# OPPORTUNITY FOR CAR RENTAL BUSINESS

## DATA SECTION

For this project, we require to analyze the neighborhoods of Mississauga city. Various authorities including governmental organizations, municipality reports, private businesses, academic researchers have divided the city of Mississauga into 22 Neighborhoods. Neighborhoods are subdivided into smaller neighborhoods and are associated with postal codes (Figure 1).



**Figure 1. showing the Map of Mississauga and the division of its neighborhoods. Boundaries of cities are marked with bold black outlines. Neighborhood boundaries are marked with black outlines. Major highways are shown in gray color. The map is sourced from Bissonnette *et al.* (2012).**

## 2.1. Postal codes

Using postal codes to analyze a particular location in a city is one of the reliable ways as it is the standard division of a city. Each postal code comprises a neighborhood or a group of neighborhoods. Below is a map of Mississauga and its neighboring cities showing postal code division (Figure 2).

It is also feasible to access the location data using the postal code of an area, therefore Mississauga's postal codes were used to extract location coordinates of neighborhoods.
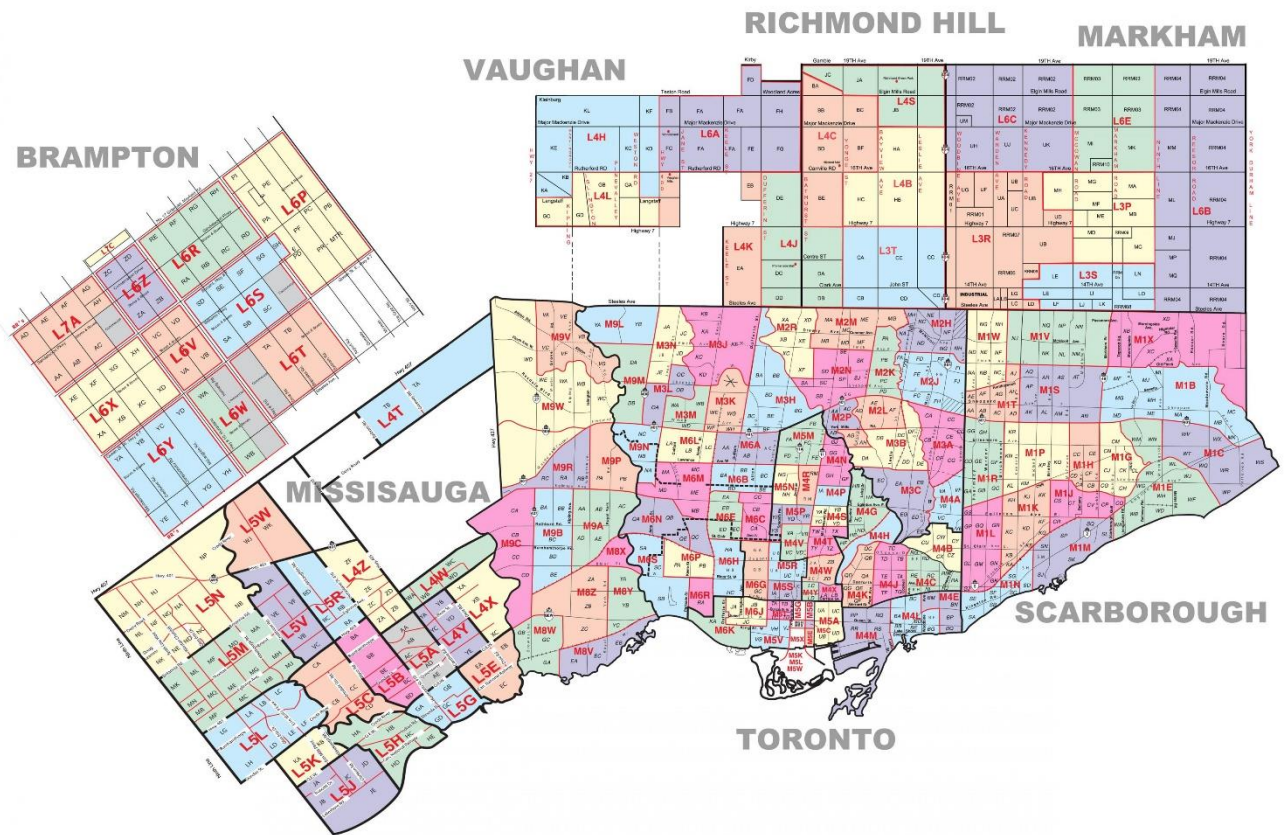


