

# capstone\_project\_final

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# Capstone Project - The Battle of Neighborhoods (Week 2)

## 0.0.1 Applied Data Science Capstone by IBM/Coursera

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## 0.2 Introduction: Business Problem

Toronto is the provincial capital of Ontario and the most populous city in Canada. Toronto is an international centre of business, finance, arts, and culture, and is recognized as one of the most multicultural and cosmopolitan cities in the world. The diverse population of Toronto reflects its current and historical role as an important destination for immigrants to Canada. More than 50 percent of residents belong to a visible minority population group, and over 200 distinct ethnic origins are represented among its inhabitants. While the majority of Torontonians speak English as their primary language, over 160 languages are spoken in the city. The insights derived from analysis will give good understanding of the business environment which help in strategically targeting the market. This will help in reduction of risk of starting a new business. And the Return on Investment will be reasonable.

## 0.3 Business Problem

The cuisine of Toronto reflects Toronto's size and multicultural diversity. Let's say one of my friends, Lily, wants to open a sushi restaurant in Toront. Starting a sushi restaurant can be a great business opportunity. New sushi bar should be open in an area that inadequate neighborhood in this way the bar can attract more customers. Therefore, this analysis necessary to ensure that we have enough customers and that we are not so close to other sushi places.

## 0.4 Data

Neighborhood has a total of 10 boroughs and 103 neighborhoods. In order to segment the neighborhoods and explore them, we will essentially need a dataset that contains the 5 boroughs and

the neighborhoods that exist in each borough as well as the the latitude and logitude coordinates of each neighborhood. The data is from our week3 assignment, I will export the data as csv file for future analysis.

Now once we got the neighborhood's latitude and longitude, let's use Foursquare Location to get the Mission District Neighborhood's all restaurant details. The restaurant details can be retrieved using search endpoint. For our project we need only Sushi restaurant data, and in search endpoint there is a attribute called category id, i.e for each category(like Indian or Italian or Mexican Restaurant) foursquare has a defined categoryid which will help us to get the desired data. Sushi category Id 4bf58dd8d48988d1d2941735 is used for retrieving data from Foursquare API.

## 0.5 Analysis

### 0.5.1 Import Libraries

In this section we import the libraries that will be required to process the data.

The first library is Pandas. Pandas is an open source, BSD-licensed library, providing high-performance, easy-to-use data structures and data analysis tools for the Python programming language.

```
[3]: pip install beautifulsoup4
```

```
Collecting beautifulsoup4
```

```
  Downloading https://files.pythonhosted.org/packages/e8/b5/7bb03a696f2c9b7af792a8f51b82974e51c268f15e925fc834876a4efa0b/beautifulsoup4-4.9.0-py3-none-any.whl (109kB)
```

```
|                                     | 112kB 10.5MB/s eta 0:00:01
```

```
Collecting soupsieve>1.2 (from beautifulsoup4)
```

```
  Downloading https://files.pythonhosted.org/packages/05/cf/ea245e52f55823f19992447b008bcb7f78efc5960d77f6c34b5b45b36dd/soupsieve-2.0-py2.py3-none-any.whl
```

```
Installing collected packages: soupsieve, beautifulsoup4
```

```
Successfully installed beautifulsoup4-4.9.0 soupsieve-2.0
```

```
Note: you may need to restart the kernel to use updated packages.
```

```
[4]: import numpy as np
import pandas as pd
pd.set_option('display.max_columns', None)
pd.set_option('display.max_rows', None)

!conda install -c conda-forge geopy --yes
from geopy.geocoders import Nominatim
import urllib.request
import json
from bs4 import BeautifulSoup
from urllib.request import urlopen
import requests
from pandas.io.json import json_normalize
```

```

import matplotlib.cm as cm
import matplotlib.colors as colors
# Matplotlib and associated plotting modules
import matplotlib.cm as cm
import matplotlib.pyplot as plt
import matplotlib.colors as colors
%matplotlib inline
from sklearn.cluster import KMeans

#!conda install -c conda-forge folium=0.5.0 --yes
import folium

print('Libraries imported.')

```

Collecting package metadata (current\_repodata.json): done  
Solving environment: done

# All requested packages already installed.

Libraries imported.

**Tranform the data into a *pandas* dataframe** Download and Explore Dataset Neighborhood has a total of 10 boroughs and 103 neighborhoods. In order to segment the neighborhoods and explore them, we will essentially need a dataset that contains the 5 boroughs and the neighborhoods that exist in each borough as well as the the latitude and logitude coordinates of each neighborhood.

This is the assignment for capstone week3 projects. For convenience, we load the cleaned data directly from week3 results. So let's go ahead and do that.

```

[5]: data = pd.read_csv("Toront data.csv",header=0,index_col=0)

print('Data downloaded!')

data.head(5)

```

Data downloaded!

```

[5]:
  Postcode  Borough  Neighbourhood  Latitude  \
0      M1B  Scarborough  Malvern, Rouge  43.806686
1      M1C  Scarborough  Rouge Hill, Port Union, Highland Creek  43.784535
2      M1E  Scarborough  Guildwood, Morningside, West Hill  43.763573
3      M1G  Scarborough  Woburn  43.770992
4      M1H  Scarborough  Cedarbrae  43.773136

  Longitude
0 -79.194353
1 -79.160497
2 -79.188711

```

```
3 -79.216917
4 -79.239476
```

Use geopy library to get the latitude and longitude values of Toronto City. In order to define an instance of the geocoder, we need to define a user\_agent. We will name our agent ny\_explorer, as shown below.

```
[6]: address = 'Toronto, CA'

geolocator = Nominatim(user_agent="explorer")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geograpical coordinate of Toronto are {}, {}.'.format(latitude, longitude))
```

The geograpical coordinate of Toronto are 43.6534817, -79.3839347.

Create a map of Toronto with neighborhoods superimposed on top.

```
[7]: import folium
# create map of New York using latitude and longitude values
map_toronto = folium.Map(location=[latitude, longitude], zoom_start=10)

# add markers to map
for lat, lng, borough, Neighbourhood in zip(data['Latitude'], data['Longitude'], data['Borough'], data['Neighbourhood']):
    label = '{} , {}'.format(Neighbourhood, borough)
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=label,
        color='blue',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_toronto)

map_toronto
```

```
[7]: <folium.folium.Map at 0x7fc35be63cc0>
```

## 0.6 Foursquare venues

```
[8]: import urllib
def getNearbyVenues(names, latitudes, longitudes, radius=5000, categoryIds=''):
    try:
        venues_list=[]
        for name, lat, lng in zip(names, latitudes, longitudes):
            #print(name)

            # create the API request URL
            url = 'https://api.foursquare.com/v2/venues/search?
            ↪&client_id={}&client_secret={}&v={}&ll={},{}&radius={}&limit={}'.
            ↪format(CLIENT_ID, CLIENT_SECRET, VERSION, lat, lng, radius, LIMIT)

            if (categoryIds != ''):
                url = url + '&categoryId={}'
                url = url.format(categoryIds)

            # make the GET request
            response = requests.get(url).json()
            results = response["response"]['venues']

            # return only relevant information for each nearby venue
            for v in results:
                success = False
                try:
                    category = v['categories'][0]['name']
                    success = True
                except:
                    pass

                if success:
                    venues_list.append([(
                        name,
                        lat,
                        lng,
                        v['name'],
                        v['location']['lat'],
                        v['location']['lng'],
                        v['categories'][0]['name']
                    )])

        nearby_venues = pd.DataFrame([item for venue_list in venues_list for
        ↪item in venue_list])
        nearby_venues.columns = ['Neighbourhood',
                                'Neighbourhood Latitude',
                                'Neighbourhood Longitude',
```

```

        'Venue',
        'Venue Latitude',
        'Venue Longitude',
        'Venue Category']

    except:
        print(url)
        print(response)
        print(results)
        print(nearby_venues)

    return(nearby_venues)

