



MOVING TO MONTREAL

Where to buy a house?

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Moving to Montreal: Where to buy a house?

Moving to a new city is never easy. You find yourself in front of a very big decision. Where in this city I don't really know should I buy a house?

How could I know what makes each part of the city different or similar to each other? What can I expect to find in each borough of this new city?

It would be a lot easier if you only knew a bunch of things, like:

- How many parks, sport fields, schools, or any other kind of point of interest are there in a given borough.
- Is it easy to move around without a car? Public transit nearby? Bike paths? This benefits a lot big children and teenagers who can't drive.
- Is a certain borough more of a residential area or more of a commercial area?
- What's the price range for different types of housing for each borough?
- Which boroughs relates to each other, which ones really differ?

So many questions... So let's put Data Analysis to the rescue!

The Data: Where to get it from?

Fortunately, we can find a lot of the data needed on the City of Montreal “Données ouvertes” (Open Data) website: <https://donnees.montreal.ca/>

Some other important data comes from non-governmental websites:

- Public transport, acquired from the "Société de transport de Montréal" (metro and bus company): <https://www.stm.info/fr/a-propos/developpeurs>
- Housing Prices for each borough, acquired from the Real estate company “Centris” Website: <https://www.centris.ca/en/tools/real-estate-statistics/montreal-island?uc=2>
- We can find the top 100 venues of each borough with the FourSquare data access API.

Montréal 

 **stm**

 **centris.ca**

 **FOURSQUARE**

The Data: Acquisition

All the csv data from the Montreal Open Data website was read to Pandas Dataframes, all the available geojson were saved to json variables with the help of the request library.

The data from the "Société de transport de Montréal" was in Shapefile format. For using this data with Folium maps, it was converted to a GeoJson format with the help of the "Free Online SHAPEFILE to JSON Converter", <https://products.aspose.app/gis/conversion/shapefile-to-json>

The Housing prices from Centris.ca is divided in one webpage for each borough. Each webpage was webscrapped for the prices and all the data collected to a dataframe.

The top 100 venues for each borough were retrieved from the FourSquare database by calling the Foursquare API once for each one of the 19 Montreal City boroughs.

Montréal 

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 **FOURSQUARE**

The Data: Wrangling

After extended wrangling, all the data was contained in Dataframes and (Geo)Jsons. Examples:

-points_of_interest_df : shape(3231, 7):

	Name	Address	Latitude	Longitude	Borough	Type	Category
0	Maison du Meunier	10897 Rue du Pont, H2B 1Z4	45.574862	-73.661102	Ahuntsic-Cartierville	Musée et centre d'interprétation / d'exposition	Point of Interest
1	Maison du Pressoir	10865 Rue du Pressoir, H2B 2L1	45.575970	-73.659553	Ahuntsic-Cartierville	Musée et centre d'interprétation / d'exposition	Point of Interest
2	Marché Central	9187 Boulevard de l'Acadie, H4N 3K1	45.534023	-73.654956	Ahuntsic-Cartierville	Centre commercial	Point of Interest

-exterior_installations_df : shape(3469, 4)

	Name	Borough	Type	Category
0	Aire de jeu 18 mois à 5 ans	Le Plateau-Mont-Royal	Aire de jeu - enfant	Exterior Installation
1	Aire de jeu 18 mois à 5 ans	Le Plateau-Mont-Royal	Aire de jeu - enfant	Exterior Installation
2	Arbri soleil	Le Plateau-Mont-Royal	Plein air	Exterior Installation

-boroughs_df: shape(34, 7) :

	Borough	single Family 2nd Quarter 2021	single Family last 4 Quarters	Condo 2nd Quarter 2021	Condo last 4 Quarters	Plex 2nd Quarter 2021	Plex last 4 Quarters
0	Outremont	**	\$2,180,000	\$690,000	\$671,500	**	**
1	LaSalle	**	\$595,000	\$380,500	\$372,040	\$756,500	\$690,000
2	Ville-Marie	\$1,530,000	\$1,149,500	\$449,000	\$445,000	\$819,000	\$847,000

-green_spaces_df : shape(2206, 5)

	Name	Borough	Area	Type	Category
0	Université Concordia - Campus Loyola	Côte-des-Neiges-Notre-Dame-de-Grâce	5.054930	Espace sportif	Green Space
1	Av. du Boisé	Côte-des-Neiges-Notre-Dame-de-Grâce	0.032364	Îlot de voirie	Green Space
2	Parc Maurice-Cullen	Côte-des-Neiges-Notre-Dame-de-Grâce	0.542681	Parc de quartier	Green Space

