

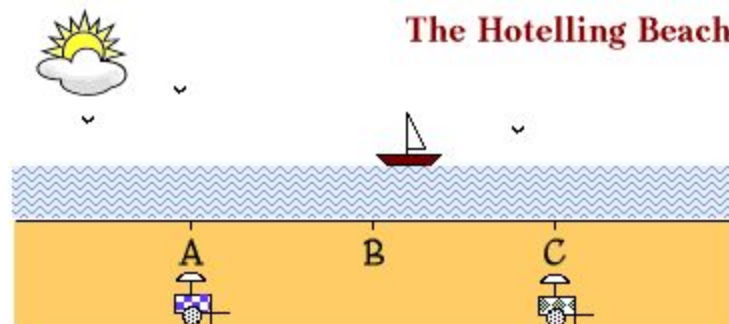
Battle of the Neighborhoods

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Introduction/Business Method:

The question I will be trying to answer is if someone is looking to open their own coffee shop, what would be the best neighborhood in Toronto to open it in? Coffee shops are an incredibly competitive market and with so many already around, using data science and basic economic principles to help decide location, would give this business an upper hand, relative to those without this information. I will be using the information I get on current coffee shop location data, to determine, based on Hotelling's linear city model, competitive advantage and supply and demand functions, which would be the ideal location for the coffee shop to get the highest profits.

Hotelling's model essentially states that businesses with near identical products should space themselves out equidistant from one another from the radius of a given "circular city" (1). (There is also a horizontal city model but the circular city model more closely represents the k-clusters I will be using in my data, which will be further described below). The below picture is a common example used to teach Hotelling's law, showing that along a beach, ice cream shops will set up equal distance from the center of the length of the beach to maximize population they can reach and therefore profits (1).



Coffee shops should space themselves out equally to attract underserved areas and to entice customers who would be reducing travel time to go to the new coffee shop instead. Being too close to other coffee shops runs the risk of entering a price war, and would mean having to reduce marginal costs more so than the competitors to be able to stay in the market. This report will benefit people who have limited knowledge of current coffee shop locations throughout Toronto, and useful information for leveraging current Foursquare data and economic principles in order to determine business locations and ideal price points.

Data:

To solve this problem, I will be using software to analyze location data pulled from Foursquare and the built in Python GeoCoder Library. I will also be pulling from information from our week 3 lab to be able to analyze the data using numerous Python Libraries. I will be using Folium mapping libraries to clearly display the data that I find. Finally, I will be pulling on prior economic knowledge to introduce competitive advantage and Hotelling's linear city model.

The data I will be pulling from Foursquare will be Neighborhood, Neighborhood Latitude, Neighborhood Longitude, Venue, Name of the venue e.g. the name of a store or restaurant, Venue Latitude, Venue Longitude, Venue Category. I will be focusing on the total number of coffee shops under the venue category per neighborhood.

Methodology:

I used Foursquare API to download venue information for all neighborhoods in Toronto, their category, longitude, latitude, and which borough they belong to.

I performed exploratory analysis on the different types of venues found in different neighborhoods in Toronto based on the Foursquare API. The table below shows a sample of this data:

