MIGRATING TO QUEBEC: A DECISION BASED ON THE CHOICE OF SCHOOL

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Mayo 2020

1. Introduction

1.1 Background

A few years ago, my wife and I started the process of emigrating to Quebec. In those years we had two young children and one of our biggest concerns was making a good neighborhood choice. Access to a nearby school, a hospital, markets and bus routes were very important aspects for the final decision.

According to the 2016 census, there are about 70,000 Colombians living in Canada, of whom 25,000 are in the province of Quebec and approximately 10% reside in the Quebec metropolitan census area (MCA).

Even though historically Latin American emigration to Canada was marked for social reasons, there are many interested in emigrating who have very good academic profiles and have the possibility of choosing good neighborhoods to live in.

An important factor to consider is the effort that Canada is making in its 2020-2022 immigration plan to increase the numbers of immigrants, seeking to maintain a balance between the number and the adaptability and productivity of immigrants.

1.2 Problem

What is the best neighborhood to live for many of these people who start this long process of emigration? The choice is complicated when the family also has school-age children. Obtaining a list of schools is not a difficult task, but other important places must be considered. For this analysis, schools with cafes, restaurants and supermarkets will be chosen.

1.3 Audience

Those interested in this project are parents who are already in the process of emigrating to Quebec with their family and have not yet chosen a neighborhood to settle in.

2. Description of Data

To consider the problem we can list the data as below:

- We search at googlemaps the list of schools including the name, type of school, coordinates and save this in a file.
- We use the Forsquare API to get the most common locations for each school in Quebec.

3. Methodology

Our first step was to search the list of schools in Quebec in GoogleMaps and save the coordinates of each one in an excel file and then load it with pandas, as shown in this figure **(Figure 1)**

Figure 1. Coordinates for Edu-Inter Quebec in GoogleMaps.

With this group of records, we build an in MS Excel a table, with the structure shown in the following table (**Table 1**)

Table 1. Part of the Quebec Schools Data Set.

School	Category	Latitude	Longitude
Cégep Limoilou	general and professional schools	46,83017655	-71,22696367
Cégep de Sainte-Foy	general and professional schools	46,786534	-71,28689287
Cégep Garneau	general and professional schools	46,79338345	-71,26315136
Collège régional Champlain St. Lawrence	general and professional schools	46,788469	-71,282042
Collège Mérici	cégep privado	46,795378	-71,23191181

At Jupyter Notebooks, we load this dataset into a data frame and display it on a folium map for analysis **(Figure 2)**