```

```

[9]: LIMIT = 500
    radius = 5000
    CLIENT_ID = 'ZMHWBS0SR12Z3YDYVHJVTZPRK3U1ZP3I2TYQAJ5CU3JUHMB5'
    CLIENT_SECRET = 'H3TT0XT3P5TIAFCV1Y2UUVLF42N44DICNKLUELK34H2TKLFR'
    VERSION = '20181020'

```

```

[10]: #https://developer.foursquare.com/docs/resources/categories
    #Sushi = 4bf58dd8d48988d1d2941735
    Toronto_venues_sushi = getNearbyVenues(names=data['Neighbourhood'],
    ↪latitudes=data['Latitude'], longitudes=data['Longitude'], radius=1000,
    ↪categoryIds='4bf58dd8d48988d1d2941735')
    Toronto_venues_sushi.head()

```

```

[10]:

```

	Neighbourhood	Neighbourhood	Latitude	\
0	Cedarbrae		43.773136	
1	Cedarbrae		43.773136	
2	Kennedy Park, Ionview, East Birchmount Park		43.727929	
3	Dorset Park, Wexford Heights, Scarborough Town...		43.757410	
4	Agincourt		43.794200	

  

	Neighbourhood	Longitude	Venue	Venue Latitude	Venue Longitude	\
0		-79.239476	H0 Sushi Express	43.780965	-79.247445	
1		-79.239476	Fukuoka Sushi	43.780679	-79.247320	
2		-79.262029	Ikki sushi	43.733489	-79.257644	
3		-79.273304	Shiro Sushi	43.756228	-79.266965	
4		-79.262029	Sushi Legend	43.796602	-79.270292	

  

	Venue Category
0	Sushi Restaurant
1	Sushi Restaurant
2	Sushi Restaurant
3	Japanese Restaurant
4	Sushi Restaurant

```
[11]: Toronto_venues_sushi.to_csv("Toronto_venues_sushi.csv")
```

```
[12]: Toronto_venues_sushi.shape
```

```
[12]: (778, 7)
```

```
[13]: def addToMap(df, color, existingMap):
      for lat, lng, local, venue, venueCat in zip(df['Venue Latitude'], df['Venue_
      ↳Longitude'], df['Neighbourhood'], df['Venue'], df['Venue Category']):
          label = '{} ({} - {})'.format(venue, venueCat, local)
          label = folium.Popup(label, parse_html=True)
          folium.CircleMarker(
              [lat, lng],
              radius=5,
              popup=label,
              color=color,
              fill=True,
              fill_color=color,
              fill_opacity=0.7).add_to(existingMap)
```

```
[14]: map_toronto_sushi = folium.Map(location=[latitude, longitude], zoom_start=10)
      addToMap(Toronto_venues_sushi, 'red', map_toronto_sushi)

      map_toronto_sushi
```

```
[14]: <folium.folium.Map at 0x7fc35a3de080>
```

```
[15]: def addColumn(startDf, columnTitle, dataDf):
      grouped = dataDf.groupby('Neighborhood').count()

      for n in startDf['Neighborhood']:
          try:
              startDf.loc[startDf['Neighborhood'] == n, columnTitle] = grouped.
              ↳loc[n, 'Venue']
          except:
              startDf.loc[startDf['Neighborhood'] == n, columnTitle] = 0
```

```
[16]: toronto_grouped = Toronto_venues_sushi.groupby('Neighbourhood').count()

      print('There are {} uniques categories.'.format(len(Toronto_venues_sushi['Venue_
      ↳Category'].unique()))

      toronto_grouped
```

There are 10 uniques categories.

[16]:

Neighbourhood Latitude \

Neighbourhood	
Agincourt	1
Bathurst Manor, Wilson Heights, Downsview North	1
Bayview Village	2
Bedford Park, Lawrence Manor East	4
Berczy Park	30
Brockton, Parkdale Village, Exhibition Place	3
Business reply mail Processing CentrE	3
CN Tower, King and Spadina, Railway Lands, Harb...	1
Canada Post Gateway Processing Centre	2
Cedarbrae	2
Central Bay Street	49
Christie	1
Church and Wellesley	32
Clarks Corners, Tam O'Shanter, Sullivan	2
Commerce Court, Victoria Hotel	50
Davisville	11
Davisville North	7
Del Ray, Mount Dennis, Keelsdale and Silverthorn	1
Don Mills	6
Dorset Park, Wexford Heights, Scarborough Town ...	1
Dufferin, Dovercourt Village	5
East Toronto	4
Fairview, Henry Farm, Oriole	5
First Canadian Place, Underground city	50
Forest Hill North & West	6
Garden District, Ryerson	44
Glencairn	2
Harbourfront East, Union Station, Toronto Islands	30
High Park, The Junction South	6
Hillcrest Village	1
Humewood-Cedarvale	3
India Bazaar, The Beaches West	1
Kennedy Park, Ionview, East Birchmount Park	1
Kensington Market, Chinatown, Grange Park	23
Lawrence Manor, Lawrence Heights	3
Lawrence Park	2
Leaside	6
Little Portugal, Trinity	10
Milliken, Agincourt North, Steeles East, L'Amor...	1
Mimico NW, The Queensway West, South of Bloor, ...	4
Moore Park, Summerhill East	5
New Toronto, Mimico South, Humber Bay Shores	2
North Toronto West	3
Northwood Park, York University	2
Parkdale, Roncesvalles	8



Queen's Park, Ontario Provincial Government	44
Regent Park, Harbourfront	9
Richmond, Adelaide, King	50
Rosedale	2
Roselawn	5
Runnymede, Swansea	9
St. James Town	49
St. James Town, Cabbagetown	4
Stn A PO Boxes	37
Studio District	7
Summerhill West, Rathnelly, South Hill, Forest ...	8
The Annex, North Midtown, Yorkville	11
The Beaches	3
The Danforth West, Riverdale	5
The Kingsway, Montgomery Road , Old Mill North	3
Thornccliffe Park	2
Toronto Dominion Centre, Design Exchange	50
University of Toronto, Harbord	19
Westmount	1
Willowdale	15
Willowdale, Newtonbrook	3
Woodbine Heights	3
York Mills West	3

Neighbourhood	Longitude \
Agincourt	1
Bathurst Manor, Wilson Heights, Downsview North	1
Bayview Village	2
Bedford Park, Lawrence Manor East	4
Berczy Park	30
Brockton, Parkdale Village, Exhibition Place	3
Business reply mail Processing Centre	3
CN Tower, King and Spadina, Railway Lands, Harb...	1
Canada Post Gateway Processing Centre	2
Cedarbrae	2
Central Bay Street	49
Christie	1
Church and Wellesley	32
Clarks Corners, Tam O'Shanter, Sullivan	2
Commerce Court, Victoria Hotel	50
Davisville	11
Davisville North	7
Del Ray, Mount Dennis, Keelsdale and Silverthorn	1
Don Mills	6
Dorset Park, Wexford Heights, Scarborough Town ...	1
Dufferin, Dovercourt Village	5

