



# IBM Data Science

## Applied Data Science

### Capstone

## Final Report

„Comparing the neighborhoods of New York & Toronto by clustering and segmenting geographical data”

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## **Introduction:**

The purpose of this Project is to help people in exploring better facilities around their neighborhood. It will help people make smart and efficient decisions on selecting great neighborhoods out of numbers of other neighborhoods in Scarborough, Toronto.

This Project aims to create an analysis of features for people migrating to Toronto to find the best neighborhood as a comparative analysis between neighborhoods. The features include median housing price and better school according to ratings, crime rates of that particular area, road connectivity, weather conditions, good management for emergency, water resources both fresh and waste water and excrement conveyed in sewers and recreational facilities.

## **Problem Which Tried to Solve:**

The major purpose of this project, is to suggest a better neighborhood in a new city for the person who is moving there.

1. Sorted list of houses in terms of housing prices in an ascending or descending order
2. Sorted list of schools in terms of location, fees, rating and reviews

## **Foursquare API:**

This project would use Four-square API as its prime data gathering source as it has a database of millions of places, especially their places API which provides the ability to perform location search, location sharing and details about a business.

## **Clustering Approach:**

To compare the similarities of two cities, we decided to explore neighborhoods, segment them, and group them into clusters to find similar neighborhoods in a big city like New York and Toronto. To be able to do that, we need to cluster data which is a form of unsupervised machine learning: k-means clustering algorithm

## **Libraries Which are Used to Develop the Project:**

- Pandas: For creating and manipulating dataframes.
- Folium: Python visualization library would be used to visualize the neighborhoods cluster distribution of using interactive leaflet map.
- Scikit Learn: For importing k-means clustering.
- JSON: Library to handle JSON files.
- XML: To separate data from presentation and XML stores data in plain text format.
- Geocoder: To retrieve Location Data.
- Beautiful Soup and Requests: To scrap and library to handle http requests.
- Matplotlib: Python Plotting Module

## **Data Description:**

I will use the Scarborough dataset which we scrapped from wikipedia on Week 3. Dataset consisting of latitude and longitude, zip codes.

### **Foursquare API Data:**

We will need data about different venues in different neighborhoods of that specific borough. In order to gain that information we will use "Foursquare" locational information. Foursquare is a location data provider with information about all venues and events within an area of interest. Such information includes venue names, locations, menus and even photos. As such, the foursquare location platform will be used as the sole data source since all the stated required information can be obtained through the API.

After finding the list of neighborhoods, we then connect to the Foursquare API to gather information about venues inside each and every neighborhood. For each neighborhood, we have chosen the radius to be 100 meter.

The data retrieved from Foursquare contained information of venues within a specified distance of the longitude and latitude of the postcodes. The information obtained per venue as follows:

1. Neighborhood
2. Neighborhood Latitude
3. Neighborhood Longitude
4. Venue
5. Name of the venue e.g. the name of a store or restaurant
6. Venue Latitude
7. Venue Longitude
8. Venue Category