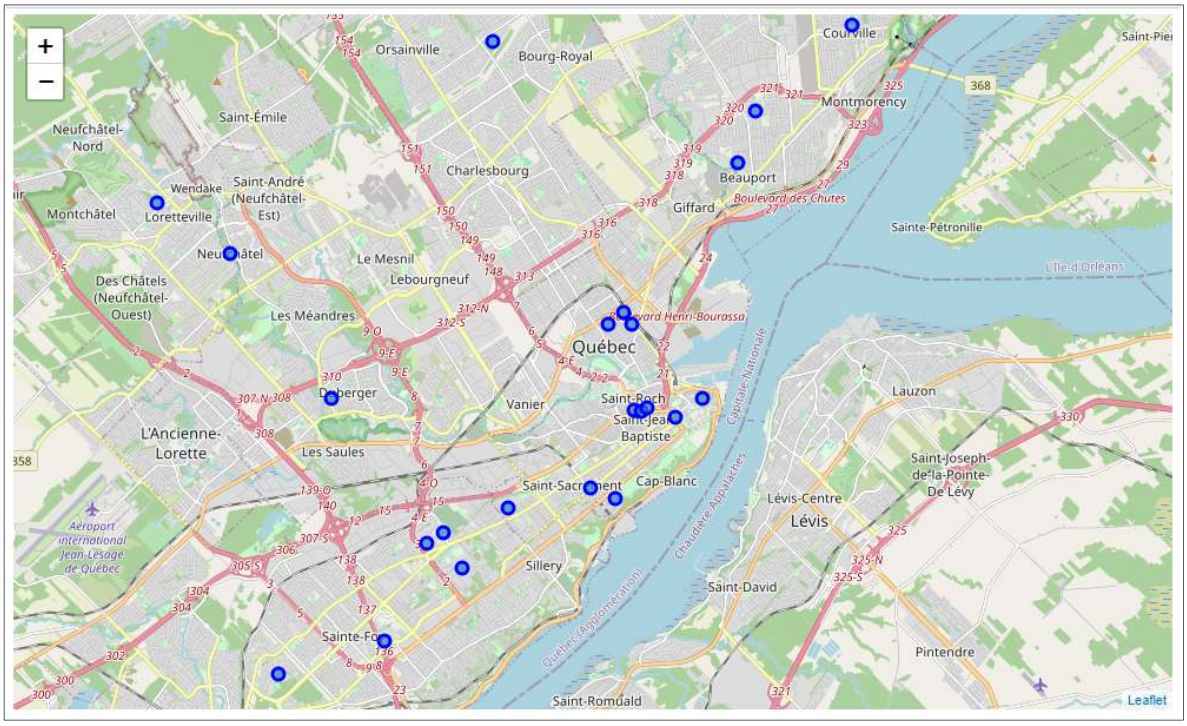

Figure 2. Quebec schools on the folium map

We search with the foursquare API the venues 1000 meters around each school

Table 2. Top five venues around Cégep Limoliu

	name	categories	lat	lng
0	La Souche	Brewery	46.829038	-71.225458
1	La Planque	Restaurant	46.826714	-71.230191
2	Nektar Caféologue	Café	46.826568	-71.230025
3	Bal du Lézard	Bar	46.826802	-71.230251
4	Fournée Bio (La)	Bakery	46.828384	-71.231527

In the next step, using an interact object, we make a violin diagram to show the frequency of the 3 main categories sought for the choice of the school. In this case: Coffee Shop, Restaurants and Park as shown in the **Figure 3.**

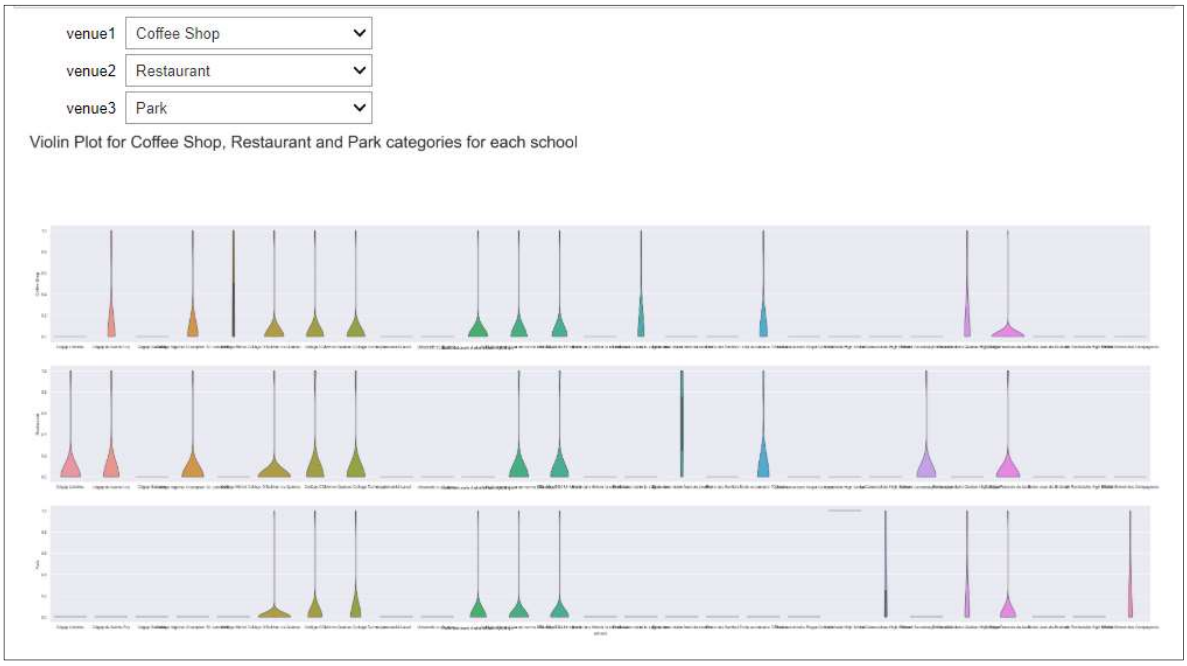

Figure 3. Violin plot for Coffe Shop, Restaurant and Park Categories for each school

Using this analysis, we found six schools that meet the requirements

Schools with Coffee Shop, Restaurant and Park at least 1000 meters

- Collège O'Sullivan de Québec
- Collège CDI
- Aviron Québec College Technique
- Institut national de la recherche scientifique
- TÉLUQ o Télé-Université
- College Francois-de-laval

