Project to Find the Optimal Number of the Toronto Financial Security Centers (TFSCs)

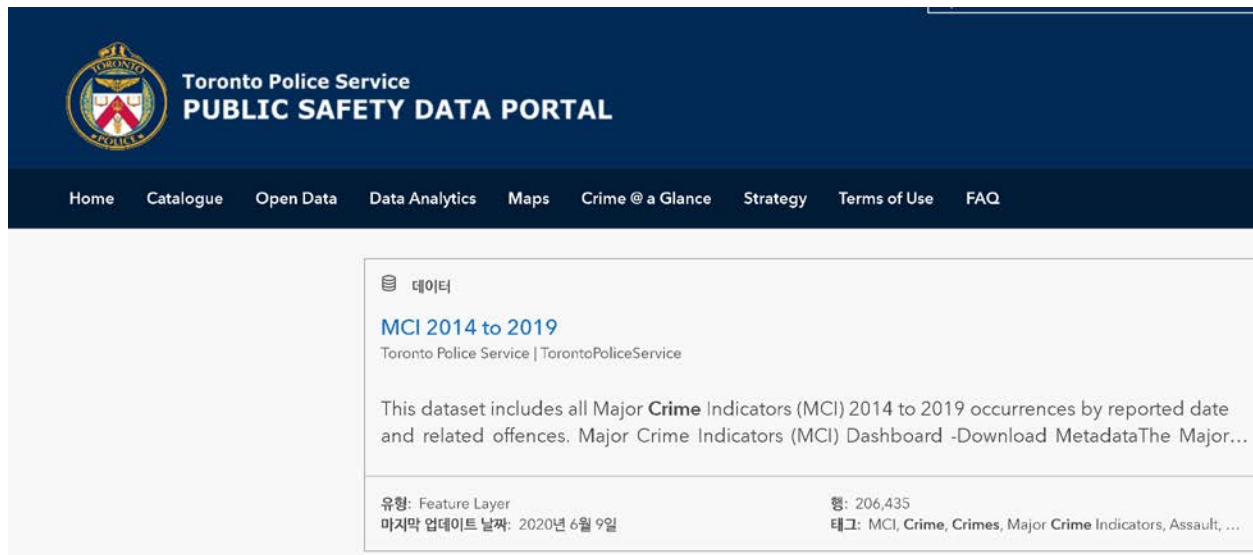21 July 2020

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Introduction

- There are around 107 robberies on average in financial firms in Toronto per year.

- **(Assumption)** The Canadian Bankers Association (CBA) decides to lower the number of bank robberies as 50% of the current average level until 2025.
  - CBA will support to establish a Toronto Financial Security Center (TFSC).
  - Main Goal of this Project:

> *Find the Optimal Number of TFSCs*
> *by the Clustering Analysis*

Data

- Robbery in Financial Institution
  - Major Crime Indicators (MCI) database

  - From the MCI data, it is possible to extract cases of the bank robbery in Toronto.
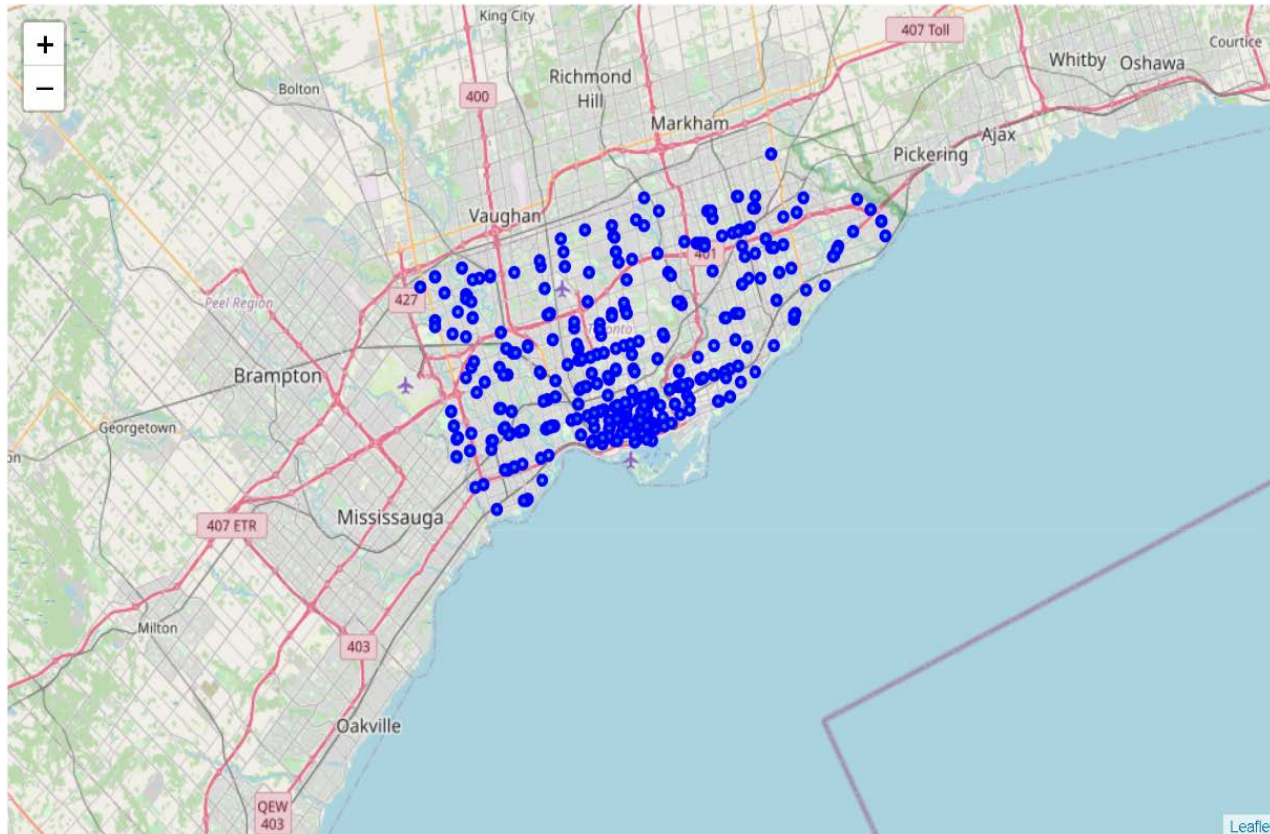
Data (*continued*)

