

# Neighborhoods with Plant-based Restaurants in Toronto

## Introduction/Business Problem

Plant-based diets are very popular nowadays, especially due to the fact that veganism is on the rise. Although veganism involves a lot more than just food, one cannot ignore the fact that plant-based food is each day more present in our everyday life. According to Happy Cow's top 10 vegan-friendly cities, Toronto is amongst the world's top 10.

Being someone who loves to travel, is a foodie and whose diet is 90% plant-based, one of the top things that guides my touristic planning is the possibility of eating at nice restaurants that offer interesting and tasty plant-based dishes.

Thus, as I also have never been to Toronto, the goal of my project is to discover which neighborhoods in Toronto have most options of plant-based restaurants for tourists whose profile meets mine: a plant-based foodie.

## Description of the data

In order to achieve this goal, we will need a list of Toronto's neighborhoods and its geographical coordinates, as well as access to location data.

This Wikipedia page ([https://en.wikipedia.org/wiki/List\\_of\\_postal\\_codes\\_of\\_Canada:\\_M](https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M)) has the information about Toronto neighborhood data. Latitude and longitude coordinates will be read from a csv file from Coursera's Applied Data Science Capstone course ([https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBMDeveloperSkillsNetwork-DS0701EN-SkillsNetwork/labs\\_v1/Geospatial\\_Coordinates.csv](https://cf-courses-data.s3.us.cloud-object-storage.appdomain.cloud/IBMDeveloperSkillsNetwork-DS0701EN-SkillsNetwork/labs_v1/Geospatial_Coordinates.csv)).

Foursquare location data is one of the most comprehensive out there, and quite accurate that it powers location data for many popular services like Apple Maps, Uber, Snapchat, Twitter and many others. So, the latitude and longitude coordinates of Toronto's neighborhoods will be used with Foursquare API in order to search the Foursquare database and find data about restaurants categories located at Toronto's neighborhoods.

Here is an example of a venue in Toronto under the category of vegan/vegetarian restaurant according to Foursquare: <https://foursquare.com/v/fresh-on-spadina/4ad4c05cf964a5200ff620e3>.

## Methodology

First, a data frame with the web scraped and cleaned data of Toronto's neighborhood data from Wikipedia was created. Boroughs not assigned were not considered. Then, we aggregated latitude and longitude data for each neighborhood.

Foursquare API was used to retrieve the top 100 venues within a radius of 2,000 meters for each neighborhood. The data frame with the results was, then, transformed to show the mean frequency of each venue category by neighborhood using one-hot encoding

technique. A new data frame was derived from this one, but only with venues under the “Vegetarian / Vegan Restaurants” category.

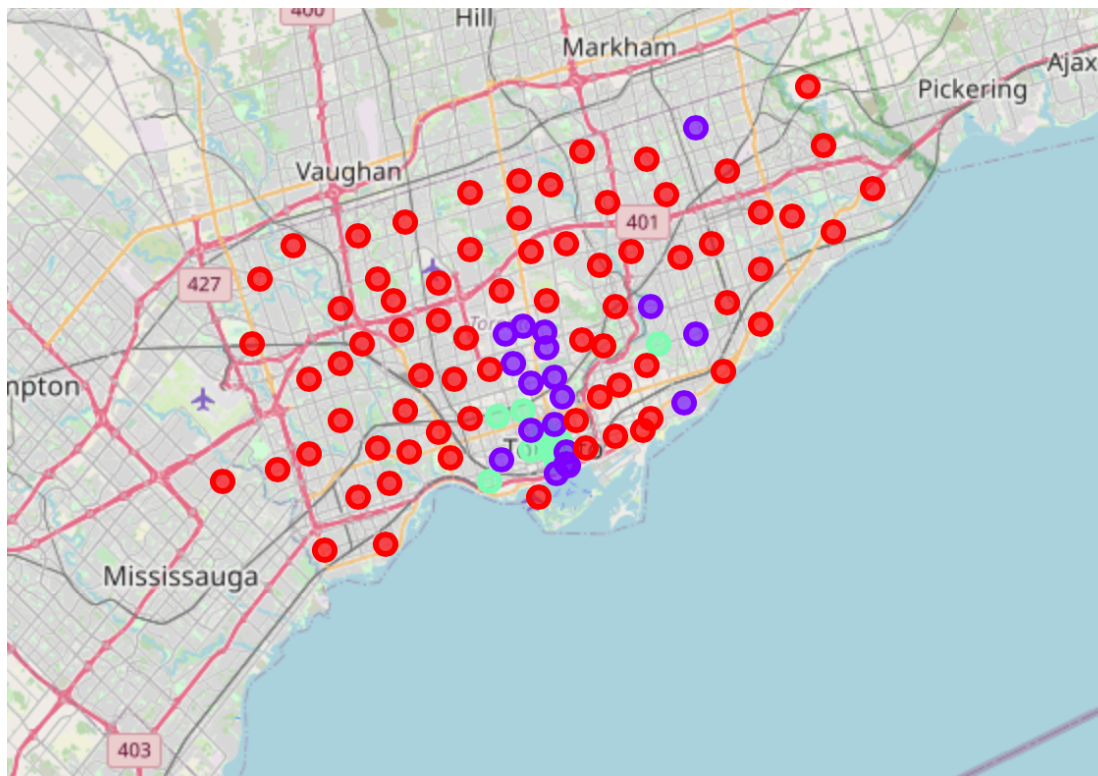
K-means clustering, a popular and simple unsupervised machine learning algorithm suited for grouping data based on their similarities, was used on this data to cluster the neighborhoods into three clusters according to the frequency of occurrence for vegetarian/vegan restaurants in order to help us identify the neighborhoods offer more options for this type of cuisine.