East Toronto	4
Fairview, Henry Farm, Oriole	5
First Canadian Place, Underground city	50
Forest Hill North & West	6
Garden District, Ryerson	44
Glencairn	2
Harbourfront East, Union Station, Toronto Islands	30
High Park, The Junction South	6
Hillcrest Village	1
Humewood-Cedarvale	3
India Bazaar, The Beaches West	1
Kennedy Park, Ionview, East Birchmount Park	1
Kensington Market, Chinatown, Grange Park	23
Lawrence Manor, Lawrence Heights	3
Lawrence Park	2
Leaside	6
Little Portugal, Trinity	10
Milliken, Agincourt North, Steeles East, L'Amor...	1
Mimico NW, The Queensway West, South of Bloor, ...	4
Moore Park, Summerhill East	5
New Toronto, Mimico South, Humber Bay Shores	2
North Toronto West	3
Northwood Park, York University	2
Parkdale, Roncesvalles	8
Queen's Park, Ontario Provincial Government	44
Regent Park, Harbourfront	9
Richmond, Adelaide, King	50
Rosedale	2
Roselawn	5
Runnymede, Swansea	9
St. James Town	49
St. James Town, Cabbagetown	4
Stn A PO Boxes	37
Studio District	7
Summerhill West, Rathnelly, South Hill, Forest ...	8
The Annex, North Midtown, Yorkville	11
The Beaches	3
The Danforth West, Riverdale	5
The Kingsway, Montgomery Road , Old Mill North	3
Thorncliffe Park	2
Toronto Dominion Centre, Design Exchange	50
University of Toronto, Harbord	19
Westmount	1
Willowdale	15
Willowdale, Newtonbrook	3
Woodbine Heights	3
York Mills West	3

	Venue	Venue Latitude \
Neighbourhood		
Agincourt	1	1
Bathurst Manor, Wilson Heights, Downsview North	1	1
Bayview Village	2	2
Bedford Park, Lawrence Manor East	4	4
Berczy Park	30	30
Brockton, Parkdale Village, Exhibition Place	3	3
Business reply mail Processing Centre	3	3
CN Tower, King and Spadina, Railway Lands, Harb...	1	1
Canada Post Gateway Processing Centre	2	2
Cedarbrae	2	2
Central Bay Street	49	49
Christie	1	1
Church and Wellesley	32	32
Clarks Corners, Tam O'Shanter, Sullivan	2	2
Commerce Court, Victoria Hotel	50	50
Davisville	11	11
Davisville North	7	7
Del Ray, Mount Dennis, Keelsdale and Silverthorn	1	1
Don Mills	6	6
Dorset Park, Wexford Heights, Scarborough Town ...	1	1
Dufferin, Dovercourt Village	5	5
East Toronto	4	4
Fairview, Henry Farm, Oriole	5	5
First Canadian Place, Underground city	50	50
Forest Hill North & West	6	6
Garden District, Ryerson	44	44
Glencairn	2	2
Harbourfront East, Union Station, Toronto Islands	30	30
High Park, The Junction South	6	6
Hillcrest Village	1	1
Humewood-Cedarvale	3	3
India Bazaar, The Beaches West	1	1
Kennedy Park, Ionview, East Birchmount Park	1	1
Kensington Market, Chinatown, Grange Park	23	23
Lawrence Manor, Lawrence Heights	3	3
Lawrence Park	2	2
Leaside	6	6
Little Portugal, Trinity	10	10
Milliken, Agincourt North, Steeles East, L'Amor...	1	1
Mimico NW, The Queensway West, South of Bloor, ...	4	4
Moore Park, Summerhill East	5	5
New Toronto, Mimico South, Humber Bay Shores	2	2
North Toronto West	3	3
Northwood Park, York University	2	2

Parkdale, Roncesvalles	8	8
Queen's Park, Ontario Provincial Government	44	44
Regent Park, Harbourfront	9	9
Richmond, Adelaide, King	50	50
Rosedale	2	2
Roselawn	5	5
Runnymede, Swansea	9	9
St. James Town	49	49
St. James Town, Cabbagetown	4	4
Stn A PO Boxes	37	37
Studio District	7	7
Summerhill West, Rathnelly, South Hill, Forest ...	8	8
The Annex, North Midtown, Yorkville	11	11
The Beaches	3	3
The Danforth West, Riverdale	5	5
The Kingsway, Montgomery Road , Old Mill North	3	3
Thornccliffe Park	2	2
Toronto Dominion Centre, Design Exchange	50	50
University of Toronto, Harbord	19	19
Westmount	1	1
Willowdale	15	15
Willowdale, Newtonbrook	3	3
Woodbine Heights	3	3
York Mills West	3	3

Venue Longitude \

Neighbourhood	
Agincourt	1
Bathurst Manor, Wilson Heights, Downsview North	1
Bayview Village	2
Bedford Park, Lawrence Manor East	4
Berczy Park	30
Brockton, Parkdale Village, Exhibition Place	3
Business reply mail Processing Centre	3
CN Tower, King and Spadina, Railway Lands, Harb...	1
Canada Post Gateway Processing Centre	2
Cedarbrae	2
Central Bay Street	49
Christie	1
Church and Wellesley	32
Clarks Corners, Tam O'Shanter, Sullivan	2
Commerce Court, Victoria Hotel	50
Davisville	11
Davisville North	7
Del Ray, Mount Dennis, Keelsdale and Silverthorn	1
Don Mills	6
Dorset Park, Wexford Heights, Scarborough Town ...	1

Dufferin, Dovercourt Village	5
East Toronto	4
Fairview, Henry Farm, Oriole	5
First Canadian Place, Underground city	50
Forest Hill North & West	6
Garden District, Ryerson	44
Glencairn	2
Harbourfront East, Union Station, Toronto Islands	30
High Park, The Junction South	6
Hillcrest Village	1
Humewood-Cedarvale	3
India Bazaar, The Beaches West	1
Kennedy Park, Ionview, East Birchmount Park	1
Kensington Market, Chinatown, Grange Park	23
Lawrence Manor, Lawrence Heights	3
Lawrence Park	2
Leaside	6
Little Portugal, Trinity	10
Milliken, Agincourt North, Steeles East, L'Amor...	1
Mimico NW, The Queensway West, South of Bloor, ...	4
Moore Park, Summerhill East	5
New Toronto, Mimico South, Humber Bay Shores	2
North Toronto West	3
Northwood Park, York University	2
Parkdale, Roncesvalles	8
Queen's Park, Ontario Provincial Government	44
Regent Park, Harbourfront	9
Richmond, Adelaide, King	50
Rosedale	2
Roselawn	5
Runnymede, Swansea	9
St. James Town	49
St. James Town, Cabbagetown	4
Stn A PO Boxes	37
Studio District	7
Summerhill West, Rathnelly, South Hill, Forest ...	8
The Annex, North Midtown, Yorkville	11
The Beaches	3
The Danforth West, Riverdale	5
The Kingsway, Montgomery Road , Old Mill North	3
Thorncliffe Park	2
Toronto Dominion Centre, Design Exchange	50
University of Toronto, Harbord	19
Westmount	1
Willowdale	15
Willowdale, Newtonbrook	3
Woodbine Heights	3

	Venue Category
Neighbourhood	
Agincourt	1
Bathurst Manor, Wilson Heights, Downsview North	1
Bayview Village	2
Bedford Park, Lawrence Manor East	4
Berczy Park	30
Brockton, Parkdale Village, Exhibition Place	3
Business reply mail Processing Centre	3
CN Tower, King and Spadina, Railway Lands, Harb...	1
Canada Post Gateway Processing Centre	2
Cedarbrae	2
Central Bay Street	49
Christie	1
Church and Wellesley	32
Clarks Corners, Tam O'Shanter, Sullivan	2
Commerce Court, Victoria Hotel	50
Davisville	11
Davisville North	7
Del Ray, Mount Dennis, Keelsdale and Silverthorn	1
Don Mills	6
Dorset Park, Wexford Heights, Scarborough Town ...	1
Dufferin, Dovercourt Village	5
East Toronto	4
Fairview, Henry Farm, Oriole	5
First Canadian Place, Underground city	50
Forest Hill North & West	6
Garden District, Ryerson	44
Glencairn	2
Harbourfront East, Union Station, Toronto Islands	30
High Park, The Junction South	6
Hillcrest Village	1
Humewood-Cedarvale	3
India Bazaar, The Beaches West	1
Kennedy Park, Ionview, East Birchmount Park	1
Kensington Market, Chinatown, Grange Park	23
Lawrence Manor, Lawrence Heights	3
Lawrence Park	2
Leaside	6
Little Portugal, Trinity	10
Milliken, Agincourt North, Steeles East, L'Amor...	1
Mimico NW, The Queensway West, South of Bloor, ...	4
Moore Park, Summerhill East	5
New Toronto, Mimico South, Humber Bay Shores	2
North Toronto West	3