**Figure 2. showing the Map of Mississauga and neighboring cities with the postal code division. Each postal code is color-coded. The map is retrieved from https://maps-mississauga.com/mississauga-postal-code-map.**

Based on the project's business requirements, Mississauga City was examined according to its neighborhoods as defined by the postal code. Using postal code is the most reliable way to divide the city and it is also helpful in combining nearby neighborhoods provided that they have similar demographics.

## 2.2. Analytical Approach – Clustering Model

Considering the business problem as identified in business understanding and literature review, the unsupervised machine learning approach is used for the available data. Understanding Mississauga's neighborhoods according to the number of rental car companies requires clustering analysis. Clustering will identify associations among various neighborhoods resulting in distinguishing areas of the low and high number of rental companies.

## 2.3. Data Requirements and Collection

The following data was acquired for the analysis:
1) Postal code list of Mississauga City with associated neighborhoods
2) Coordinates of each postal code

The data was required in a table format, however, there was various sort of postal code lists available on the internet with the inconsistent dataset. Therefore, this analysis collected the data from the website "https://postal-codes.cybo.com/canada/mississauga/" to gather the postal code numbers, associated neighborhoods, and their coordinates (Table 1). The coordinates were also confirmed by google maps.

The collected data was transferred to the excel sheet and saved as a comma-delimited file to use directly in a Jupiter notebook.

| | Postal Code | Neighborhood | Latitude | Longitude |
|---|---|---|---|---|
| 0 | L4Y | West Applewood, West Dixie, NW Lakeview | 43.607600 | -79.59970 |
| 1 | L5M | Churchill Meadows, Central Erin Mills, South S... | 43.561800 | -79.72320 |
| 2 | L4X | East Applewood, East Dixie, NE Lakeview | 43.618838 | -79.58343 |
| 3 | L5A | Mississauga Valleys, East Cooksville | 43.589600 | -79.61090 |
| 4 | L5E | Central Lakeview | 43.585500 | -79.56600 |
| 5 | L5B | West Cooksville, Fairview, City Centre, East C... | 43.582100 | -79.63340 |
| 6 | L5G | SW Lakeview, Mineola, East Port Credit | 43.567500 | -79.57720 |
| 7 | L4W | Matheson, East Rathwood | 43.647600 | -79.62210 |
| 8 | L4Z | West Rathwood, East Hurontario, SE Gateway | 43.622200 | -79.65580 |
| 9 | L5R | West Hurontario, SW Gateway | 43.614800 | -79.67830 |
| 10 | L5C | West Creditview, Mavis, Erindale | 43.564100 | -79.64460 |
| 11 | L5H | West Port Credit, Lorne Park, East Sheridan | 43.542000 | -79.61090 |
| 12 | L5T | Courtney Park, East Gateway | 43.651700 | -79.66710 |
| 13 | L5V | East Credit | 43.596800 | -79.68950 |
| 14 | L5J | Clarkson | 43.506000 | -79.63340 |
| 15 | L5N | Lisgar, Meadowvale | 43.588100 | -79.75120 |
| 16 | L4T | Malton | 43.716100 | -79.64460 |
| 17 | L5W | Meadowvale Village | 43.636800 | -79.71190 |
| 18 | L5K | Clarkson, Erin Mills | 43.525500 | -79.66420 |
| 19 | L5L | Erin Mills | 43.543900 | -79.68390 |
| 20 | L5P | Toronto Pearson International Airport | 43.690400 | -79.62380 |
| 21 | L5S | Etobicoke, Malton, Streetsville, Toronto Pears... | 43.689700 | -79.66710 |
| 22 | L4V | Etobicoke, Malton, Toronto Pearson Internation... | 43.689700 | -79.66710 |

