shop is the 1st most common venues.

Table 1: 5 neighbourhoods showing the 10 most common venues

| No | 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 | Berczy Park | Coffee Shop | Cocktail Bar | Café | Cheese Shop | Seafood Restaurant | Bakery | Restaurant | Beer Bar | Lounge | Liquor Store |
| 1 | Brockton, Parkdale Village, Exhibition Place | Café | Coffee Shop | Breakfast Spot | Bakery | Performing Arts Venue | Pet Store | Convenience Store | Climbing Gym | Restaurant | Burrito Place |
| 2 | Business reply mail Processing Centre, South C... | Park | Auto Workshop | Comic Shop | Pizza Place | Butcher | Restaurant | Burrito Place | Brewery | Light Rail Station | Skate Park |
| 3 | CN Tower, King and Spadina, Railway Lands, Har... | Airport Service | Airport Lounge | Airport Terminal | Coffee Shop | Harbor / Marina | Plane | Rental Car Location | Sculpture Garden | Boutique | Boat or Ferry |
| 4 | Central Bay Street | Coffee Shop | Sandwich Place | Japanese Restaurant | Italian Restaurant | Café | Department Store | Thai Restaurant | Bubble Tea Shop | Burger Joint | Bar |

This proves that opening a coffee shop in Toronto appears to be feasible.

All neighbourhoods where coffee shop is the most common venue are chosen for next step. Table 2 shows 13 potential neighbourhoods.

Table 2: 13 potential neighbourhoods with a coffee shop as the 1st most common venue

| 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 |
|---|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|
| Berczy Park | Coffee Shop | Cocktail Bar | Café | Cheese Shop | Seafood Restaurant | Bakery | Restaurant | Beer Bar | Lounge | Liquor Store |
| Central Bay Street | Coffee Shop | Sandwich Place | Japanese Restaurant | Italian Restaurant | Café | Department Store | Thai Restaurant | Bubble Tea Shop | Burger Joint | Bar |
| Church and Wellesley | Coffee Shop | Sushi Restaurant | Japanese Restaurant | Gay Bar | Restaurant | Bubble Tea Shop | Pub | Pizza Place | Dance Studio | Yoga Studio |
| Commerce Court, Victoria Hotel | Coffee Shop | Café | Restaurant | Hotel | American Restaurant | Gym | Italian Restaurant | Japanese Restaurant | Seafood Restaurant | Beer Bar |
| First Canadian Place, Underground city | Coffee Shop | Café | Restaurant | Hotel | Gym | Seafood Restaurant | American Restaurant | Salad Place | Japanese Restaurant | Asian Restaurant |
| Harbourfront East, Union Station, Toronto Islands | Coffee Shop | Aquarium | Hotel | Café | Scenic Lookout | Fried Chicken Joint | Sporting Goods Shop | Italian Restaurant | Restaurant | Brewery |
| Queen's Park, Ontario Provincial Government | Coffee Shop | Sushi Restaurant | Diner | Bar | Beer Bar | Smoothie Shop | Music Venue | Sandwich Place | Distribution Center | Discount Store |
| Regent Park, Harbourfront | Coffee Shop | Bakery | Park | Pub | Breakfast Spot | Café | Theater | Hotel | Ice Cream Shop | Spa |
| Richmond, Adelaide, King | Coffee Shop | Café | Restaurant | Gym | Deli / Bodega | Hotel | Thai Restaurant | Salad Place | Sushi Restaurant | Cosmetics Shop |
| St. James Town | Coffee Shop | Café | Restaurant | Cocktail Bar | Gastropub | American Restaurant | Moroccan | Creperie | Gym | Department Store |

| 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 |
|--|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|------------------------|
| | | | | | | | Restaurant | | | |
| St. James Town, Cabbagetown | Coffee Shop | Bakery | Chinese Restaurant | Pizza Place | Restaurant | Pub | Café | Italian Restaurant | Butcher | Japanese Restaurant |
| Stn A PO Boxes | Coffee Shop | Café | Seafood Restaurant | Japanese Restaurant | Hotel | Italian Restaurant | Cocktail Bar | Beer Bar | Restaurant | Art Gallery |
| Toronto Dominion Centre, Design Exchange | Coffee Shop | Hotel | Café | Restaurant | American Restaurant | Salad Place | Italian Restaurant | Japanese Restaurant | Seafood Restaurant | Tea Room |

The critical value is a deduction between frequency of coffee shop and frequency of café (frequency of coffee shop minus frequency of café). Table 3 shows frequency of coffee shop, café and critical value for 13 potential neighbourhoods, which is sorted from the highest critical value to the smallest critical value.

