

Geographical clustering

WHERE TO SETTLE IN MONTREAL ?

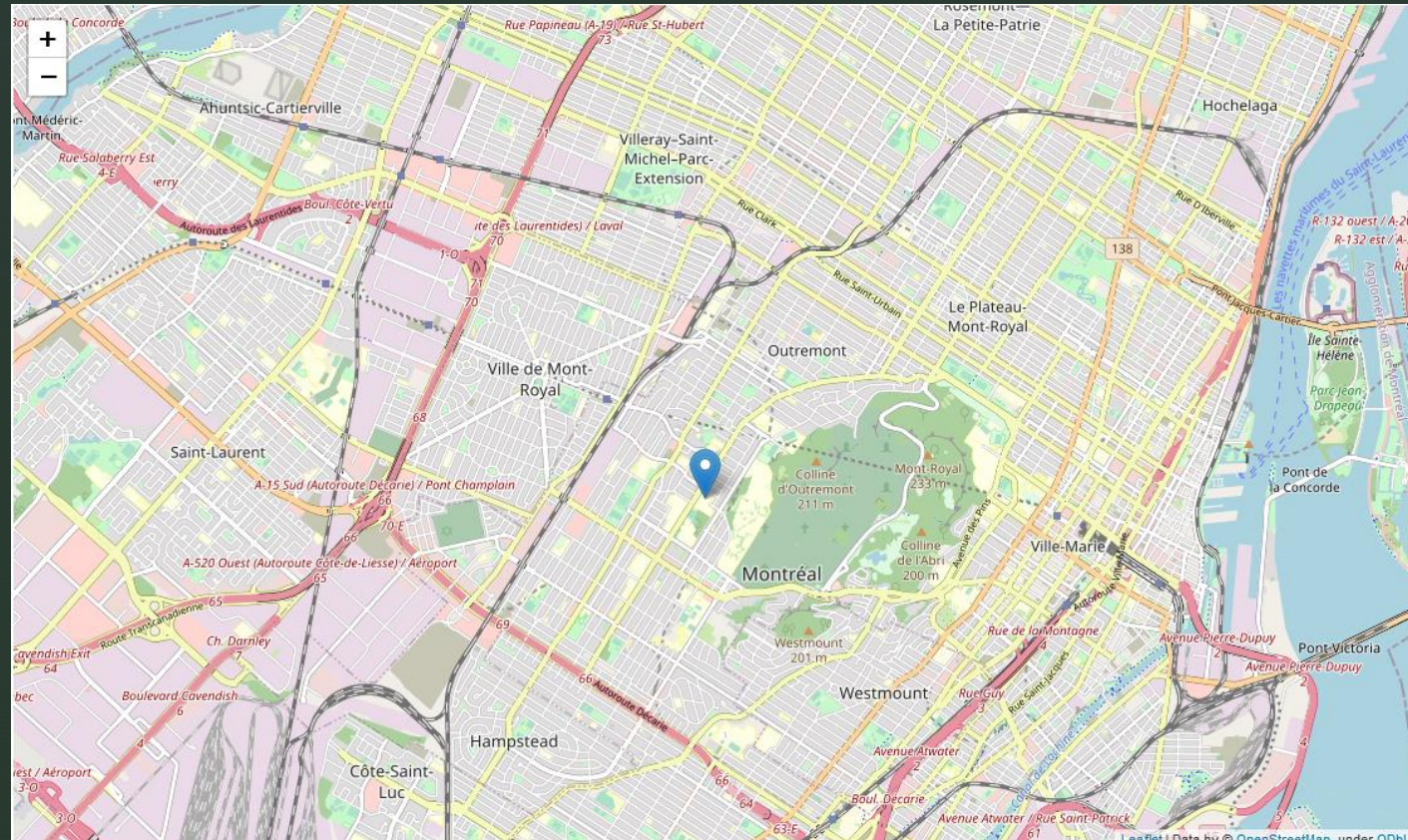
A future student at HEC Montreal (QC, CA)...