-mtl_free_wifi_df : shape(450, 6)

	Name	Address	Latitude	Longitude	Borough	Category
0	MtlWifi Rue Saint Jacques / Place d'Armes	Rue Saint Jacques / Place d'Armes	45.504720	-73.557920	Ville-Marie	Mtl Free Wifi
1	MtlWifi Rue Notre-Dames/ Place d'Armes	Rue Notre-Dames/ Place d'Armes	45.504860	-73.556600	Ville-Marie	Mtl Free Wifi
2	MtlWifi Rue Le Royer / boul. Saint-Laurent	Rue Le Royer / boul. Saint-Laurent	45.505780	-73.554670	Ville-Marie	Mtl Free Wifi

-metro_stations_df: shape(68, 4):

	Name	Borough	Metro line	Category
0	Station Angrignon	Le Sud-Ouest	Green line	Metro station
1	Station Monk	Le Sud-Ouest	Green line	Metro station
2	Station Jolicoeur	Le Sud-Ouest	Green line	Metro station

-montreal_venues_df: shape(1620, 6):

	Borough	Venue	Venue Latitude	Venue Longitude	Venue Address	Venue Category
0	Outremont	Mamie Clafoutis	45.521466	-73.613998	[1291 ave. Van Horne (coin av. Outremont), Mon...	Bakery
1	Outremont	Le Glacier Bilboquet	45.518993	-73.609737	[1311 ave. Bernard Ouest (coin Outremont), Mon...	Ice Cream Shop
2	Outremont	Damas	45.522596	-73.613112	[1201 Van Horne, Montréal QC H2V 1K4, Canada]	Mediterranean Restaurant

Machine learning : Clustering

As the primary objective of all this exercise is to compare the boroughs, they were grouped together by similarity. Machine Learning techniques were used, more precisely, the unsupervised machine learning algorithm "Kmeans Clustering".

By applying Kmeans Clustering the 19 Montreal City boroughs were classified into 6 clusters with similar common features.

	Borough	Cluster	1st Most Common Feature	2nd Most Common Feature	3rd Most Common Feature	4th Most Common Feature	5th Most Common Feature	6th Most Common Feature	7th Most Common Feature	8th Most Common Feature	9th Most Common Feature	10th Most Common Feature
0	Ahuntsic-Cartierville	5	Sportif	Récréatif	Aire de jeu - enfant	Parc de quartier	Parc	Loisirs et détente	Îlot de voirie	École primaire	Mtl Free Wifi	Organisme communautaire et centre de loisirs
1	Anjou	2	Sportif	Aire de jeu - enfant	Récréatif	Parc de quartier	Parc	Loisirs et détente	Green space	Pharmacy	École primaire	Restaurant
2	Côte-des-Neiges-Notre-Dame-de-Grâce	1	Sportif	Récréatif	Aire de jeu - enfant	Organisme communautaire et centre de loisirs	Parc	Parc de quartier	École primaire	École secondaire et professionnelle	Mtl Free Wifi	Loisirs et détente
3	L'Île-Bizard-Sainte-Genève	2	Parc	Aire de jeu - enfant	Sportif	Plein air	Parc de voisinage	Green space	Récréatif	Parc-nature	Parc de quartier	Îlot de verdure
4	LaSalle	1	Aire de jeu - enfant	Récréatif	Sportif	Parc	Parc urbain	Parc de voisinage	Parc de quartier	Loisirs et détente	École primaire	Green space
5	Lachine	2	Sportif	Plein air	Récréatif	Parc	Aire de jeu -	Mtl Free	Parc de	Parc de	Loisirs et	Place publique

Results:

boroughs_features_sorted:
shape(19, 12) : Dataframe for identifying the 10 most common feature categories for the 19 Montreal City boroughs and the cluster they belong to. Not a huge difference between boroughs, except for Ville-Marie (downtown).

