Mapping Toronto in the Context of Vancouver's Neighborhoods

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The Problem

Toronto and Vancouver are two of the largest cities in Canada, It is not uncommon for residents of one of these cities to either travel to the other for vacation or to move to the other city

In order to understand another city, it is beneficial to map it out in reference to a city that you understand much better.

As a resident of Vancouver, it would make sense to me to relate the neighborhoods in Vancouver that I am familiar with to the neighborhoods of Toronto to improve my understanding of the city's layout and which neighborhoods interest me.
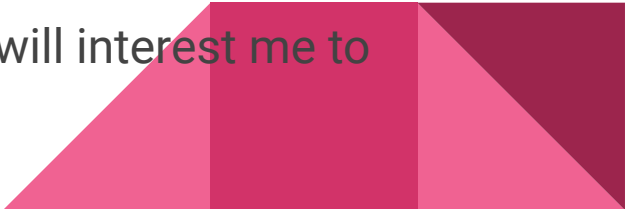
The Solution

Leverage foursquare data and the clustering algorithms to map out Toronto's neighborhoods in the context of how similar they are to the neighborhoods in Vancouver

Create clusters of the different neighborhoods in Vancouver, then map the neighborhoods of Toronto through the model to determine which cluster each borough aligns with

Using this data, I will be able to determine what parts of Vancouver and Toronto are similar to one another and what areas of the Toronto will interest me to investigate further

Data - Geographical Neighborhood Data

There are two primary types of data that will be required for this project:

Geographical data on the different Neighborhoods of Toronto and Vancouver. This must contain coordinated of each neighborhoods. These will be scrapped and formatted from the following web pages. These will be taken from the following pages:

Toronto: https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M

Vancouver: https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_V

Data - Venue Data

The second type of data that will be required is information on the different venues in each neighborhood of the two cities.

This will be retrieved using the Foursquare API. We will take the top 300 venues for each neighborhood.

This data will be one-hot encoded, then aggregated, summed and normalized for each neighborhood to make a distribution of the different types of venues in each neighborhood.

Methodology

We will complete this objective through four steps:

1. Retrieve the coordinate and venue data in all 41 postal code FSAs in Vancouver and 98 in Toronto
2. Train a k-means cluster algorithm with the venue data from the Vancouver neighborhoods to cluster the neighborhoods into 8 categories
3. Use the k-means cluster to algorithm that we developed to categorize the neighborhoods in Toronto
4. Create a distance matrix between all the neighborhoods in each Toronto against all the neighborhoods in Vancouver