Northwood Park, York University	2
Parkdale, Roncesvalles	8
Queen's Park, Ontario Provincial Government	44
Regent Park, Harbourfront	9
Richmond, Adelaide, King	50
Rosedale	2
Roselawn	5
Runnymede, Swansea	9
St. James Town	49
St. James Town, Cabbagetown	4
Stn A PO Boxes	37
Studio District	7
Summerhill West, Rathnelly, South Hill, Forest ...	8
The Annex, North Midtown, Yorkville	11
The Beaches	3
The Danforth West, Riverdale	5
The Kingsway, Montgomery Road , Old Mill North	3
Thorncliffe Park	2
Toronto Dominion Centre, Design Exchange	50
University of Toronto, Harbord	19
Westmount	1
Willowdale	15
Willowdale, Newtonbrook	3
Woodbine Heights	3
York Mills West	3

### 0.7 3. Analyze Each Neighborhood

```
[17]: # one hot encoding
onehot = pd.get_dummies(Toronto_venues_sushi[['Venue Category']], prefix="",
    ↪ prefix_sep="")

# add neighborhood column back to dataframe
onehot['Neighbourhood'] = Toronto_venues_sushi['Neighbourhood']

# move neighborhood column to the first column
fixed_columns = [onehot.columns[-1]] + list(onehot.columns[:-1])

onehot = onehot[fixed_columns]

print(onehot.shape)
onehot.head()
```

(778, 11)

```
[17]:
```

	Neighbourhood	Asian Restaurant	\
0	Cedarbrae		0

1		Cedarbrae	0
2	Kennedy Park, Ionview, East Birchmount Park		0
3	Dorset Park, Wexford Heights, Scarborough Town...		0
4		Agincourt	0

	Fast Food Restaurant	Grocery Store	Hawaiian Restaurant	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	0	0	0	

	Japanese Restaurant	Korean Restaurant	Restaurant	Seafood Restaurant	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	1	0	0	0	
4	0	0	0	0	

	Sushi Restaurant	Thai Restaurant
0	1	0
1	1	0
2	1	0
3	0	0
4	1	0

```
[18]: onehot_grouped = onehot.groupby('Neighbourhood').mean().reset_index()
print(onehot_grouped.shape)
onehot_grouped
```

(68, 11)

```
[18]:
```

	Neighbourhood	Asian Restaurant	\
0	Agincourt	0.000000	
1	Bathurst Manor, Wilson Heights, Downsview North	0.000000	
2	Bayview Village	0.000000	
3	Bedford Park, Lawrence Manor East	0.000000	
4	Berczy Park	0.033333	
5	Brockton, Parkdale Village, Exhibition Place	0.000000	
6	Business reply mail Processing CentrE	0.000000	
7	CN Tower, King and Spadina, Railway Lands, Har...	0.000000	
8	Canada Post Gateway Processing Centre	0.000000	
9	Cedarbrae	0.000000	
10	Central Bay Street	0.020408	
11	Christie	0.000000	
12	Church and Wellesley	0.031250	
13	Clarks Corners, Tam O'Shanter, Sullivan	0.000000	



14	Commerce Court, Victoria Hotel	0.020000
15	Davisville	0.000000
16	Davisville North	0.000000
17	Del Ray, Mount Dennis, Keelsdale and Silverthorn	0.000000
18	Don Mills	0.000000
19	Dorset Park, Wexford Heights, Scarborough Town...	0.000000
20	Dufferin, Dovercourt Village	0.000000
21	East Toronto	0.000000
22	Fairview, Henry Farm, Oriole	0.200000
23	First Canadian Place, Underground city	0.020000
24	Forest Hill North & West	0.000000
25	Garden District, Ryerson	0.022727
26	Glencairn	0.000000
27	Harbourfront East, Union Station, Toronto Islands	0.000000
28	High Park, The Junction South	0.000000
29	Hillcrest Village	0.000000
30	Humewood-Cedarvale	0.000000
31	India Bazaar, The Beaches West	0.000000
32	Kennedy Park, Ionview, East Birchmount Park	0.000000
33	Kensington Market, Chinatown, Grange Park	0.000000
34	Lawrence Manor, Lawrence Heights	0.000000
35	Lawrence Park	0.000000
36	Leaside	0.000000
37	Little Portugal, Trinity	0.000000
38	Milliken, Agincourt North, Steeles East, L'Amo...	0.000000
39	Mimico NW, The Queensway West, South of Bloor,...	0.250000
40	Moore Park, Summerhill East	0.000000
41	New Toronto, Mimico South, Humber Bay Shores	0.000000
42	North Toronto West	0.000000
43	Northwood Park, York University	0.000000
44	Parkdale, Roncesvalles	0.000000
45	Queen's Park, Ontario Provincial Government	0.022727
46	Regent Park, Harbourfront	0.000000
47	Richmond, Adelaide, King	0.020000
48	Rosedale	0.000000
49	Roselawn	0.000000
50	Runnymede, Swansea	0.000000
51	St. James Town	0.020408
52	St. James Town, Cabbagetown	0.000000
53	Stn A PO Boxes	0.027027
54	Studio District	0.000000
55	Summerhill West, Rathnelly, South Hill, Forest...	0.000000
56	The Annex, North Midtown, Yorkville	0.000000
57	The Beaches	0.000000
58	The Danforth West, Riverdale	0.000000
59	The Kingsway, Montgomery Road , Old Mill North	0.000000
60	Thorncliffe Park	0.000000

61	Toronto Dominion Centre, Design Exchange	0.020000
62	University of Toronto, Harbord	0.000000
63	Westmount	0.000000
64	Willowdale	0.000000
65	Willowdale, Newtonbrook	0.000000
66	Woodbine Heights	0.000000
67	York Mills West	0.000000

	Fast Food Restaurant	Grocery Store	Hawaiian Restaurant \
0	0.000000	0.000000	0.000000
1	0.000000	0.000000	0.000000
2	0.000000	0.000000	0.000000
3	0.000000	0.000000	0.000000
4	0.000000	0.000000	0.000000
5	0.000000	0.000000	0.000000
6	0.000000	0.000000	0.000000
7	0.000000	0.000000	0.000000
8	0.000000	0.000000	0.000000
9	0.000000	0.000000	0.000000
10	0.020408	0.020408	0.000000
11	0.000000	0.000000	0.000000
12	0.031250	0.000000	0.000000
13	0.000000	0.000000	0.000000
14	0.000000	0.020000	0.000000
15	0.000000	0.000000	0.000000
16	0.000000	0.000000	0.000000
17	0.000000	0.000000	0.000000
18	0.000000	0.000000	0.000000
19	0.000000	0.000000	0.000000
20	0.000000	0.000000	0.000000
21	0.000000	0.000000	0.000000
22	0.000000	0.000000	0.000000
23	0.000000	0.020000	0.000000
24	0.000000	0.000000	0.000000
25	0.022727	0.000000	0.000000
26	0.000000	0.000000	0.000000
27	0.000000	0.000000	0.000000
28	0.000000	0.000000	0.000000
29	0.000000	0.000000	0.000000
30	0.000000	0.000000	0.000000
31	0.000000	0.000000	0.000000
32	0.000000	0.000000	0.000000
33	0.000000	0.000000	0.043478
34	0.000000	0.000000	0.000000
35	0.000000	0.000000	0.000000
36	0.000000	0.000000	0.000000
37	0.000000	0.000000	0.000000