	Borough	Cluster	1st Most Common Feature	2nd Most Common Feature	3rd Most Common Feature	4th Most Common Feature	5th Most Common Feature	6th Most Common Feature	7th Most Common Feature	8th Most Common Feature	9th Most Common Feature	10th Most Common Feature
0	Ahuntsic-Cartierville	5	Sportif	Récréatif	Aire de jeu - enfant	Parc de quartier	Parc	Loisirs et détente	Îlot de voirie	École primaire	Mtl Free Wifi	Organisme communautaire et centre de loisirs
1	Anjou	2	Sportif	Aire de jeu - enfant	Récréatif	Parc de quartier	Parc	Loisirs et détente	Green space	Pharmacy	École primaire	Restaurant
2	Côte-des-Neiges-Notre-Dame-de-Grâce	1	Sportif	Récréatif	Aire de jeu - enfant	Organisme communautaire et centre de loisirs	Parc	Parc de quartier	École primaire	École secondaire et professionnelle	Mtl Free Wifi	Loisirs et détente
3	L'Île-Bizard-Sainte-Geneviève	2	Parc	Aire de jeu - enfant	Sportif	Plein air	Parc de voisinage	Green space	Récréatif	Parc-nature	Parc de quartier	Îlot de verdure
4	LaSalle	1	Aire de jeu - enfant	Récréatif	Sportif	Parc	Parc urbain	Parc de voisinage	Parc de quartier	Loisirs et détente	École primaire	Green space
5	Lachine	2	Sportif	Plein air	Récréatif	Parc	Aire de jeu - enfant	Mtl Free Wifi	Parc de quartier	Parc de voisinage	Loisirs et détente	Place publique
6	Le Plateau-Mont-Royal	0	Aire de jeu - enfant	Parc	Récréatif	Parc de voisinage	Théâtre / salle de spectacle / petit lieu de d...	Loisirs et détente	Mtl Free Wifi	Îlot de verdure	Organisme communautaire et centre de loisirs	Sportif
7	Le Sud-Ouest	0	Parc	Aire de jeu - enfant	Mtl Free Wifi	Organisme communautaire et centre de loisirs	Récréatif	Îlot de verdure	Loisirs et détente	Parc de quartier	Sportif	Parc de voisinage
8	Mercier-Hochelaga-Maisonneuve	5	Aire de jeu - enfant	Récréatif	Sportif	Parc de quartier	Parc	Loisirs et détente	Organisme communautaire et centre de loisirs	Plein air	Mtl Free Wifi	École primaire
	Montréal-Nord	2	Aire de jeu -	Récréatif	Green space	Parc	Sportif	Parc de quartier	Loisirs et détente	Mtl Free Wifi	École primaire	Plein air

Results:

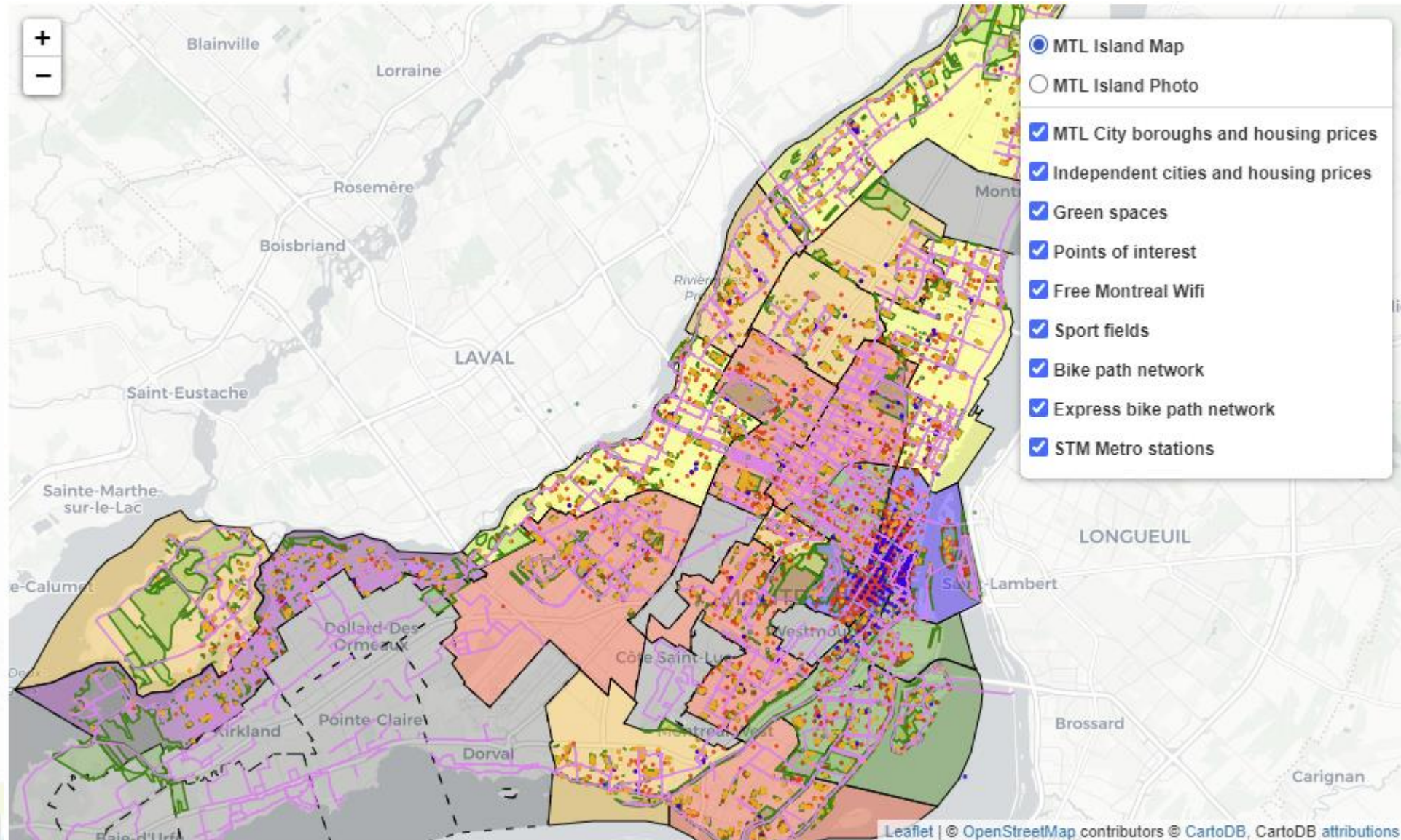
boroughs_19_df: shape(19, 7) :
Dataframe created for comparing
in just one glance the different
types of Housing prices from
borough to borough. Here, we can
easily see big differences in prices
from region to region.