... would like to settle in a place :

- Close to her school or to a metro station
- With a lot of restaurants, especially french and italian ones
- Near a swimming-pool and a park
- And with at least one supermarket in the neighbourhood.

How can we help her ?

MAP of Montreal centered on HEC Montreal

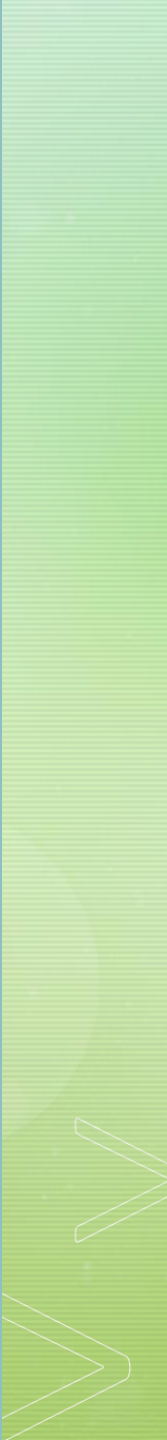




Foursquare API

Thanks to Python and its Pandas and requests library, we can easily get the data we are interested in from Foursquare, that gathers information in thousands of venues all over the world.

Here we asked for the venues from the said categories, in a radius of 4 km around the school.



DataFrame

	id	name	lat	lon	address	category
0	4b6c85fdf964a520ad402ce3	Duc de Lorraine	45.494618	-73.618279	5002 ch. de la Côte-des-Neiges (Rue du Frère A...	french
1	5c3cd1a4f2554e002c2d4bd9	Restaurant Jérôme Ferrer – Europea	45.496492	-73.571741	1065, rue de la Montagne	french
2	4b1c02b5f964a520ac0024e3	Café Holt	45.497755	-73.575552	1300, rue Sherbrooke Ouest (De La Montagne)	french
3	4bf40f2c706e20a175dfa898	Chez Lévéque	45.518265	-73.597054	1030 Ave. Laurier Ouest (coin Hutchison)	french
4	4aea6fd9f964a52094bb21e3	Leméac	45.518191	-73.597304	1045 Av. Laurier O (coin Durocher)	french
...
205	4c13fbcba9c220a124cc569d	Marché Richelieu	45.521697	-73.570204	3795 rue Saint-André (coin Roy)	supermarkets
206	4b12f1c4f964a520559123e3	IGA	45.476430	-73.666752	5800 cavendish	supermarkets
207	50113943e4b08f147b200c8b	Marche Station 54	45.532628	-73.596918	760 Rosemont East (Avenue de Chateaubriand)	supermarkets
208	4c827d1651ada1cd06d01c10	Metro Côte-des-Neiges	45.495158	-73.620010	5150 Ch De La Côte-Des-Neiges	supermarkets
209	4e40861ba8099680852c6769	Provigo	45.501104	-73.628182	Canada	supermarkets