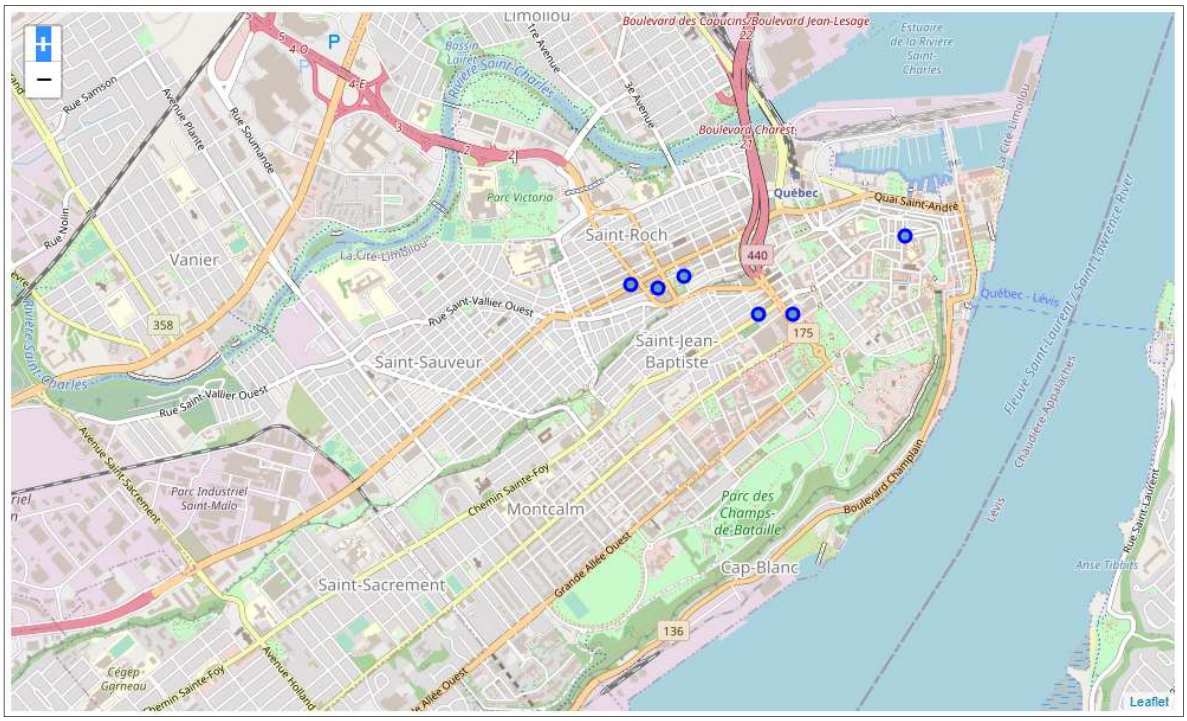

Figure 4. Folium map with the six schools that meet the requirements.

With these six schools, we carried out a more extensive analysis, expanded the search area to 2,000 meters and re-explored the sites of interest, obtaining the number of venues shown in the **Table 3**

Table 3. Number of venues around each school.

school	
Aviron_College_Technique	32
College_Francois-de-laval	71
Collège_CDI	53
Collège_OSullivan	53
Institut_national_recherche_scientifique	46
TÉLUQ	43

Now we extend the search to the 15 most frequent places and make a clustering using the clustering machine learning algorithm KMeans with 3 groups.

4. Results

After all these steps, we show the locations of the selected schools on the Quebec map **(Figure 5)**, differentiating them by color.