	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	Bakery	Seafood Restaurant	Farmers Market	Cheese Shop	Beer Bar	Restaurant	Greek Restaurant	Pub
1	Brockton, Parkdale Village, Exhibition Place	Café	Coffee Shop	Breakfast Spot	Nightclub	Performing Arts Venue	Convenience Store	Bar	Bakery	Italian Restaurant	Stadium
2	Business reply mail Processing Centre, South C...	Auto Workshop	Park	Fast Food Restaurant	Light Rail Station	Farmers Market	Recording Studio	Burrito Place	Pizza Place	Restaurant	Butcher
3	CN Tower, King and Spadina, Railway Lands, Har...	Airport Lounge	Airport Service	Coffee Shop	Harbor / Marina	Plane	Rental Car Location	Sculpture Garden	Boutique	Bar	Boat or Ferry
4	Central Bay Street	Coffee Shop	Café	Sandwich Place	Italian Restaurant	Salad Place	Department Store	Thai Restaurant	Japanese Restaurant	Burger Joint	Bubble Tea Shop
5	Christie	Grocery Store	Café	Park	Athletics & Sports	Restaurant	Nightclub	Candy Store	Coffee Shop	Baby Store	Italian Restaurant
6	Church and Wellesley	Coffee Shop	Gay Bar	Sushi Restaurant	Japanese Restaurant	Restaurant	Pub	Café	Yoga Studio	Hotel	Men's Store
7	Commerce Court, Victoria Hotel	Coffee Shop	Restaurant	Hotel	Café	Gym	American Restaurant	Japanese Restaurant	Italian Restaurant	Deli / Bodega	Seafood Restaurant
8	Davisville	Pizza Place	Dessert Shop	Sandwich Place	Gym	Coffee Shop	Sushi Restaurant	Café	Italian Restaurant	Greek Restaurant	Indoor Play Area
9	Davisville North	Dance Studio	Hotel	Park	Gym / Fitness Center	Breakfast Spot	Sandwich Place	Department Store	Dog Run	Food & Drink Shop	Dir...

I then compared likeness of the most underserved neighborhoods for coffee shops to the least underserved neighborhoods in Toronto.

Results

Based on the top 10 venues for each neighborhood we can see that the top neighborhoods in Toronto to have a coffee shop, would be areas that are being

underserved in terms of number of coffee shops/cafes. While cafes are another venue type, it is important to see the number of cafes in the area as well, since these also often serve coffee and could pose as a source of competition. Based on the Foursquare data, the best neighborhoods to open a new coffee shop would be Davisville North, Business Reply Mail Processing Centre, Lawrence Park, and The Beaches. These 4 neighborhoods were the only ones that did not have either a cafe or a coffee shop in their top 10 venues.

----Business reply mail Processing
Centre, South Central Letter Processing
Plant Toronto----

	Venue	Freq
0	Skate Park	0.06
1	Auto Workshop	0.06
2	Farmers Market	0.06
3	Fast Food Restaurant	0.06
4	Burrito Place	0.06
5	Light Rail Station	0.06
6	Butcher	0.06
7	Restaurant	0.06
8	Recording Studio	0.06
9	Garden Center	0.06

----Davisville North----

	Venue	Freq
0	Park	0.11
1	Breakfast Spot	0.11
2	Hotel	0.11
3	Food & Drink Shop	0.11
4	Dog Run	0.11
5	Department Store	0.11
6	Dance Studio	0.11
7	Sandwich Place	0.11
8	Gym / Fitness Center	0.11
9	Theater	0.00

----Lawrence Park----

	Venue	Freq
0	Swim School	0.33
1	Bus Line	0.33
2	Park	0.33
3	Optical Shop	0.00
4	Miscellaneous Shop	0.00
5	Liquor Store	0.00
6	Lounge	0.00
7	Malay Restaurant	0.00
8	Market	0.00
9	Martial Arts School	0.00

----The Beaches----

	Venue	Freq
0	Health Food Store	0.25
1	Trail	0.25
2	Pub	0.25
3	Yoga Studio	0.00
4	Modern European Restaurant	0.00
5	Liquor Store	0.00
6	Lounge	0.00
7	Malay Restaurant	0.00
8	Market	0.00
9	Martial Arts School	0.00

Furthermore, the worst 2 neighborhoods to open a new coffee shop would be Queen's Park and Central Bay Street. Queen's Park had the highest number of already existing

coffee shops (also note the College venues being in the top 10, meaning this is likely in a campus area which is likely to have a high number of coffee shops). Central Bay has the highest combined frequency of coffee shops and cafe's meaning that the population seeking out coffee already has plenty of options to choose from.