38	0.000000	0.000000	0.000000
39	0.000000	0.000000	0.000000
40	0.000000	0.000000	0.000000
41	0.000000	0.000000	0.000000
42	0.000000	0.000000	0.000000
43	0.000000	0.000000	0.000000
44	0.000000	0.000000	0.000000
45	0.022727	0.000000	0.000000
46	0.000000	0.000000	0.000000
47	0.000000	0.020000	0.000000
48	0.000000	0.000000	0.000000
49	0.000000	0.000000	0.000000
50	0.000000	0.000000	0.000000
51	0.000000	0.020408	0.000000
52	0.000000	0.000000	0.000000
53	0.000000	0.000000	0.000000
54	0.000000	0.000000	0.000000
55	0.000000	0.000000	0.000000
56	0.000000	0.000000	0.000000
57	0.000000	0.000000	0.000000
58	0.000000	0.000000	0.000000
59	0.000000	0.000000	0.000000
60	0.000000	0.000000	0.000000
61	0.000000	0.020000	0.000000
62	0.000000	0.000000	0.000000
63	0.000000	0.000000	0.000000
64	0.000000	0.000000	0.000000
65	0.000000	0.000000	0.000000
66	0.000000	0.000000	0.000000
67	0.000000	0.000000	0.000000

	Japanese Restaurant	Korean Restaurant	Restaurant	Seafood Restaurant \
0	0.000000	0.000000	0.000000	0.000000
1	0.000000	0.000000	0.000000	0.000000
2	0.000000	0.000000	0.000000	0.000000
3	0.000000	0.000000	0.000000	0.000000
4	0.133333	0.000000	0.200000	0.000000
5	0.333333	0.000000	0.000000	0.000000
6	0.000000	0.000000	0.000000	0.000000
7	0.000000	0.000000	0.000000	0.000000
8	0.000000	0.000000	0.000000	0.000000
9	0.000000	0.000000	0.000000	0.000000
10	0.081633	0.000000	0.000000	0.000000
11	1.000000	0.000000	0.000000	0.000000
12	0.093750	0.03125	0.031250	0.000000
13	0.000000	0.000000	0.000000	0.000000
14	0.140000	0.000000	0.080000	0.000000

15	0.000000	0.00000	0.000000	0.000000
16	0.000000	0.00000	0.142857	0.000000
17	0.000000	0.00000	0.000000	0.000000
18	0.333333	0.00000	0.000000	0.000000
19	1.000000	0.00000	0.000000	0.000000
20	0.000000	0.00000	0.000000	0.000000
21	0.000000	0.00000	0.000000	0.000000
22	0.400000	0.00000	0.200000	0.000000
23	0.140000	0.00000	0.080000	0.000000
24	0.166667	0.00000	0.000000	0.000000
25	0.113636	0.00000	0.000000	0.000000
26	0.000000	0.00000	0.000000	0.000000
27	0.133333	0.00000	0.200000	0.000000
28	0.000000	0.00000	0.000000	0.000000
29	0.000000	0.00000	0.000000	0.000000
30	0.000000	0.00000	0.000000	0.000000
31	0.000000	0.00000	0.000000	0.000000
32	0.000000	0.00000	0.000000	0.000000
33	0.043478	0.00000	0.000000	0.043478
34	0.000000	0.00000	0.000000	0.000000
35	0.000000	0.00000	0.000000	0.000000
36	0.166667	0.00000	0.000000	0.000000
37	0.100000	0.00000	0.000000	0.000000
38	0.000000	0.00000	0.000000	0.000000
39	0.000000	0.00000	0.000000	0.000000
40	0.200000	0.00000	0.000000	0.000000
41	0.000000	0.00000	0.000000	0.000000
42	0.000000	0.00000	0.333333	0.000000
43	0.000000	0.00000	0.500000	0.000000
44	0.000000	0.00000	0.000000	0.000000
45	0.090909	0.00000	0.000000	0.000000
46	0.000000	0.00000	0.000000	0.000000
47	0.120000	0.00000	0.040000	0.000000
48	0.000000	0.50000	0.000000	0.000000
49	0.200000	0.00000	0.000000	0.000000
50	0.000000	0.00000	0.000000	0.000000
51	0.102041	0.00000	0.102041	0.000000
52	0.000000	0.25000	0.000000	0.000000
53	0.135135	0.00000	0.162162	0.000000
54	0.000000	0.00000	0.000000	0.000000
55	0.125000	0.00000	0.000000	0.000000
56	0.000000	0.00000	0.000000	0.000000
57	0.333333	0.00000	0.000000	0.000000
58	0.000000	0.00000	0.000000	0.000000
59	0.000000	0.00000	0.000000	0.000000
60	0.000000	0.00000	0.000000	0.000000
61	0.140000	0.00000	0.100000	0.000000

62	0.000000	0.00000	0.000000	0.000000
63	0.000000	0.00000	0.000000	0.000000
64	0.066667	0.00000	0.000000	0.000000
65	0.000000	0.00000	0.000000	0.000000
66	0.000000	0.00000	0.000000	0.000000
67	0.000000	0.00000	0.000000	0.000000

	Sushi Restaurant	Thai Restaurant
0	1.000000	0.000000
1	1.000000	0.000000
2	1.000000	0.000000
3	1.000000	0.000000
4	0.633333	0.000000
5	0.666667	0.000000
6	1.000000	0.000000
7	1.000000	0.000000
8	1.000000	0.000000
9	1.000000	0.000000
10	0.857143	0.000000
11	0.000000	0.000000
12	0.781250	0.000000
13	1.000000	0.000000
14	0.740000	0.000000
15	1.000000	0.000000
16	0.857143	0.000000
17	1.000000	0.000000
18	0.666667	0.000000
19	0.000000	0.000000
20	1.000000	0.000000
21	1.000000	0.000000
22	0.200000	0.000000
23	0.740000	0.000000
24	0.833333	0.000000
25	0.840909	0.000000
26	1.000000	0.000000
27	0.666667	0.000000
28	1.000000	0.000000
29	1.000000	0.000000
30	1.000000	0.000000
31	1.000000	0.000000
32	1.000000	0.000000
33	0.826087	0.043478
34	1.000000	0.000000
35	1.000000	0.000000
36	0.833333	0.000000
37	0.900000	0.000000
38	1.000000	0.000000

39	0.750000	0.000000
40	0.800000	0.000000
41	1.000000	0.000000
42	0.666667	0.000000
43	0.500000	0.000000
44	1.000000	0.000000
45	0.863636	0.000000
46	1.000000	0.000000
47	0.800000	0.000000
48	0.500000	0.000000
49	0.800000	0.000000
50	1.000000	0.000000
51	0.755102	0.000000
52	0.750000	0.000000
53	0.675676	0.000000
54	1.000000	0.000000
55	0.875000	0.000000
56	1.000000	0.000000
57	0.666667	0.000000
58	1.000000	0.000000
59	1.000000	0.000000
60	1.000000	0.000000
61	0.720000	0.000000
62	1.000000	0.000000
63	1.000000	0.000000
64	0.933333	0.000000
65	1.000000	0.000000
66	1.000000	0.000000
67	1.000000	0.000000

```
[19]: def return_most_common_venues(row, num_top_venues):
      row_categories = row.iloc[1:]
      row_categories_sorted = row_categories.sort_values(ascending=False)

      return row_categories_sorted.index.values[0:num_top_venues]
```

```
[36]: num_top_venues = 10

      indicators = ['st', 'nd', 'rd']

      # create columns according to number of top venues
      columns = ['Neighbourhood']
      for ind in np.arange(num_top_venues):
          try:
              columns.append('{} {} Most Common Venue'.format(ind+1, indicators[ind]))
          except:
              columns.append('{}th Most Common Venue'.format(ind+1))
```

```

# create a new dataframe
neighborhoods_venues_sorted = pd.DataFrame(columns=columns)
neighborhoods_venues_sorted['Neighbourhood'] = onehot_grouped['Neighbourhood']

for ind in np.arange(onehot_grouped.shape[0]):
    neighborhoods_venues_sorted.iloc[ind, 1:] =
    →return_most_common_venues(onehot_grouped.iloc[ind, :], num_top_venues)

neighborhoods_venues_sorted.head()