	Borough	single Family 2nd Quarter 2021	single Family last 4 Quarters	Condo 2nd Quarter 2021	Condo last 4 Quarters	Plex 2nd Quarter 2021	Plex last 4 Quarters
0	Outremont	**	\$2,180,000	\$690,000	\$671,500	**	**
1	LaSalle	**	\$595,000	\$380,500	\$372,040	\$756,500	\$690,000
2	Ville-Marie	\$1,530,000	\$1,149,500	\$449,000	\$445,000	\$819,000	\$847,000
3	Le Plateau-Mont-Royal	\$1,180,000	\$1,221,000	\$505,000	\$495,000	\$1,050,000	\$1,050,000
4	Le Sud-Ouest	\$805,000	\$777,000	\$430,000	\$420,000	\$735,500	\$712,000
5	Rivière-des-Prairies-Pointe-aux-Trembles	\$455,000	\$420,000	\$280,000	\$242,000	\$597,500	\$550,000
6	Lachine	\$590,000	\$575,000	\$410,000	\$341,000	\$642,500	\$580,000
7	Montréal-Nord	\$403,000	\$396,000	\$285,000	\$270,000	\$615,000	\$555,000
8	L'Île-Bizard-Sainte-Genève	\$595,000	\$550,000	**	\$246,000	**	**
9	Ahuntsic-Cartierville	\$708,500	\$700,000	\$357,250	\$330,700	\$808,000	\$777,500
10	Saint-Léonard	**	\$613,500	\$350,000	\$340,000	\$884,000	\$840,000
11	Mercier-Hochelaga-Maisonneuve	\$480,000	\$511,500	\$360,100	\$349,000	\$685,000	\$635,000
12	Côte-des-Neiges-Notre-Dame-de-Grâce	\$1,240,000	\$1,114,000	\$440,000	\$440,000	\$900,000	\$847,500
13	Rosemont-La Petite-Patrie	**	\$749,000	\$460,000	\$440,000	\$835,500	\$785,000
14	Saint-Laurent	\$832,500	\$795,125	\$435,000	\$412,000	**	\$755,000
15	Villeray-Saint-Michel-Parc-Extension	\$645,000	\$580,000	\$388,875	\$385,500	\$735,000	\$690,000
16	Anjou	**	\$530,000	\$322,000	\$293,500	\$712,500	\$683,500
17	Pierrefonds-Roxboro	\$585,000	\$527,000	\$326,250	\$300,000	**	**
18	Verdun	\$1,050,000	\$941,000	\$500,500	\$489,900	\$801,250	\$787,500

Results:

Visualization of all the data in a Folium Map, where we can turn on and off the main feature categories displayed.