- Bank Location in Toronto
  - Foursquare API
  - It is necessary to make a dataframe having latitude and longitude coordinates based on the postal codes, including each borough and neighborhood in Toronto.
  - It is necessary to extract the bank location information and make a new dataframe from the exploration of every searched venue in Toronto.

Location Information of Banks in Toronto (*First Five Rows*)

	Postal Code	Borough	Neighbourhood	Latitude	Longitude	Bank
47	M5A	Downtown Toronto	Regent Park, Harbourfront	43.654260	-79.360636	1
84	M7A	Downtown Toronto	Queen's Park, Ontario Provincial Government	43.662301	-79.389494	1
154	M4B	East York	Parkview Hill, Woodbine Gardens	43.706397	-79.309937	1
225	M5B	Downtown Toronto	Garden District, Ryerson	43.657162	-79.378937	1
375	M1E	Scarborough	Guildwood, Morningside, West Hill	43.763573	-79.188711	1

Methodology

- **Location Clustering of the Robbery in Financial Institutions in Toronto**
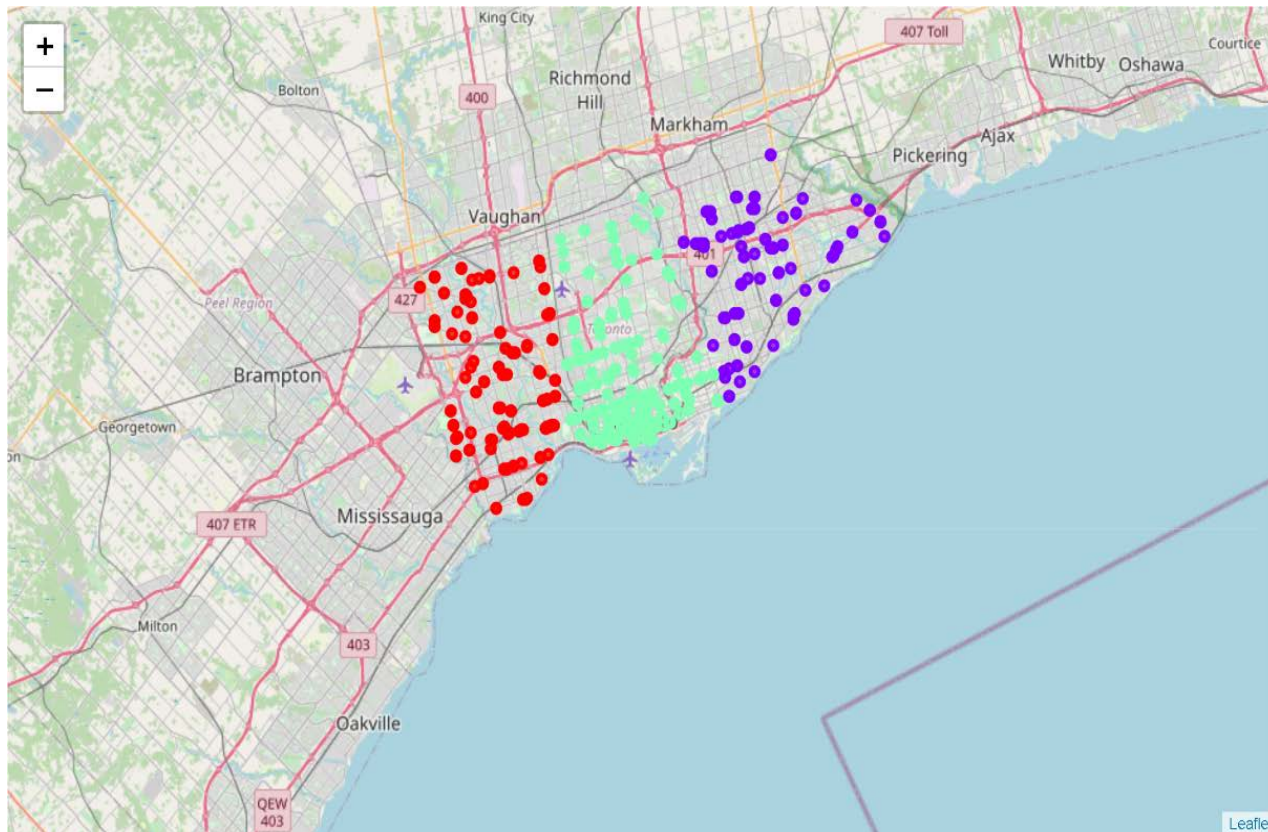
Robbery in Financial Institutions in Toronto (2014-19)