```

```

[36]:

```

	Neighbourhood	1st Most Common Venue	\
0	Agincourt	Sushi Restaurant	
1	Bathurst Manor, Wilson Heights, Downsview North	Sushi Restaurant	
2	Bayview Village	Sushi Restaurant	
3	Bedford Park, Lawrence Manor East	Sushi Restaurant	
4	Berczy Park	Sushi Restaurant	

  

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	\
0	Thai Restaurant	Seafood Restaurant	Restaurant	
1	Thai Restaurant	Seafood Restaurant	Restaurant	
2	Thai Restaurant	Seafood Restaurant	Restaurant	
3	Thai Restaurant	Seafood Restaurant	Restaurant	
4	Restaurant	Japanese Restaurant	Asian Restaurant	

  

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	\
0	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant	
1	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant	
2	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant	
3	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant	
4	Thai Restaurant	Seafood Restaurant	Korean Restaurant	

  

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Grocery Store	Fast Food Restaurant	Asian Restaurant
1	Grocery Store	Fast Food Restaurant	Asian Restaurant
2	Grocery Store	Fast Food Restaurant	Asian Restaurant
3	Grocery Store	Fast Food Restaurant	Asian Restaurant
4	Hawaiian Restaurant	Grocery Store	Fast Food Restaurant

Cluster Neighborhoods

```

[63]: # set number of clusters
kclusters = 5

toronto_grouped_clustering = onehot_grouped.drop('Neighbourhood', 1)

# run k-means clustering

```

```
kmeans = KMeans(n_clusters=kclusters, random_state=0).
↳fit(toronto_grouped_clustering)

# check cluster labels generated for each row in the dataframe
kmeans.labels_[0:10]
```

```
[63]: array([1, 1, 1, 1, 2, 3, 1, 1, 1, 1], dtype=int32)
```

```
[64]: neighborhoods_venues_sorted.columns
```

```
[64]: Index(['Cluster Labels', 'Neighbourhood', '1st Most Common Venue',
        '2nd Most Common Venue', '3rd Most Common Venue',
        '4th Most Common Venue', '5th Most Common Venue',
        '6th Most Common Venue', '7th Most Common Venue',
        '8th Most Common Venue', '9th Most Common Venue',
        '10th Most Common Venue'],
        dtype='object')
```

```
[65]: # add clustering labels

if 'Cluster Labels' in neighborhoods_venues_sorted.columns:
    print("neighborhoods_venues_sorted has Cluster Labels columns")
else:
    neighborhoods_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)

toronto_merged = data
toronto_merged = toronto_merged.join(neighborhoods_venues_sorted.
↳set_index('Neighbourhood'), on='Neighbourhood')
toronto_merged.fillna(0,inplace=True)
toronto_merged[['Cluster Labels']] = toronto_merged[['Cluster Labels']].
↳astype(int)
toronto_merged
```

neighborhoods\_venues\_sorted has Cluster Labels columns

```
[65]:
```

	Postcode	Borough \
0	M1B	Scarborough
1	M1C	Scarborough
2	M1E	Scarborough
3	M1G	Scarborough
4	M1H	Scarborough
5	M1J	Scarborough
6	M1K	Scarborough
7	M1L	Scarborough
8	M1M	Scarborough
9	M1N	Scarborough
10	M1P	Scarborough



11	M1R	Scarborough
12	M1S	Scarborough
13	M1T	Scarborough
14	M1V	Scarborough
15	M1W	Scarborough
16	M1X	Scarborough
17	M2H	North York
18	M2J	North York
19	M2K	North York
20	M2L	North York
21	M2M	North York
22	M2N	North York
23	M2P	North York
24	M2R	North York
25	M3A	North York
26	M3B	North York
27	M3C	North York
28	M3H	North York
29	M3J	North York
30	M3K	North York
31	M3L	North York
32	M3M	North York
33	M3N	North York
34	M4A	North York
35	M4B	East York
36	M4C	East York
37	M4E	East Toronto
38	M4G	East York
39	M4H	East York
40	M4J	East York
41	M4K	East Toronto
42	M4L	East Toronto
43	M4M	East Toronto
44	M4N	Central Toronto
45	M4P	Central Toronto
46	M4R	Central Toronto
47	M4S	Central Toronto
48	M4T	Central Toronto
49	M4V	Central Toronto
50	M4W	Downtown Toronto
51	M4X	Downtown Toronto
52	M4Y	Downtown Toronto
53	M5A	Downtown Toronto
54	M5B	Downtown Toronto
55	M5C	Downtown Toronto
56	M5E	Downtown Toronto
57	M5G	Downtown Toronto

58	M5H	Downtown Toronto
59	M5J	Downtown Toronto
60	M5K	Downtown Toronto
61	M5L	Downtown Toronto
62	M5M	North York
63	M5N	Central Toronto
64	M5P	Central Toronto
65	M5R	Central Toronto
66	M5S	Downtown Toronto
67	M5T	Downtown Toronto
68	M5V	Downtown Toronto
69	M5W	Downtown Toronto
70	M5X	Downtown Toronto
71	M6A	North York
72	M6B	North York
73	M6C	York
74	M6E	York
75	M6G	Downtown Toronto
76	M6H	West Toronto
77	M6J	West Toronto
78	M6K	West Toronto
79	M6L	North York
80	M6M	York
81	M6N	York
82	M6P	West Toronto
83	M6R	West Toronto
84	M6S	West Toronto
85	M7A	Downtown Toronto
86	M7R	Mississauga
87	M7Y	East Toronto
88	M8V	Etobicoke
89	M8W	Etobicoke
90	M8X	Etobicoke
91	M8Y	Etobicoke
92	M8Z	Etobicoke
93	M9A	Etobicoke
94	M9B	Etobicoke
95	M9C	Etobicoke
96	M9L	North York
97	M9M	North York
98	M9N	York
99	M9P	Etobicoke
100	M9R	Etobicoke
101	M9V	Etobicoke
102	M9W	Etobicoke

Neighbourhood    Latitude    Longitude    \

0	Malvern, Rouge	43.806686	-79.194353
1	Rouge Hill, Port Union, Highland Creek	43.784535	-79.160497
2	Guildwood, Morningside, West Hill	43.763573	-79.188711
3	Woburn	43.770992	-79.216917
4	Cedarbrae	43.773136	-79.239476
5	Scarborough Village	43.744734	-79.239476
6	Kennedy Park, Ionview, East Birchmount Park	43.727929	-79.262029
7	Golden Mile, Clairlea, Oakridge	43.711112	-79.284577
8	Cliffside, Cliffcrest, Scarborough Village West	43.716316	-79.239476
9	Birch Cliff, Cliffside West	43.692657	-79.264848
10	Dorset Park, Wexford Heights, Scarborough Town...	43.757410	-79.273304
11	Wexford, Maryvale	43.750071	-79.295849
12	Agincourt	43.794200	-79.262029
13	Clarks Corners, Tam O'Shanter, Sullivan	43.781638	-79.304302
14	Milliken, Agincourt North, Steeles East, L'Amo...	43.815252	-79.284577
15	Steeles West, L'Amoreaux West	43.799525	-79.318389
16	Upper Rouge	43.836125	-79.205636
17	Hillcrest Village	43.803762	-79.363452
18	Fairview, Henry Farm, Oriole	43.778517	-79.346556
19	Bayview Village	43.786947	-79.385975
20	York Mills, Silver Hills	43.757490	-79.374714
21	Willowdale, Newtonbrook	43.789053	-79.408493
22	Willowdale	43.770120	-79.408493
23	York Mills West	43.752758	-79.400049
24	Willowdale	43.782736	-79.442259
25	Parkwoods	43.753259	-79.329656
26	Don Mills	43.745906	-79.352188
27	Don Mills	43.725900	-79.340923
28	Bathurst Manor, Wilson Heights, Downsview North	43.754328	-79.442259
29	Northwood Park, York University	43.767980	-79.487262
30	Downsview	43.737473	-79.464763
31	Downsview	43.739015	-79.506944
32	Downsview	43.728496	-79.495697
33	Downsview	43.761631	-79.520999
34	Victoria Village	43.725882	-79.315572
35	Parkview Hill, Woodbine Gardens	43.706397	-79.309937
36	Woodbine Heights	43.695344	-79.318389
37	The Beaches	43.676357	-79.293031
38	Leaside	43.709060	-79.363452
39	Thorncliffe Park	43.705369	-79.349372
40	East Toronto	43.685347	-79.338106
41	The Danforth West, Riverdale	43.679557	-79.352188
42	India Bazaar, The Beaches West	43.668999	-79.315572
43	Studio District	43.659526	-79.340923
44	Lawrence Park	43.728020	-79.388790
45	Davisville North	43.712751	-79.390197
46	North Toronto West	43.715383	-79.405678