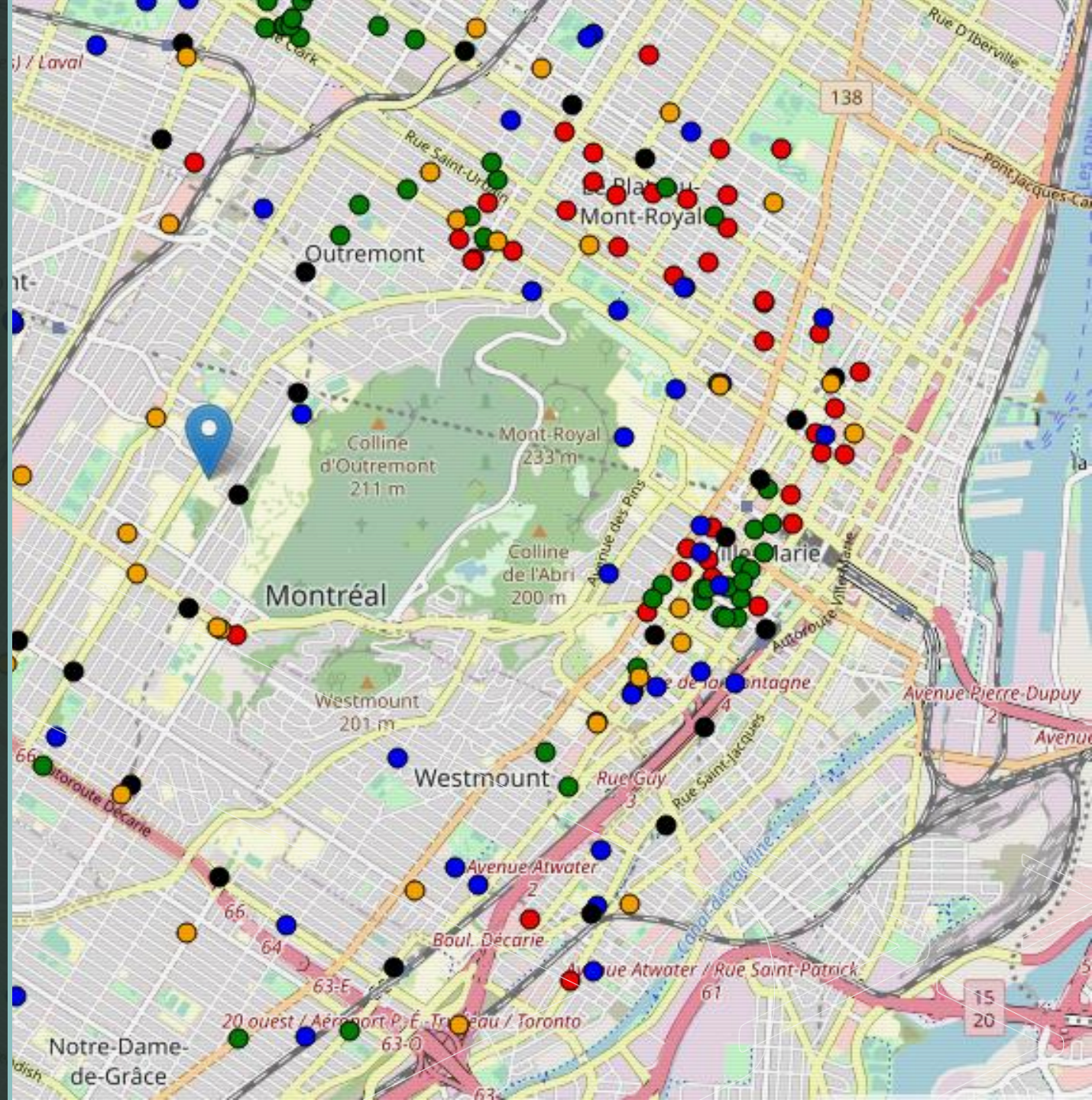
This is an excerpt of the data we got after cleaning and converted them to a pandas DataFrame. Data are Foursquare id, name, address and coordinates of the venue, and their category : french (restaurant), italian (restaurant), pool, metro, supermarket). (parks are not in the list as they are already displayed on the map).

A first visualisation a little confusing...

We used Folium library to display each venue with a color related to its category :

- **French restaurants**
- **Italian restaurants**
- **Pools**
- **Supermarkets**
- **Metro stations**

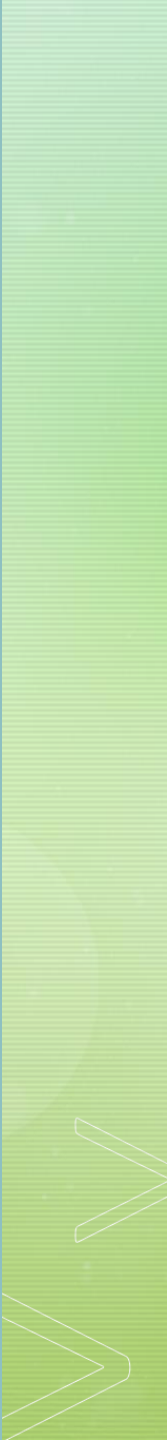
But the result is not easy to read.