Methodology (*continued*)

▪ **Location Clustering of the Robbery in Financial Institutions in Toronto**

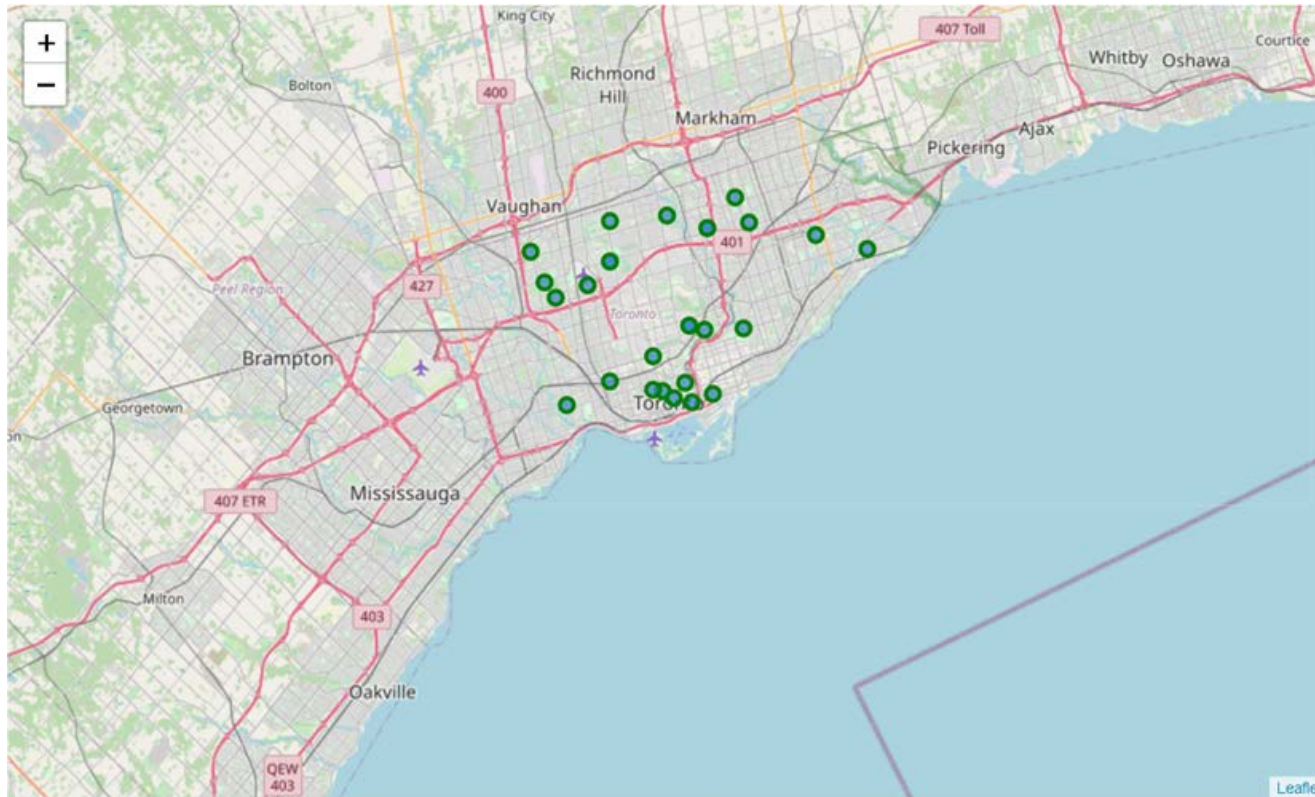**Cluster Map of the Robbery in Financial Institutions in Toronto**