47	Davisville	43.704324	-79.388790
48	Moore Park, Summerhill East	43.689574	-79.383160
49	Summerhill West, Rathnelly, South Hill, Forest...	43.686412	-79.400049
50	Rosedale	43.679563	-79.377529
51	St. James Town, Cabbagetown	43.667967	-79.367675
52	Church and Wellesley	43.665860	-79.383160
53	Regent Park, Harbourfront	43.654260	-79.360636
54	Garden District, Ryerson	43.657162	-79.378937
55	St. James Town	43.651494	-79.375418
56	Berczy Park	43.644771	-79.373306
57	Central Bay Street	43.657952	-79.387383
58	Richmond, Adelaide, King	43.650571	-79.384568
59	Harbourfront East, Union Station, Toronto Islands	43.640816	-79.381752
60	Toronto Dominion Centre, Design Exchange	43.647177	-79.381576
61	Commerce Court, Victoria Hotel	43.648198	-79.379817
62	Bedford Park, Lawrence Manor East	43.733283	-79.419750
63	Roselawn	43.711695	-79.416936
64	Forest Hill North & West	43.696948	-79.411307
65	The Annex, North Midtown, Yorkville	43.672710	-79.405678
66	University of Toronto, Harbord	43.662696	-79.400049
67	Kensington Market, Chinatown, Grange Park	43.653206	-79.400049
68	CN Tower, King and Spadina, Railway Lands, Har...	43.628947	-79.394420
69	Stn A PO Boxes	43.646435	-79.374846
70	First Canadian Place, Underground city	43.648429	-79.382280
71	Lawrence Manor, Lawrence Heights	43.718518	-79.464763
72	Glencairn	43.709577	-79.445073
73	Humewood-Cedarvale	43.693781	-79.428191
74	Caledonia-Fairbanks	43.689026	-79.453512
75	Christie	43.669542	-79.422564
76	Dufferin, Dovercourt Village	43.669005	-79.442259
77	Little Portugal, Trinity	43.647927	-79.419750
78	Brockton, Parkdale Village, Exhibition Place	43.636847	-79.428191
79	North Park, Maple Leaf Park, Upwood Park	43.713756	-79.490074
80	Del Ray, Mount Dennis, Keelsdale and Silverthorn	43.691116	-79.476013
81	Runnymede, The Junction North	43.673185	-79.487262
82	High Park, The Junction South	43.661608	-79.464763
83	Parkdale, Roncesvalles	43.648960	-79.456325
84	Runnymede, Swansea	43.651571	-79.484450
85	Queen's Park, Ontario Provincial Government	43.662301	-79.389494
86	Canada Post Gateway Processing Centre	43.636966	-79.615819
87	Business reply mail Processing Centre	43.662744	-79.321558
88	New Toronto, Mimico South, Humber Bay Shores	43.605647	-79.501321
89	Alderwood, Long Branch	43.602414	-79.543484
90	The Kingsway, Montgomery Road , Old Mill North	43.653654	-79.506944
91	Old Mill South, King's Mill Park, Sunnylea, Hu...	43.636258	-79.498509
92	Mimico NW, The Queensway West, South of Bloor,...	43.628841	-79.520999
93	Islington Avenue	43.667856	-79.532242

94	West Deane Park, Princess Gardens, Martin Grov...	43.650943	-79.554724
95	Eringate, Bloordale Gardens, Old Burnhamthorpe...	43.643515	-79.577201
96	Humber Summit	43.756303	-79.565963
97	Humberlea, Emery	43.724766	-79.532242
98	Weston	43.706876	-79.518188
99	Westmount	43.696319	-79.532242
100	Kingsview Village, St. Phillips, Martin Grove ...	43.688905	-79.554724
101	South Steeles, Silverstone, Humbergate, Jamest...	43.739416	-79.588437
102	Northwest	43.706748	-79.594054

	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	0	Sushi Restaurant	Thai Restaurant	
5	0	0	0	
6	0	Sushi Restaurant	Thai Restaurant	
7	0	0	0	
8	0	0	0	
9	0	0	0	
10	4	Japanese Restaurant	Thai Restaurant	
11	0	0	0	
12	0	Sushi Restaurant	Thai Restaurant	
13	0	Sushi Restaurant	Thai Restaurant	
14	0	Sushi Restaurant	Thai Restaurant	
15	0	0	0	
16	0	0	0	
17	0	Sushi Restaurant	Thai Restaurant	
18	1	Japanese Restaurant	Sushi Restaurant	
19	0	Sushi Restaurant	Thai Restaurant	
20	0	0	0	
21	0	Sushi Restaurant	Thai Restaurant	
22	0	Sushi Restaurant	Japanese Restaurant	
23	0	Sushi Restaurant	Thai Restaurant	
24	0	Sushi Restaurant	Japanese Restaurant	
25	0	0	0	
26	2	Sushi Restaurant	Japanese Restaurant	
27	2	Sushi Restaurant	Japanese Restaurant	
28	0	Sushi Restaurant	Thai Restaurant	
29	3	Sushi Restaurant	Restaurant	
30	0	0	0	
31	0	0	0	
32	0	0	0	
33	0	0	0	
34	0	0	0	
35	0	0	0	

36	0	Sushi Restaurant	Thai Restaurant
37	2	Sushi Restaurant	Japanese Restaurant
38	2	Sushi Restaurant	Japanese Restaurant
39	0	Sushi Restaurant	Thai Restaurant
40	0	Sushi Restaurant	Thai Restaurant
41	0	Sushi Restaurant	Thai Restaurant
42	0	Sushi Restaurant	Thai Restaurant
43	0	Sushi Restaurant	Thai Restaurant
44	0	Sushi Restaurant	Thai Restaurant
45	0	Sushi Restaurant	Restaurant
46	3	Sushi Restaurant	Restaurant
47	0	Sushi Restaurant	Thai Restaurant
48	2	Sushi Restaurant	Japanese Restaurant
49	2	Sushi Restaurant	Japanese Restaurant
50	5	Sushi Restaurant	Korean Restaurant
51	2	Sushi Restaurant	Korean Restaurant
52	2	Sushi Restaurant	Japanese Restaurant
53	0	Sushi Restaurant	Thai Restaurant
54	2	Sushi Restaurant	Japanese Restaurant
55	2	Sushi Restaurant	Restaurant
56	3	Sushi Restaurant	Restaurant
57	2	Sushi Restaurant	Japanese Restaurant
58	2	Sushi Restaurant	Japanese Restaurant
59	3	Sushi Restaurant	Restaurant
60	2	Sushi Restaurant	Japanese Restaurant
61	2	Sushi Restaurant	Japanese Restaurant
62	0	Sushi Restaurant	Thai Restaurant
63	2	Sushi Restaurant	Japanese Restaurant
64	2	Sushi Restaurant	Japanese Restaurant
65	0	Sushi Restaurant	Thai Restaurant
66	0	Sushi Restaurant	Thai Restaurant
67	2	Sushi Restaurant	Thai Restaurant
68	0	Sushi Restaurant	Thai Restaurant
69	3	Sushi Restaurant	Restaurant
70	2	Sushi Restaurant	Japanese Restaurant
71	0	Sushi Restaurant	Thai Restaurant
72	0	Sushi Restaurant	Thai Restaurant
73	0	Sushi Restaurant	Thai Restaurant
74	0	0	0
75	4	Japanese Restaurant	Thai Restaurant
76	0	Sushi Restaurant	Thai Restaurant
77	2	Sushi Restaurant	Japanese Restaurant
78	2	Sushi Restaurant	Japanese Restaurant
79	0	0	0
80	0	Sushi Restaurant	Thai Restaurant
81	0	0	0
82	0	Sushi Restaurant	Thai Restaurant