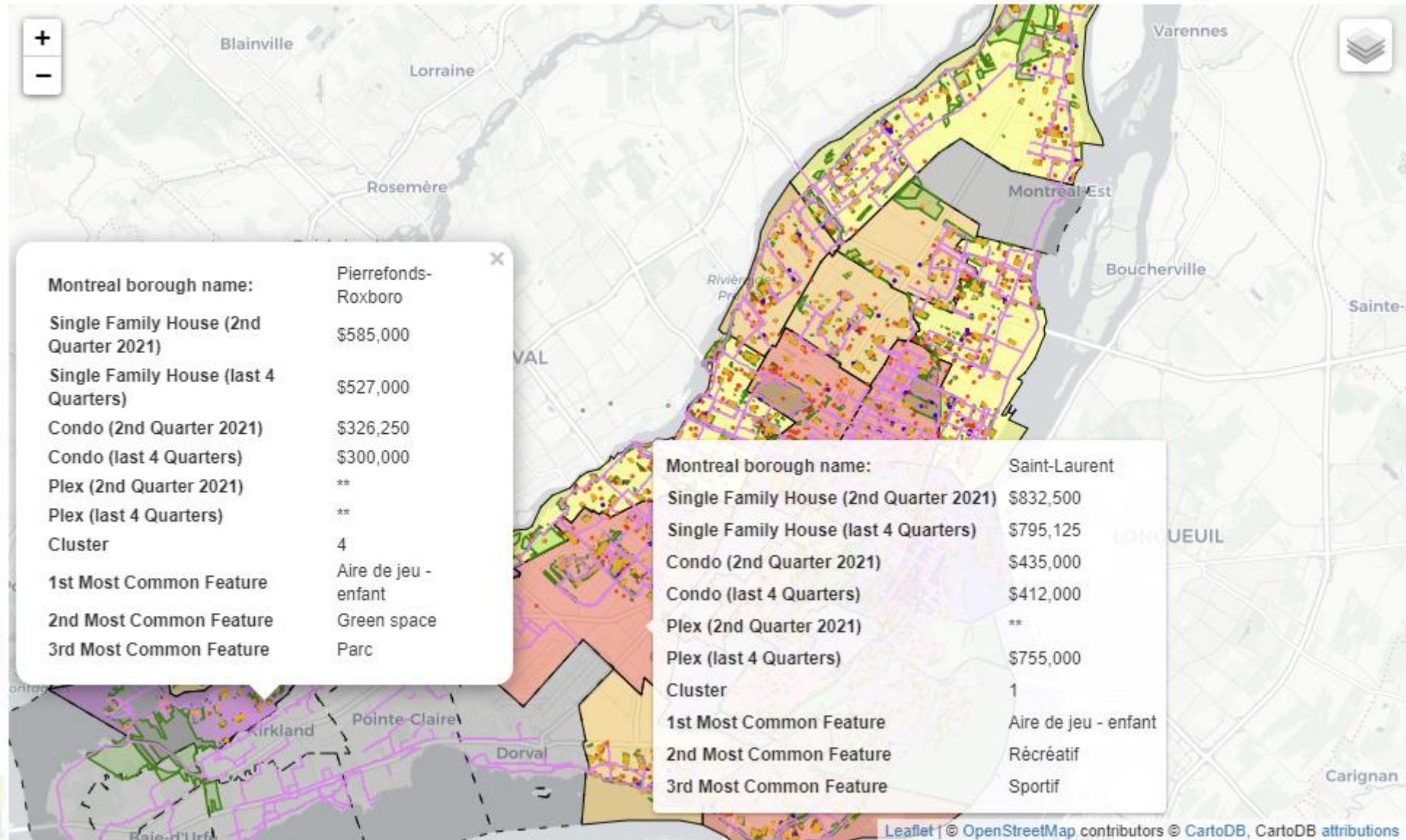
A Folium Map is a very convenient way of visualizing spatial data such as the density of the features in your target borough or the proximity to certain feature you would like close to home.