## Results

The three resulting clusters were the following:

Cluster 0	neighborhoods where there aren't any vegetarian/vegan restaurants (red dots on the map).
Cluster 1	neighborhoods with some options of vegetarian/vegan restaurants (purple dots on the map).
Cluster 2	neighborhoods with high concentration of vegetarian/vegan restaurants (aquamarine dots on the map).

Only clusters 1 and 2 have suitable neighborhoods with plant-based (vegetarian/vegan) restaurants options.



Map of clusters

Cluster 1 has nineteen neighborhoods with some vegetarian/vegan restaurants:

Cluster Labels	Neighborhood	Vegetarian / Vegan Restaurant	PostalCode	Borough	Latitude	Longitude
1	Golden Mile, Clairlea, Oakridge	0.011364	M1L	Scarborough	43.711112	-79.284577
1	Victoria Village	0.010417	M4A	North York	43.725882	-79.315572
1	The Beaches	0.010000	M4E	East Toronto	43.676357	-79.293031
1	Roselawn	0.010000	M5N	Central Toronto	43.711695	-79.416936
1	North Toronto West	0.010000	M4R	Central Toronto	43.715383	-79.405678
1	Enclave of M5E	0.010000	M5W	Downtown Toronto Stn A	43.646435	-79.374846
1	Rosedale	0.010000	M4W	Downtown Toronto	43.679563	-79.377529
1	Forest Hill North & West	0.010000	M5P	Central Toronto	43.696948	-79.411307
1	University of Toronto, Harbord	0.010000	M5S	Downtown Toronto	43.662696	-79.400049
1	Summerhill West, Rathnelly, South Hill, Forest...	0.010000	M4V	Central Toronto	43.686412	-79.400049
1	Harbourfront East, Union Station, Toronto Islands	0.010000	M5J	Downtown Toronto	43.640816	-79.381752
1	Church and Wellesley	0.010000	M4Y	Downtown Toronto	43.665860	-79.383160
1	Moore Park, Summerhill East	0.010000	M4T	Central Toronto	43.689574	-79.383160
1	Milliken, Agincourt North, Steeles East, L'Amo...	0.010000	M1V	Scarborough	43.815252	-79.284577
1	Berczy Park	0.010000	M5E	Downtown Toronto	43.644771	-79.373306
1	Davisville North	0.010000	M4P	Central Toronto	43.712751	-79.390197
1	Little Portugal, Trinity	0.010000	M6J	West Toronto	43.647927	-79.419750
1	Davisville	0.010000	M4S	Central Toronto	43.704324	-79.388790
1	St. James Town	0.010000	M5C	Downtown Toronto	43.651494	-79.375418

Cluster 2, the one with higher concentration of vegetarian/vegan restaurants, has twelve neighborhoods with this kind of restaurant:

Cluster Labels	Neighborhood	Vegetarian / Vegan Restaurant	PostalCode	Borough	Latitude	Longitude
2	Christie	0.04	M6G	Downtown Toronto	43.669542	-79.422564
2	Ontario Provincial Government	0.03	M7A	Queen's Park	43.662301	-79.389494
2	Parkview Hill, Woodbine Gardens	0.02	M4B	East York	43.706397	-79.309937
2	The Annex, North Midtown, Yorkville	0.02	M5R	Central Toronto	43.672710	-79.405678
2	Garden District, Ryerson	0.02	M5B	Downtown Toronto	43.657162	-79.378937
2	Toronto Dominion Centre, Design Exchange	0.02	M5K	Downtown Toronto	43.647177	-79.381576
2	First Canadian Place, Underground city	0.02	M5X	Downtown Toronto	43.648429	-79.382280
2	Brockton, Parkdale Village, Exhibition Place	0.02	M6K	West Toronto	43.636847	-79.428191
2	Commerce Court, Victoria Hotel	0.02	M5L	Downtown Toronto	43.648198	-79.379817
2	Kensington Market, Chinatown, Grange Park	0.02	M5T	Downtown Toronto	43.653206	-79.400049
2	Richmond, Adelaide, King	0.02	M5H	Downtown Toronto	43.650571	-79.384568
2	Central Bay Street	0.02	M5G	Downtown Toronto	43.657952	-79.387383

## Discussion

Most neighborhoods with plant-based restaurants are located in Downtown Toronto. And, according to the results, Christie is the neighborhood with more options of vegetarian/vegan restaurants, followed by Ontario Provincial Government.

The fact that most plant-based restaurants are situated around the central area of Toronto is ideal for tourists who are plant-based foodies and also enjoy having many touristic attractions at hand.

## **Conclusion**

By utilizing resources freely available and a simple machine learning algorithm, it was possible to find out interesting information about plant-based restaurant locations in Toronto.

Tourists who like vegetarian/vegan food will certainly have their food restrictions met by choosing one of the plant-based restaurants options available in the neighborhoods around Downtown Toronto, being Christie the neighborhood with more occurrence of this kind of cuisine.