(*According to the elbow method, the optimal number of clusters is three.*)

Methodology (*continued*)

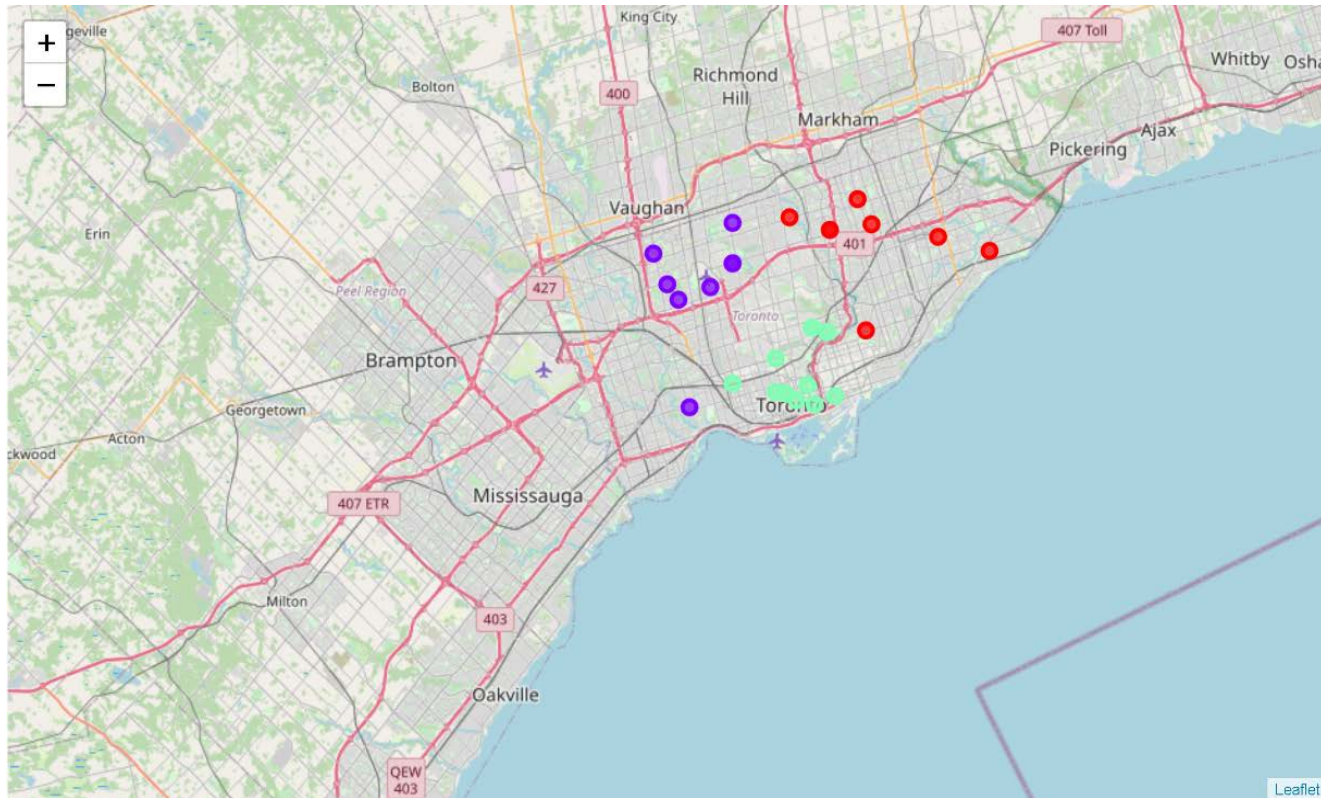- **Location Clustering of the Banks in Toronto**

Banks in Toronto

Methodology (*continued*)

- **Location Clustering of the Banks in Toronto**

Cluster Map of the Banks in Toronto

(*According to the elbow method, the optimal number of clusters is three.*)

Result and Discussion

- There are three clusters in bank robberies and bank locations in Toronto.

- This implies that at least three TFSCs in Toronto need to be established if there let be one TFSC in each cluster.

- The detailed location of each TFSC can simply be the centroid of each cluster. However, it is necessary to regard more factors:
  - Transportation, Population,
  - Existing Public Security Enforcement (e.g., Police Stations)
  - Incompleteness of Foursquare Database for Bank Locations

Conclusion

- It can be necessary to have three TFSC in Toronto, given that there are three clusters both in bank locations and robbery cases in financial institutions.