Results

Cluster map of the
different neighborhoods

68% pf neighborhoods
belong to one cluster

Neighborhoods of same
clusters are
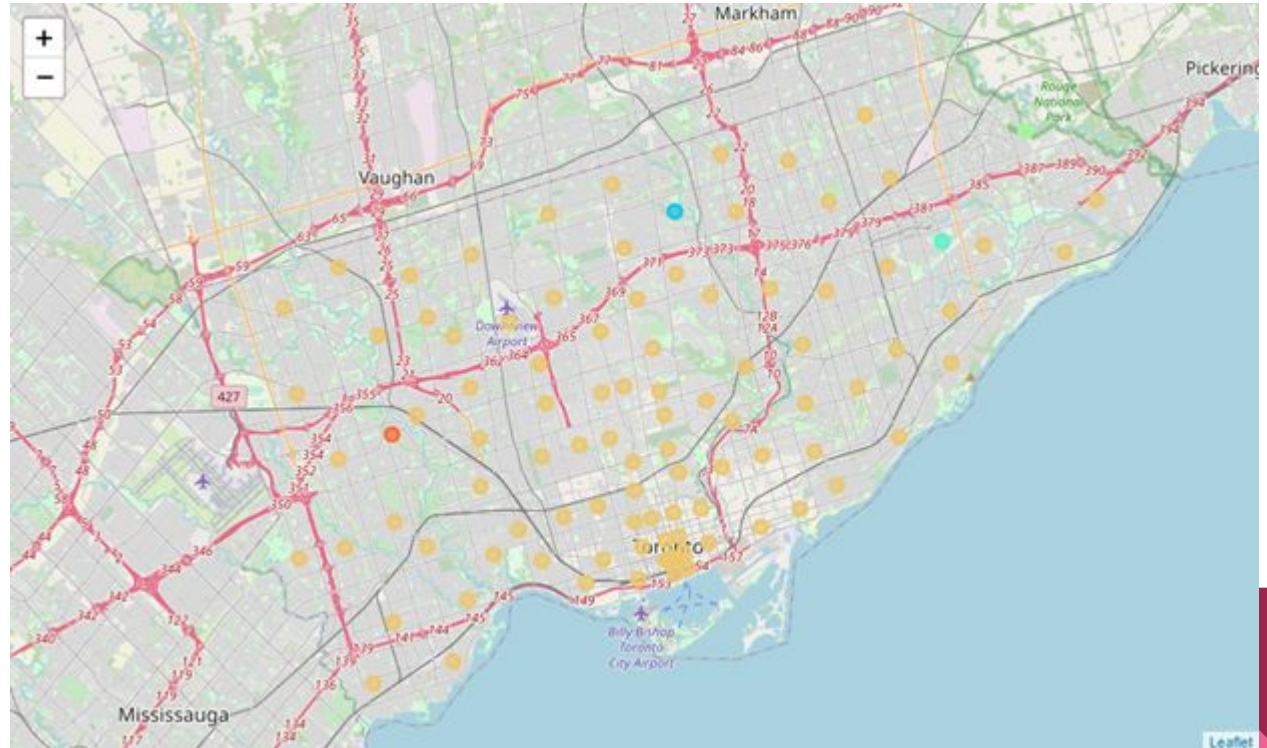geographically close to
each other
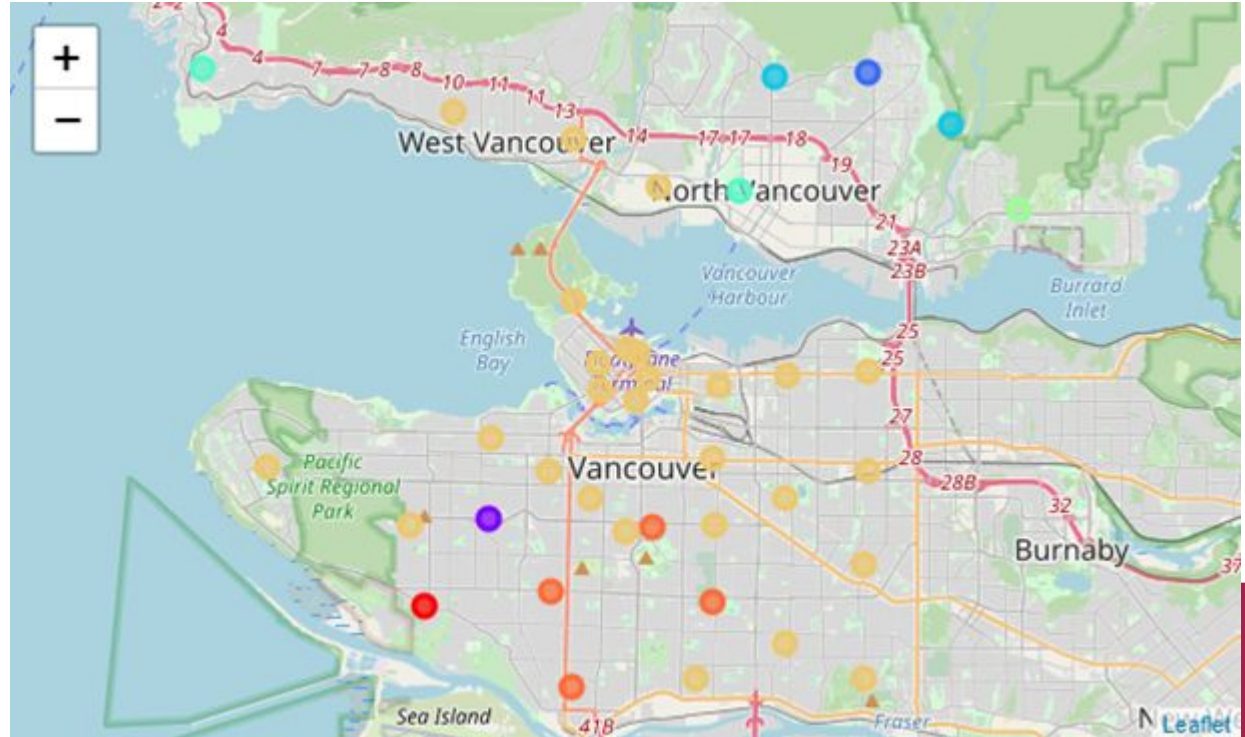
Results