----Queen's Park, Ontario Provincial
Government----

	Venue	Freq
0	Coffee Shop	0.24
1	Yoga Studio	0.03
2	Portuguese Restaurant	0.03
3	Smoothie Shop	0.03
4	Sandwich Place	0.03
5	Café	0.03
6	Restaurant	0.03
7	Chinese Restaurant	0.03
8	College Auditorium	0.03
9	College Cafeteria	0.03

----Central Bay Street----

	Venue	Freq
0	Coffee Shop	0.18
1	Café	0.06
2	Italian Restaurant	0.04
3	Sandwich Place	0.04
4	Department Store	0.03
5	Salad Place	0.03
6	Japanese Restaurant	0.03
7	Bubble Tea Shop	0.03
8	Thai Restaurant	0.03
9	Burger Joint	0.03

By using the data frame showing the neighborhood along with the corresponding borough, you can see that both of the neighborhoods with the highest amount of coffee shops come from Downtown Toronto, meaning that this would be the worst borough to build a new coffee shop from. On the other hand, of the 4 most underserved neighborhoods, they equally come from East Toronto and Central Toronto, meaning that looking in these boroughs would be a great start for looking for a new area to open a coffee shop. The image below shows a snippet of what that dataframe looked like:

	PostalCode	Borough	Neighborhood
0	M1B	Scarborough	Malvern, Rouge
1	M1C	Scarborough	Rouge Hill, Port Union, Highland Creek
2	M1E	Scarborough	Guildwood, Morningside, West Hill
3	M1G	Scarborough	Woburn
4	M1H	Scarborough	Cedarbrae
5	M1J	Scarborough	Scarborough Village
6	M1K	Scarborough	Kennedy Park, Ionview, East Birchmount Park
7	M1L	Scarborough	Golden Mile, Clairlea, Oakridge
8	M1M	Scarborough	Cliffside, Cliffcrest, Scarborough Village West
9	M1N	Scarborough	Birch Cliff, Cliffside West
10	M1P	Scarborough	Dorset Park, Wexford Heights, Scarborough Town...

Discussion

Through this assignment we learned that the top 4 neighborhoods for opening a new coffee shop would be Business reply mail Processing Centre, South Central Letter Processing Plant Toronto, Lawrence Park, Davisville and The Beaches. The single worst neighborhood to open a new coffee shop would be Queen's Park, Ontario Provincial Government.

Further looking at the top venues of these top 4, you can extrapolate which of these 4 would be the most ideal. To do this, similar venues, as well as complementary venues need to be considered. Additionally, location of these neighborhoods as well. Based on these reasons, I would consider Davisville North, to be the best neighborhood overall to open a new coffee shop. Ideally, we would be looking for the neighborhood the most similar to Queens since coffee shops are successful there. Both Davisville and the Beaches have venues that emphasize healthy living (yoga studio, dance, gyms, health food shops, parks), but the distribution of these shops is higher overall for Davisville. This was determined looking at the frequency of the venues in the top 10 for these 2 neighborhoods. The Beaches have insignificantly low numbers of anything past the first 3, while Davisville has an even spread of a wide variety of venues.

One could further argue that Queens would be the best place to open another coffee shop as they currently have so many already. However, in order to remain competitive, they would need to drop prices below the already existing coffee shops, which might not be possible if the existing coffee shops are part of large corporations that already have minimal marginal costs. Therefore if a new coffee shop opened in an underserved market, they would be able to charge higher prices and obtain greater profits.

However, this only works if they are located in an area that the population would see a need for coffee shops. This is why we compare which underserved populations are most similar to the highest served neighborhoods, where coffee shops are already successful.

Conclusion

In today's society, knowing your competition is essential for remaining viable in the market. Choosing to open another similar shop in an already saturated market will mean having to lower marginal prices to a less than ideal level. In order to determine the best neighborhood in Toronto to open a new coffee shop, we want to compare the most underserved neighborhoods, to the highest served neighborhoods and compare the similarities and differences. Based on these factors, I believe that Davisville would be the best neighborhood in Toronto to open a new coffee shop.

Sources:

1. Hotelling's Model. Robert Schenk.
<http://ingrimayne.com/econ/International/Hotelling.html>
2. Coursera:
<https://www.coursera.org/learn/applied-data-science-capstone/home/week/3>