## **Methodology:**

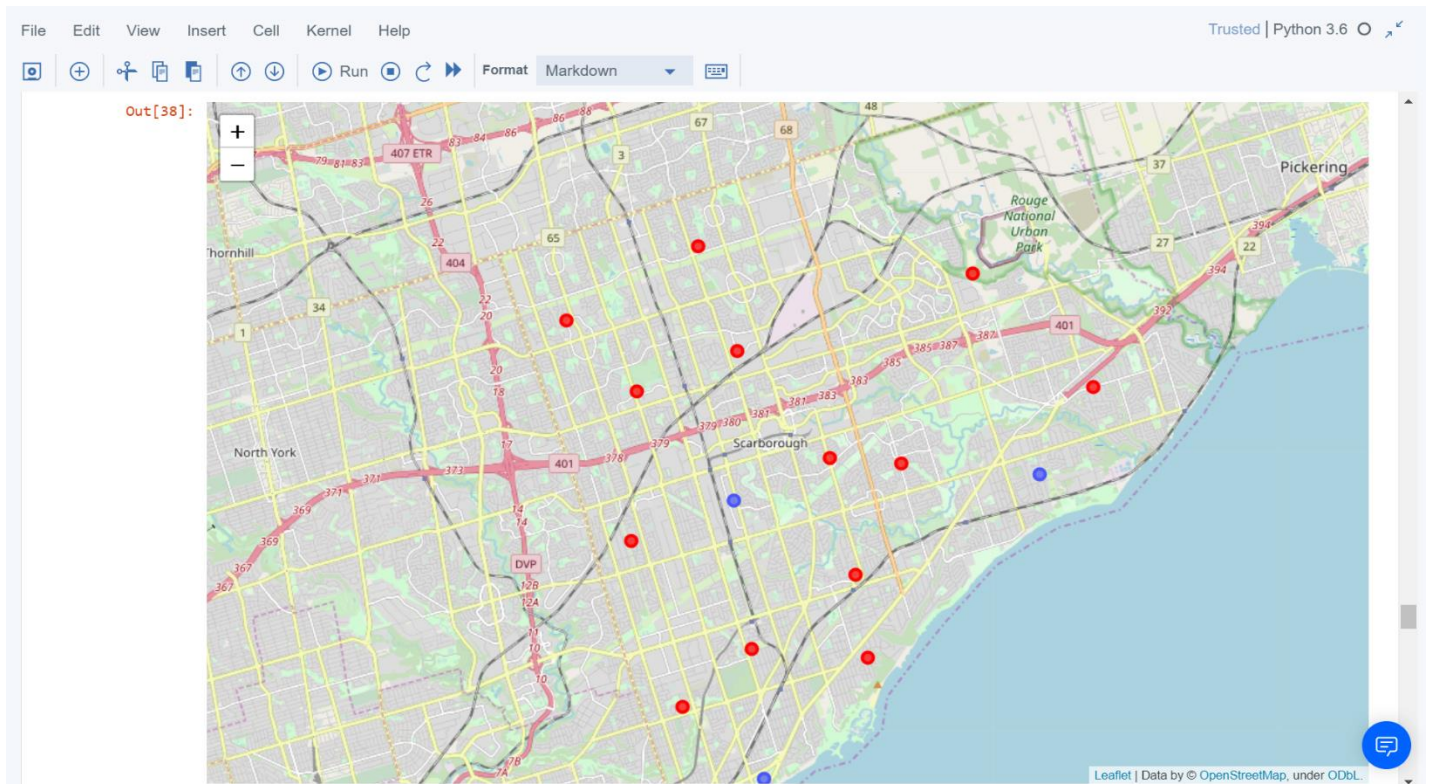
### **Clustering Approach:**

To compare the similarities of two cities, we decided to explore neighborhoods, segment them, and group them into clusters to find similar neighborhoods in a big city like New York and Toronto. To be able to do that, we need to cluster data which is a form of unsupervised machine learning: k-means clustering algorithm. Using credentials of Foursquare API features of near-by places of the neighborhoods would

be mined. Due to http request limitations the number of places per neighborhood parameter would reasonably be set to 100 and the radius parameter would be set to 500.

## Results:

### Map of Clusters:



## Discussion:

The major purpose of this project was to suggest a better neighborhood in a new city for the person who is moving there. Taking into account social presence in society in terms of like minded people, connectivity to the airport, bus stand, city center, markets and other daily needs things nearby.

By clustering the data using k means clustering and displaying similar neighborhoods throughout Toronto, this task has been met. You could spin this idea even further and go on to compare house prices and other expenses in these areas to find the best suited neighborhood but that was not in the scope of this project.

## **Conclusion:**

In this project, using k-means cluster algorithm I separated the neighborhood into 10(Ten) different clusters and for 103 different latitude and longitude from dataset, which have very-similar neighborhoods around them. Using the folium map these clusters are displayed nicely with their geographical data in Toronto.

Having reached the end of this course, I would like to thank coursera and IBM for creating this really interesting opportunity to gain a professional certificate in Data Science. Even though I will not become a Data Scientist in the near future, the skills I have learned in this course will improve my problem solving in my current job.

Even though this course was very intense at times, it was always fun and interesting and I am certain to take another one soon, probably in the field of Artificial Intelligence.