**Table 1. showing postal codes, neighborhoods, and coordinates of Mississauga city.**

## 2.4.  Data Understanding and Preparation

To assess the data, various libraries including Pandas, NumPy, Folium, Matplotlib, and Geopy with Nominatim was imported. The following procedure was pursued:

- The data was loaded in a table format and columns of postal code, coordinates, and neighborhoods were sorted. Irrelevant data was dropped (Table 1).
- Using Nominatim, the location of Mississauga was retrieved.
- To assess the geographical boundaries and extents of the neighborhoods, the postal zones of Mississauga were displayed on a map using the Folium library (Figure 3).
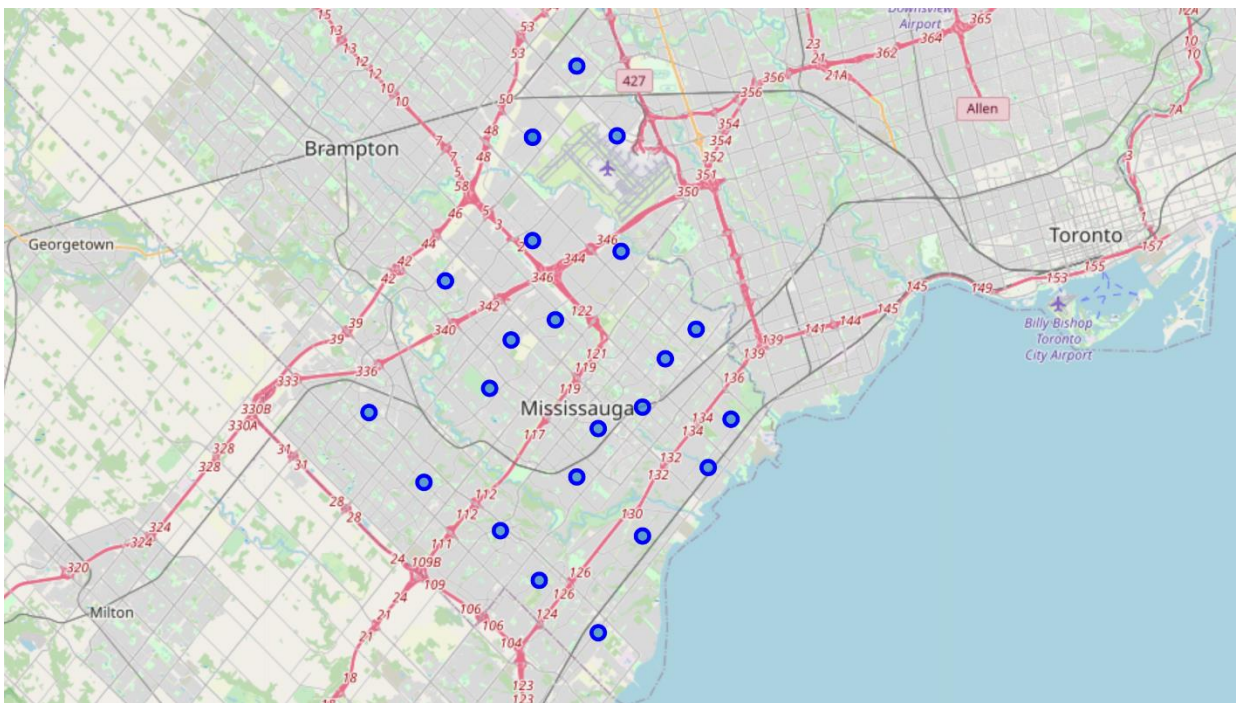


**Figure 3. showing the Map of Mississauga with superimposed postal code locations in blue circles.**

- To find out the rental companies across Mississauga City, we required a location provider. For this purpose, this analysis used the **Foursquare location provider**. Foursquare requires the user to create an API id and password through which the users can retrieve data about nearby venues, specific venues by their name, provided that the

user enters a specific location. In our analysis, we entered query for venue "rental car", within the surrounding of 10km in each neighborhood.

The Foursquare API resulted in 881 rental car companies including automotive shops in Mississauga City. This dataset needs to be in groups according to the postal codes to examine the density of rental companies in each neighborhood area. Therefore, the data is sorted accordingly with a table showing the total number of rental companies in each neighborhood.