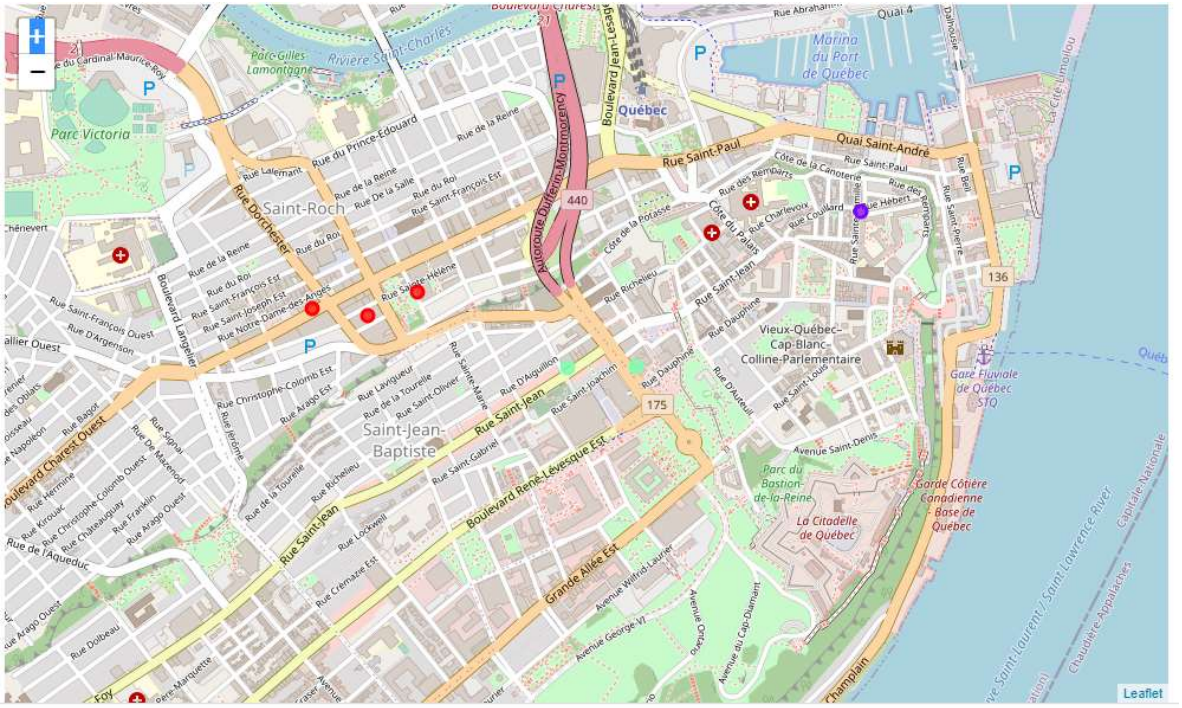

Figure 5. Folium map with the clustering of the six schools.

After clustering, we look again at the 10 most frequent places in each group for a general analysis of the neighborhood

```
quebec_merged.loc[quebec_merged['Cluster Labels'] == 0, quebec_merged.columns[[1] + list(range(5, quebec_merged.shape[1]))]]
```

	category	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
8	cégep privado especializado	Gastropub	Bakery	Restaurant	Café	Park	Brewery	Diner	Other Nightlife	Coffee Shop	Library
12	University	Gastropub	Pub	French Restaurant	Restaurant	Brewery	Café	Grocery Store	Coffee Shop	Bakery	Cocktail Bar
13	University	Restaurant	Gastropub	French Restaurant	Café	Pub	Brewery	Bar	Coffee Shop	Bakery	Ice Cream Shop

Figure 6. Top 10 venues en the first cluster (0)

```
quebec_merged.loc[quebec_merged['Cluster Labels'] == 1, quebec_merged.columns[[1] + list(range(5, quebec_merged.shape[1]))]]
```

	category	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
25	Secondary School	Hotel	French Restaurant	Restaurant	Plaza	Neighborhood	Park	Bar	Café	Pizza Place	Historic Site

Figure 7. Top 10 venues en the second cluster (1)

```
quebec_merged.loc[quebec_merged['Cluster Labels'] == 2, quebec_merged.columns[[1] + list(range(5, quebec_merged.shape[1]))]]
```

	category	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
6	cégep privado especializado	Café	Hotel	Italian Restaurant	Coffee Shop	Restaurant	Gym	Boutique	Ramen Restaurant	Hostel	Hookah Bar
7	cégep privado especializado	Restaurant	Grocery Store	Hotel	French Restaurant	Concert Hall	Park	Plaza	Coffee Shop	Bar	Swiss Restaurant

Figure 8. Top 10 venues en the third cluster (2)

5. Discussion

By reviewing all types of sites by category, such as final clients, we conclude that the first cluster **(Figure 6)** is more alive, much fun, and perfect for us. It has parks, libraries, cafes, many gastropubs, restaurants, many French restaurants. We think it is a very interesting area of Quebec. Finally, it is near a boulevard and it is good for our trip in the city.

About the second group **(Figure 7)** we have the feeling that it is a more tourist area. It has a hotel as the first common place and we are not currently interested in moving to a

tourist neighborhood. The same of the last cluster **(Figure 8)**, we found many hotels around.

6. Conclusion

The use of geographic data in the analysis of scientific data could have a strong impact on the behavioral decisions of the world population. This is a great opportunity to create tools to help you make a good decision.

7. Future Directions

In this study we use only the school environment, but there are many variables that together are very important for a move decision, each of these variables is an opportunity to improve this study.

With more data like socioeconomic distribution, ethnic immigration, ethnic colonies, bus routes, distribution of companies by economic sector, it is possible to make a complete tool that helps many people in the emigration process.