Cluster map of Toronto neighborhoods in terms of the clusters of Vancouver neighborhoods

Most neighborhoods belong to one cluster from Vancouver

We do see 4 cases of neighborhoods in Vancouver aligning to niche clusters of Vancouver neighborhoods

Results

Closest pairings of the distance matrix indicating the pairs of neighborhoods form each city that are most alike. We see that this confirms the results from the first step and adds further detail to the cluster that comprises the majority of neighborhoods

	Vancouver Neighborhood	Toronto Neighborhood	Distance
1571	North Vancouver - Northwest Central	Bayview Village	0.666667
467	Killarney	Steeles West, L'Amoreaux West	0.800000
3220	Waterfront / Coal Harbour / Canada Place	Toronto Dominion Centre, Design Exchange	0.940000
3165	Waterfront / Coal Harbour / Canada Place	First Canadian Place, Underground city	0.980000
3201	Waterfront / Coal Harbour / Canada Place	Richmond, Adelaide, King	0.990000

Discussion

At its highest level, there is a common thread between most neighborhoods in both cities. Of the 40 neighborhoods in Vancouver, 27 fell into the same cluster and when categorizing the 98 neighborhoods in Toronto, 94 fell into this same cluster

We can conclude that many neighborhoods in both cities have a similar composition of venues where they tend to largely contain coffee shops, cafes, green spaces, public transit routes and a variety of restaurants.

Discussion

We are able to see a few unique neighborhoods in Toronto that align with unique areas of Vancouver. In some cases we can see a similarity to a cluster of neighborhoods or directly to a neighborhood.

The following were cases of niche neighborhoods in unusual clusters:

Westmount in Toronto was placed in cluster 7

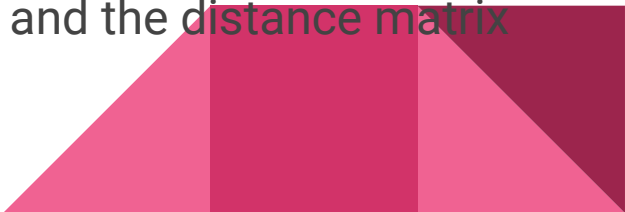The Malvern, Rouge Neighborhood in Toronto was placed in cluster 5

The Cedarbrae neighborhood in Toronto was placed in cluster 4

Discussion

After reviewing the 5 most similar pair of neighbourhoods we can draw a number of conclusions

The North Vancouver - Northwest Central neighborhood in Vancouver and the Bayview Village neighborhood in Toronto were found to be the most similar to one another. They were also both categorized in the same niche cluster. We can see the that they have a number of commonalities, specifically the large portion of Yoga studios, Schools, Eastern European restaurants, Trails, Electronic Shops and Parks. This is an excellent case of both the cluster model and the distance matrix finding two communities that have much in common

Discussion

The Killarney neighborhood in Vancouver and the Steeles West, L'Amoreaux West in Toronto. They both have a commonly high proportion of fast food restaurants, Chinese restaurants, and coffee shops.

Discussion

The next three closest pairings were the Waterfront / Coal Harbour / Canada Place neighborhood in Vancouver to the Toronto Dominion Centre, Design Exchange neighborhood, the First Canadian Place, Underground city neighborhood and the Richmond, Adelaide, King neighborhood in Toronto.

We can conclude that their common link between these four neighborhoods is that they serve as the central areas in their respective cities for commerce. We can see that in cases there is a large overlap in common venues including coffee shops, hotels and more North American style restaurants.

Conclusion

There is a commonality that links many neighborhoods in both cities,

There are certain niche neighborhoods that are distinct from others in their city and yet are similar to a neighborhood in the other city

These are neighborhoods have substantial range and are filled with nature, recreation, multicultural influence or serve as large hubs for the cities thriving business sector

As a future extension of this project, I think it would be insightful to run a second iteration of this process only using the neighborhoods from Vancouver that were placed in cluster 6