Clustering restaurants

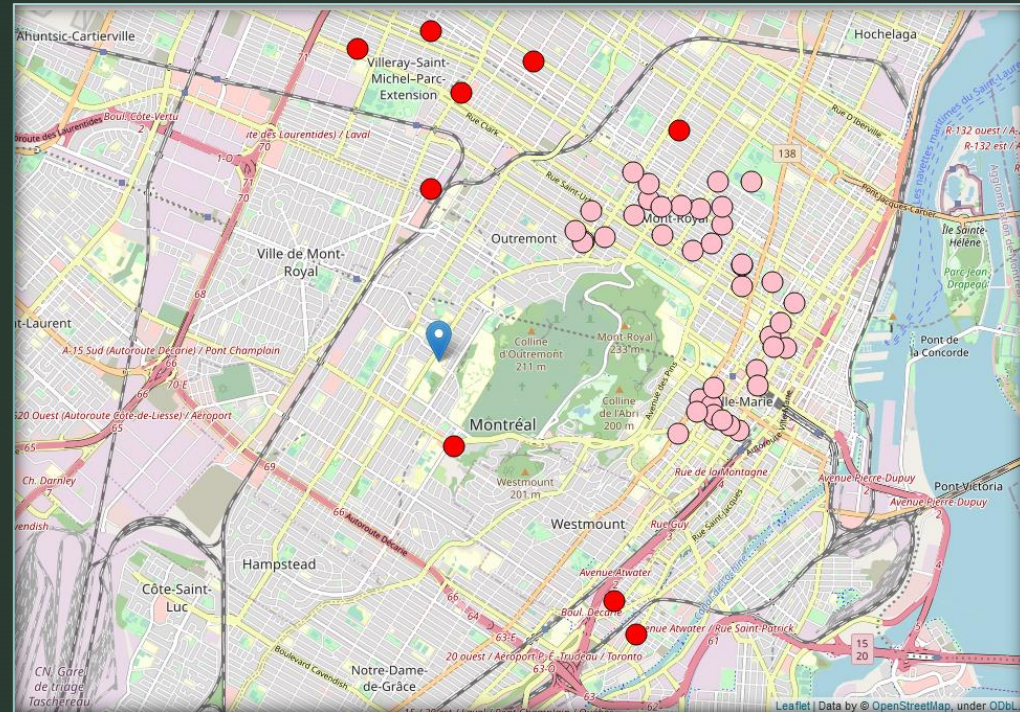
The density of restaurants in a given place is an indice of how lively this place is. French restaurants and Italian ones have then been clusterized with the DBSCAN method that groups entities that are in the same zone of density.



French restaurants clusters

2 clusters :