Table 3: 13 potential neighbourhoods with the critical value of frequency

| Neighborhood | Café | Coffee Shop | critical_value |
|---|----------|-------------|----------------|
| Queen's Park, Ontario Provincial Government | 0.027778 | 0.222222222 | 0.194444444 |
| Regent Park, Harbourfront | 0.043478 | 0.173913043 | 0.130434783 |
| Central Bay Street | 0.045455 | 0.166666667 | 0.121212121 |
| Harbourfront East, Union Station, Toronto Islands | 0.04 | 0.13 | 0.09 |
| Church and Wellesley | 0.013158 | 0.078947368 | 0.065789474 |
| Stn A PO Boxes | 0.041237 | 0.103092784 | 0.06185567 |
| Richmond, Adelaide, King | 0.053191 | 0.106382979 | 0.053191489 |
| Berczy Park | 0.034483 | 0.086206897 | 0.051724138 |
| Commerce Court, Victoria Hotel | 0.07 | 0.12 | 0.05 |
| Toronto Dominion Centre, Design Exchange | 0.07 | 0.1 | 0.03 |
| St. James Town, Cabbagetown | 0.046512 | 0.069767442 | 0.023255814 |
| First Canadian Place, Underground city | 0.08 | 0.1 | 0.02 |
| St. James Town | 0.064103 | 0.064102564 | 0 |

As can be seen from Table 3, the neighbourhood of Queen's Park, Ontario Provincial Government has the highest critical value, therefore is chosen for next step. The next step is to determine locations of coffee shops in this neighbourhood. Table 4 shows all coffee shops with their location in the neighbourhood.

Table 4: All coffee shops with their location in the neighbourhood

| Neighborhood | Neighborhood Latitude | Neighborhood Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|-----------------------|------------------------|----------------|----------------|-----------------|----------------|
| Queen's Park, Ontario Provincial Government | 43.6623 | -79.3895 | Neo Coffee Bar | 43.66014 | -79.3859 | Coffee Shop |
| Queen's Park, Ontario Provincial Government | 43.6623 | -79.3895 | Coffee Public | 43.66076 | -79.3862 | Coffee Shop |
| Queen's Park, Ontario Provincial Government | 43.6623 | -79.3895 | Starbucks | 43.6582 | -79.389 | Coffee Shop |

| Neighborhood | Neighborhood Latitude | Neighborhood Longitude | Venue | Venue Latitude | Venue Longitude | Venue Category |
|---|-----------------------|------------------------|-------------|----------------|-----------------|----------------|
| Queen's Park, Ontario Provincial Government | 43.6623 | -79.3895 | Tim Hortons | 43.66104 | -79.3938 | Coffee Shop |
| Queen's Park, Ontario Provincial Government | 43.6623 | -79.3895 | Starbucks | 43.66089 | -79.3937 | Coffee Shop |
| Queen's Park, Ontario Provincial Government | 43.6623 | -79.3895 | Tim Hortons | 43.65941 | -79.3912 | Coffee Shop |
| Queen's Park, Ontario Provincial Government | 43.6623 | -79.3895 | Tim Hortons | 43.65818 | -79.3907 | Coffee Shop |
| Queen's Park, Ontario Provincial Government | 43.6623 | -79.3895 | Tim Hortons | 43.65891 | -79.3887 | Coffee Shop |

Next step is find out how many venues relating coffee are located in an areas of 8 coffee shops in Table 4 within a distance of 200 meters. Table 5 shows an example for Neo Coffee Bar and Table 6 summaries number of venues relating for 8 coffee shops above.