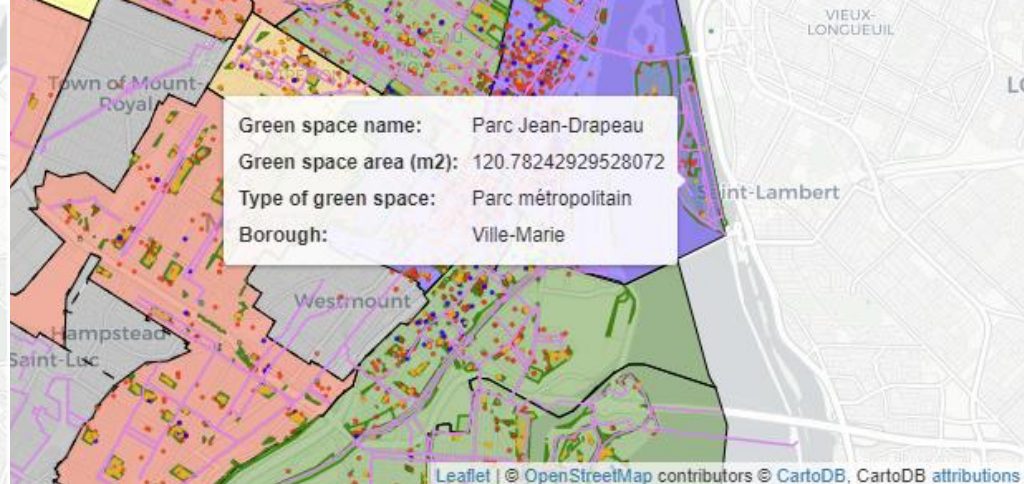
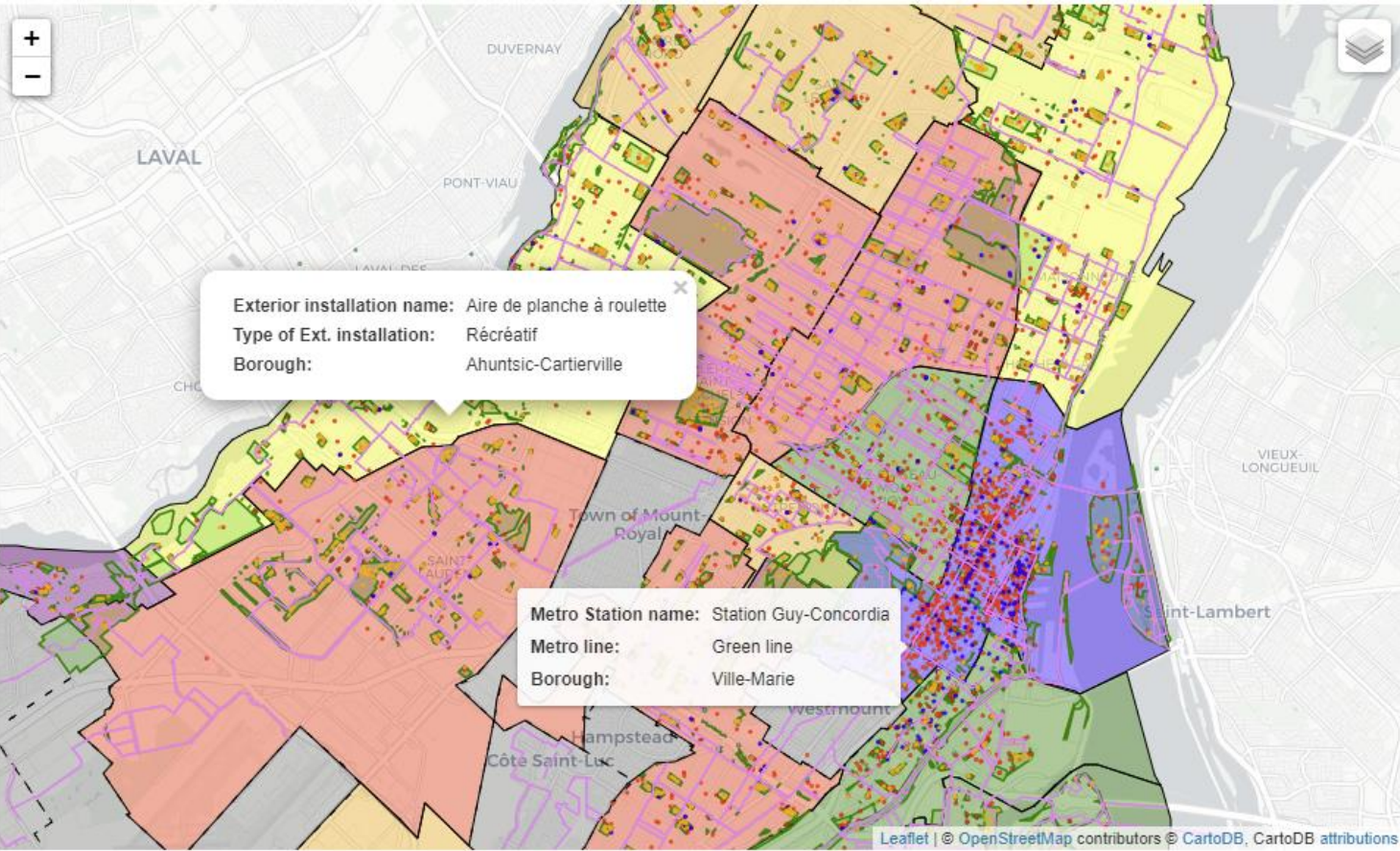
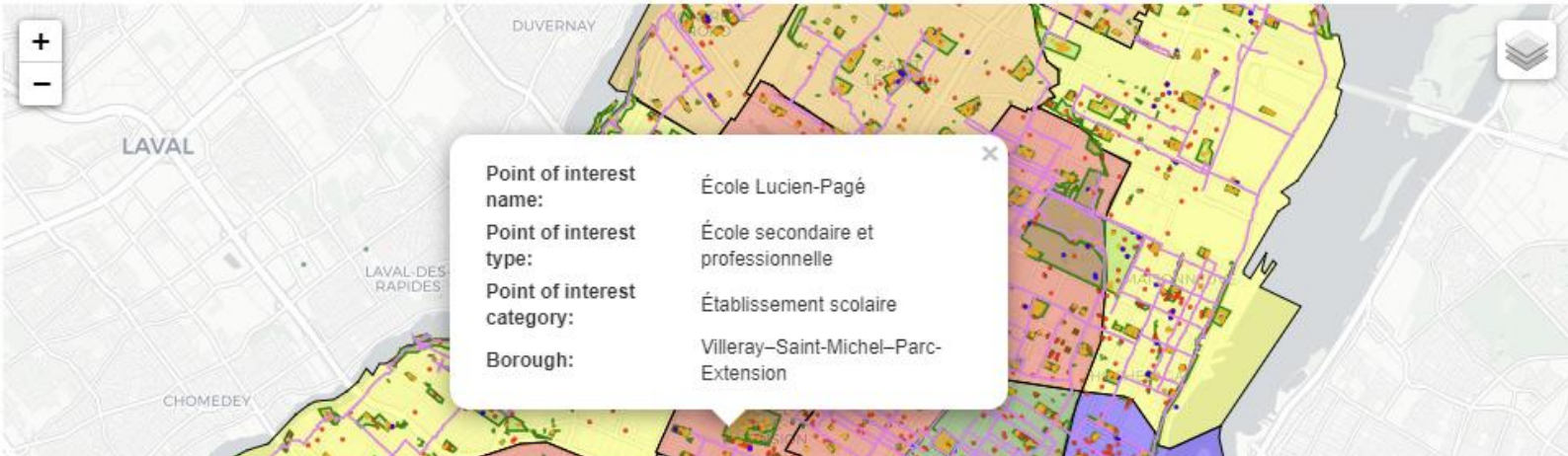
Results:

We can click on or just hover over any feature on the map to get a pop-up with the associated data.

We can use this for comparing data between 2 different boroughs, like for example, their Housing Prices and their 3 Most Common Features.



Results:



Conclusions and recommendations:

- Based on the most common features of almost all the boroughs, they seem fairly similar and homogeneous, all good to adopt as your future home location.
- The more subtle differences between them would come on the less common features, which are less numerous and therefore don't make part of the 10 Most Common Features and influence a lot less the clustering algorithm.
- The final choice of one borough over the other will probably be influenced a lot more by the House pricing that by the features existing in the borough, and maybe a bit because of the proximity to certain desired less-common features as proximity to work or venues oriented to certain ethnicities.
- The one big exception is the borough "Ville-Marie", which is pretty much the Downtown, not the most residential area and completely dominated by features other than those of the rest of the boroughs.

For expanding the scope of this Data Analysis, it would be recommended to also consider the pricing for Rental Housing, rush-hour traffic, and getting a secondary clustering based only on the venue categories for finding out the "Vibe" of the boroughs.