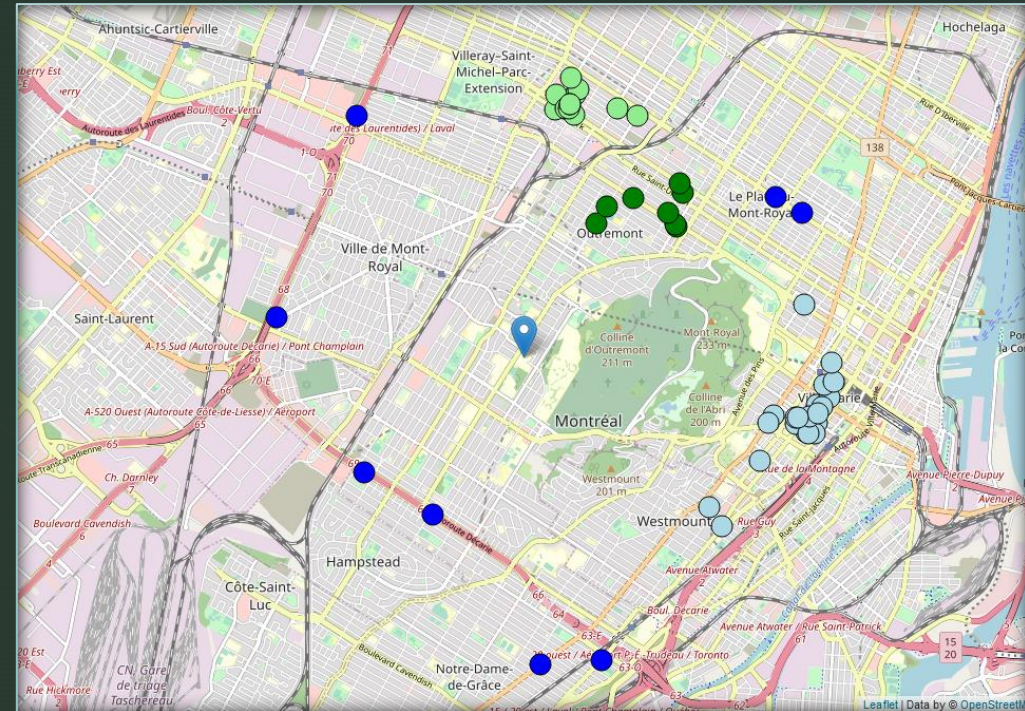
- Restaurants that are numerous in the zone
- Restaurants more afar