Table 5: Venues relating coffee in an area of Neo Coffee Bar

| id | location.address | location.lat | location.lng | name |
|--------------------------|-----------------------|--------------|--------------|------------------------|
| 5db70a0c306d6b000861ac9f | 770 Bay Street Unit 3 | 43.66014 | -79.38587 | Neo Coffee Bar |
| 4b156e98f964a520cbac23e3 | 801 Bay St | 43.660714 | -79.385491 | Timothy's World Coffee |
| 4bce5e21cc8cd13a7359c4cf | 444 Yonge St | 43.660467 | -79.384654 | Timothy's World Coffee |
| 568bcf61498e3aaff5e351f8 | 800 Bay St | 43.660763 | -79.386184 | Coffee Public |
| 5a81ae339deb7d369fa7f146 | 44 Gerrard St W | 43.658833 | -79.383684 | Hailed Coffee |
| 56b2d97f498ebb2041ae6502 | 800 Bay St | 43.66115 | -79.386199 | Coffee Place |
| 5d850196f516bc00089d2488 | 800 Bay St | 43.660867 | -79.386206 | 800 Coffee Bar |
| 537d4d6d498ec171ba22e7fe | 82 Gerrard Street W | 43.658421 | -79.385613 | Jimmy's Coffee |

Table 6: number of venues relating for 8 coffee shops

| Neighborhood | Venue | Venue Latitude | Venue Longitude | Venue Category | Number of venues relating coffee |
|---|----------------|----------------|-----------------|----------------|----------------------------------|
| Queen's Park, Ontario Provincial Government | Neo Coffee Bar | 43.66014 | -79.3859 | Coffee Shop | 8 |
| Queen's Park, Ontario Provincial Government | Coffee Public | 43.66076 | -79.3862 | Coffee Shop | 7 |
| Queen's Park, Ontario Provincial Government | Starbucks | 43.6582 | -79.389 | Coffee Shop | 2 |
| Queen's Park, Ontario Provincial Government | Tim Hortons | 43.66104 | -79.3938 | Coffee Shop | 1 |
| Queen's Park, Ontario Provincial Government | Starbucks | 43.66089 | -79.3937 | Coffee Shop | 2 |
| Queen's Park, Ontario Provincial Government | Tim Hortons | 43.65941 | -79.3912 | Coffee Shop | 1 |
| Queen's Park, Ontario Provincial Government | Tim Hortons | 43.65818 | -79.3907 | Coffee Shop | 1 |
| Queen's Park, Ontario Provincial Government | Tim Hortons | 43.65891 | -79.3887 | Coffee Shop | 1 |

5. Discussion

There are some following findings to discuss:

- Opening a coffee shop in Toronto appears to be feasible as there are 13 neighbourhoods where coffee shop is the 1st most common venues. These neighbourhoods seem to be good place for choosing.
- Among 13 neighbourhoods, the neighbourhood of Queen's Park, Ontario Provincial Government has the highest critical value, which prove the frequency of coffee shop is really great whilst the frequency of café is quite small. The alternative of café cannot attract people to drink coffee, compared to the coffee shops.
- There are 8 main coffee shops in the neighbourhood of Queen's Park, Ontario Provincial Government. Of these, the area nearby Neo Coffee Bar has highest number of venues relating coffee. This implies that residents in this area can go to the coffee shop frequently and this area take advantages to attract people in its neighbourhood. As a results, there is a great chance to open a new coffee shop in this area. In addition, it seems to be easier for more people to recognise/notice a new coffee shop when they visit the existing famous coffee venues or search these shops online in this area.

6. Conclusion

- Opening a new coffee shop in Toronto will be considered by businessmen.
- The methodology to identify a potential location for opening the new coffee can be acceptable by using the available data on internet and the Foursquare location data. The model to obtain the maximum chance for attractiveness of new coffee shop is very simple, however it can be feasible based on the available data.
- The results appear to sensible and show that the area nearby Neo Coffee Bar is recommended to open the new coffee shop.