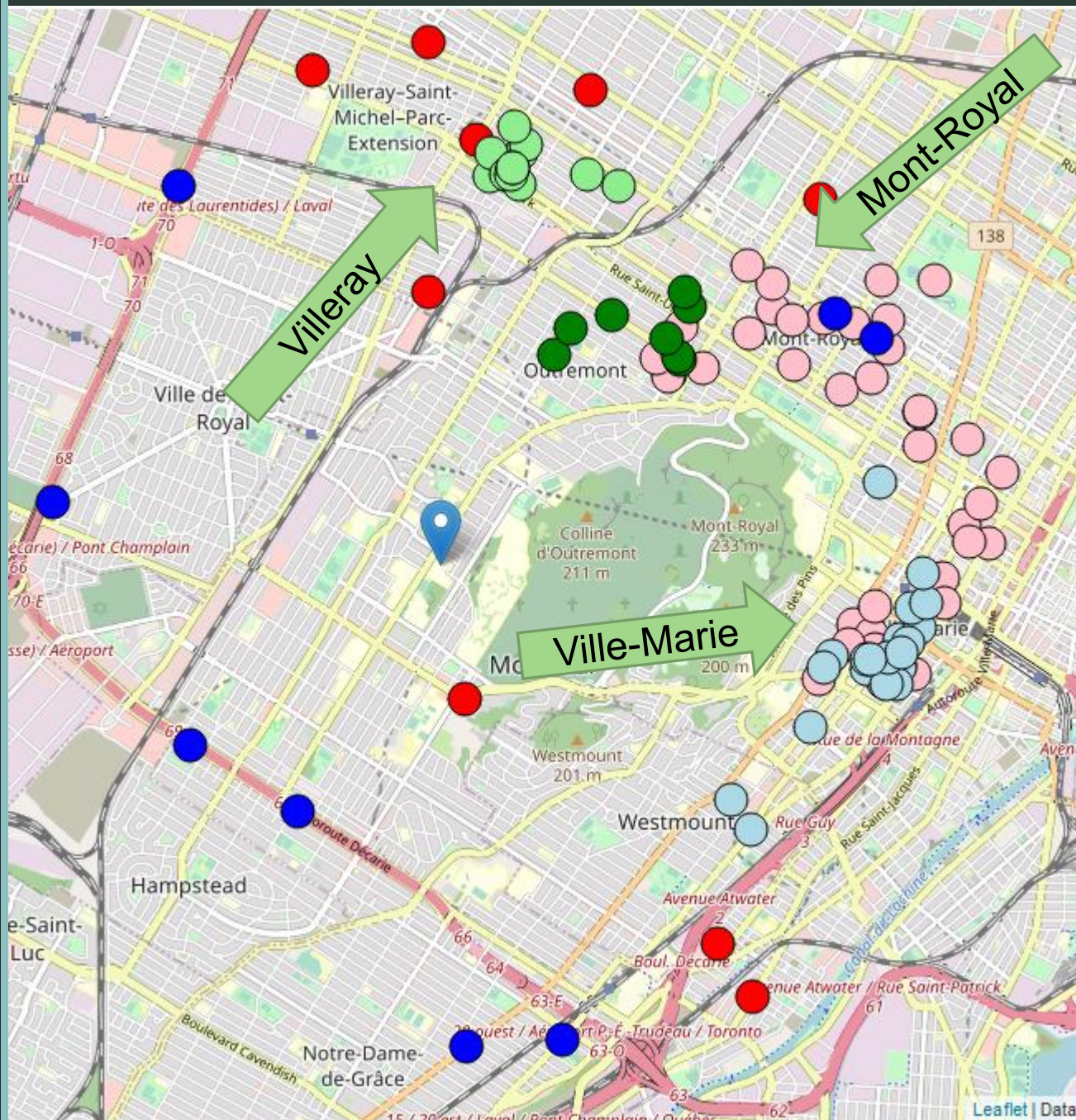


Italian restaurants clusters

4 clusters :

- In green or light blue: 3 different clusters
- Restaurants more afar





Overlapping maps

We can then distinguish 3 zones where there are many restaurants:

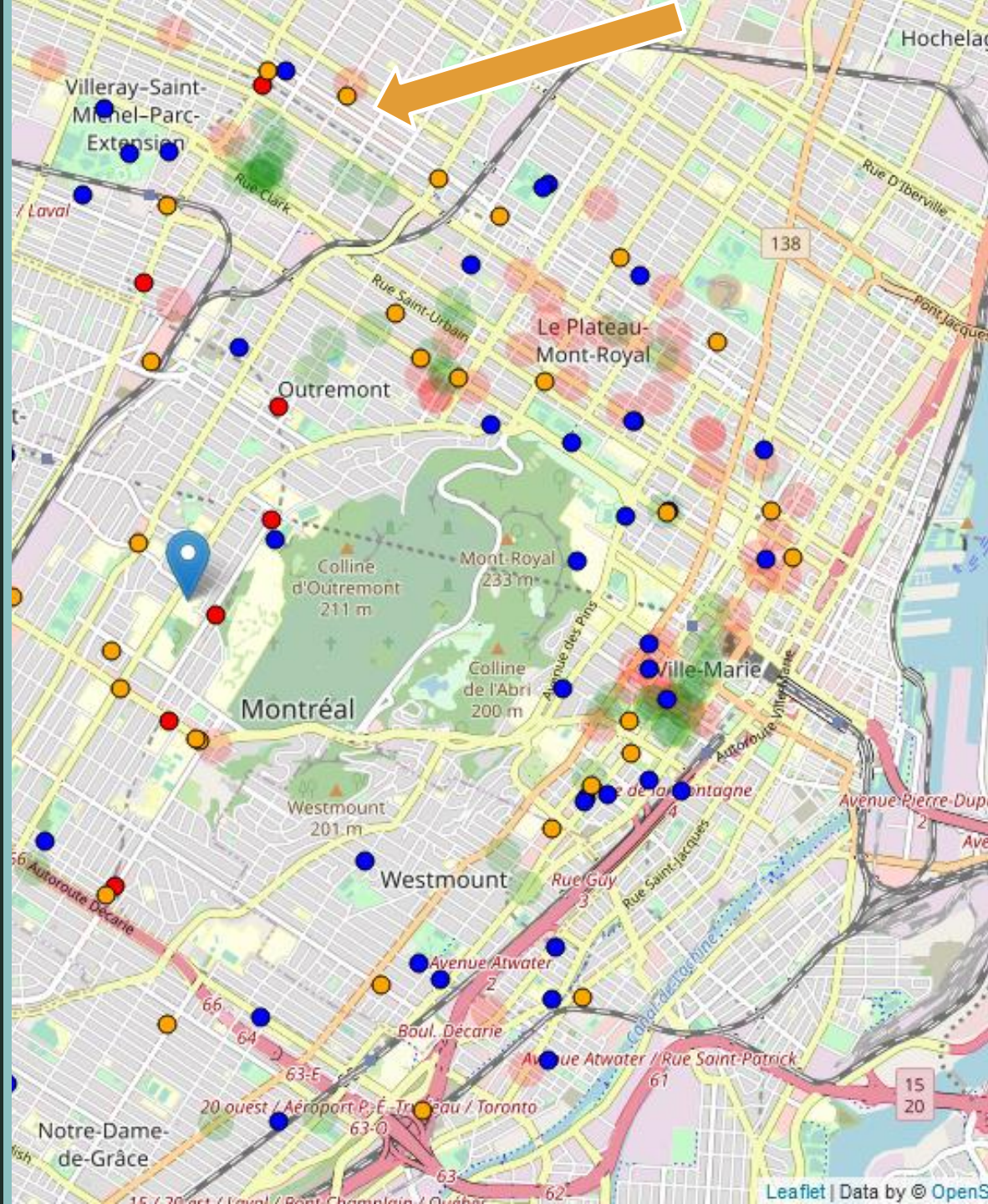
- Villeray Saint Michel Parc Extension
- Mont-Royal
- Ville-Marie

How about metro stations ?

We are only interested in the stations directly linked to the school, that is to say, those on the Blue Line (each metro line in Montreal has a color).

As the line is not indicated in the Foursquare data we got for metro stations, we found them in the Wikipedia page about them, and after cleaning and refining, our list of metro stations was reduced to the only Blue Line ones.

	id	name	lat	lon	address	category	color	blue line
144	4b2abacdf964a52078ae24e3	STM Station Université-de-Montréal	45.503466	-73.618103	Montréal QC	metros	black	True
145	4b6caf0af964a520f94b2ce3	STM Station de L'Acadie	45.525726	-73.625000	Montréal QC	metros	black	True
146	4aff627cf964a520063822e3	STM Station de Snowdon	45.485333	-73.627860	Montréal QC	metros	black	True
149	4b57256ff964a520372828e3	STM Station de la Côte-des-Neiges	45.496377	-73.622564	Montréal QC	metros	black	True
151	4b67509ef964a52070472be3	STM Station Édouard-Montpetit	45.509822	-73.612816	Station Édouard-Montpetit	metros	black	True
172	4b0403c4f964a520e55022e3	STM Station Jean-Talon	45.538999	-73.613767	Station Jean-Talon	metros	black	True
174	4b9a9fe5f964a5206ac735e3	STM Station d'Outremont	45.517464	-73.612114	1400 Van horn	metros	black	True



Final map

Restaurants are shown in translucent colors, metro stations in red for improved lisibility.

The place that fulfills all the required criteria is Villeray Saint Michel parc Extension. The 2 other zones (Le Plateau Mont Royal and Ville-Marie) offer lots of restaurants, pools and supermarkets but there is no red dot so no metro station of the Blue line.



References

- Foursquare API
- Wikipedia list of metro stations of Montreal