83	0	Sushi Restaurant	Thai Restaurant
84	0	Sushi Restaurant	Thai Restaurant
85	2	Sushi Restaurant	Japanese Restaurant
86	0	Sushi Restaurant	Thai Restaurant
87	0	Sushi Restaurant	Thai Restaurant
88	0	Sushi Restaurant	Thai Restaurant
89	0	0	0
90	0	Sushi Restaurant	Thai Restaurant
91	0	0	0
92	2	Sushi Restaurant	Asian Restaurant
93	0	0	0
94	0	0	0
95	0	0	0
96	0	0	0
97	0	0	0
98	0	0	0
99	0	Sushi Restaurant	Thai Restaurant
100	0	0	0
101	0	0	0
102	0	0	0

	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	Seafood Restaurant	Restaurant	Korean Restaurant	
5	0	0	0	
6	Seafood Restaurant	Restaurant	Korean Restaurant	
7	0	0	0	
8	0	0	0	
9	0	0	0	
10	Sushi Restaurant	Seafood Restaurant	Restaurant	
11	0	0	0	
12	Seafood Restaurant	Restaurant	Korean Restaurant	
13	Seafood Restaurant	Restaurant	Korean Restaurant	
14	Seafood Restaurant	Restaurant	Korean Restaurant	
15	0	0	0	
16	0	0	0	
17	Seafood Restaurant	Restaurant	Korean Restaurant	
18	Restaurant	Asian Restaurant	Thai Restaurant	
19	Seafood Restaurant	Restaurant	Korean Restaurant	
20	0	0	0	
21	Seafood Restaurant	Restaurant	Korean Restaurant	
22	Thai Restaurant	Seafood Restaurant	Restaurant	
23	Seafood Restaurant	Restaurant	Korean Restaurant	
24	Thai Restaurant	Seafood Restaurant	Restaurant	

25		0	0	0
26	Thai Restaurant	Seafood Restaurant		Restaurant
27	Thai Restaurant	Seafood Restaurant		Restaurant
28	Seafood Restaurant		Restaurant	Korean Restaurant
29	Thai Restaurant	Seafood Restaurant		Korean Restaurant
30		0	0	0
31		0	0	0
32		0	0	0
33		0	0	0
34		0	0	0
35		0	0	0
36	Seafood Restaurant		Restaurant	Korean Restaurant
37	Thai Restaurant	Seafood Restaurant		Restaurant
38	Thai Restaurant	Seafood Restaurant		Restaurant
39	Seafood Restaurant		Restaurant	Korean Restaurant
40	Seafood Restaurant		Restaurant	Korean Restaurant
41	Seafood Restaurant		Restaurant	Korean Restaurant
42	Seafood Restaurant		Restaurant	Korean Restaurant
43	Seafood Restaurant		Restaurant	Korean Restaurant
44	Seafood Restaurant		Restaurant	Korean Restaurant
45	Thai Restaurant	Seafood Restaurant		Korean Restaurant
46	Thai Restaurant	Seafood Restaurant		Korean Restaurant
47	Seafood Restaurant		Restaurant	Korean Restaurant
48	Thai Restaurant	Seafood Restaurant		Restaurant
49	Thai Restaurant	Seafood Restaurant		Restaurant
50	Thai Restaurant	Seafood Restaurant		Restaurant
51	Thai Restaurant	Seafood Restaurant		Restaurant
52		Restaurant	Korean Restaurant	Fast Food Restaurant
53	Seafood Restaurant		Restaurant	Korean Restaurant
54	Fast Food Restaurant		Asian Restaurant	Thai Restaurant
55	Japanese Restaurant		Grocery Store	Asian Restaurant
56	Japanese Restaurant		Asian Restaurant	Thai Restaurant
57	Grocery Store	Fast Food Restaurant		Asian Restaurant
58		Restaurant	Grocery Store	Asian Restaurant
59	Japanese Restaurant		Thai Restaurant	Seafood Restaurant
60		Restaurant	Grocery Store	Asian Restaurant
61		Restaurant	Grocery Store	Asian Restaurant
62	Seafood Restaurant		Restaurant	Korean Restaurant
63	Thai Restaurant	Seafood Restaurant		Restaurant
64	Thai Restaurant	Seafood Restaurant		Restaurant
65	Seafood Restaurant		Restaurant	Korean Restaurant
66	Seafood Restaurant		Restaurant	Korean Restaurant
67	Seafood Restaurant	Japanese Restaurant		Hawaiian Restaurant
68	Seafood Restaurant		Restaurant	Korean Restaurant
69	Japanese Restaurant		Asian Restaurant	Thai Restaurant
70		Restaurant	Grocery Store	Asian Restaurant
71	Seafood Restaurant		Restaurant	Korean Restaurant



72	Seafood Restaurant	Restaurant	Korean Restaurant
73	Seafood Restaurant	Restaurant	Korean Restaurant
74	0	0	0
75	Sushi Restaurant	Seafood Restaurant	Restaurant
76	Seafood Restaurant	Restaurant	Korean Restaurant
77	Thai Restaurant	Seafood Restaurant	Restaurant
78	Thai Restaurant	Seafood Restaurant	Restaurant
79	0	0	0
80	Seafood Restaurant	Restaurant	Korean Restaurant
81	0	0	0
82	Seafood Restaurant	Restaurant	Korean Restaurant
83	Seafood Restaurant	Restaurant	Korean Restaurant
84	Seafood Restaurant	Restaurant	Korean Restaurant
85	Fast Food Restaurant	Asian Restaurant	Thai Restaurant
86	Seafood Restaurant	Restaurant	Korean Restaurant
87	Seafood Restaurant	Restaurant	Korean Restaurant
88	Seafood Restaurant	Restaurant	Korean Restaurant
89	0	0	0
90	Seafood Restaurant	Restaurant	Korean Restaurant
91	0	0	0
92	Thai Restaurant	Seafood Restaurant	Restaurant
93	0	0	0
94	0	0	0
95	0	0	0
96	0	0	0
97	0	0	0
98	0	0	0
99	Seafood Restaurant	Restaurant	Korean Restaurant
100	0	0	0
101	0	0	0
102	0	0	0

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue \
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
5	0	0	0
6	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
7	0	0	0
8	0	0	0
9	0	0	0
10	Korean Restaurant	Hawaiian Restaurant	Grocery Store
11	0	0	0
12	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
13	Japanese Restaurant	Hawaiian Restaurant	Grocery Store

14	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
15	0	0	0
16	0	0	0
17	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
18	Seafood Restaurant	Korean Restaurant	Hawaiian Restaurant
19	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
20	0	0	0
21	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
22	Korean Restaurant	Hawaiian Restaurant	Grocery Store
23	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
24	Korean Restaurant	Hawaiian Restaurant	Grocery Store
25	0	0	0
26	Korean Restaurant	Hawaiian Restaurant	Grocery Store
27	Korean Restaurant	Hawaiian Restaurant	Grocery Store
28	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
29	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
30	0	0	0
31	0	0	0
32	0	0	0
33	0	0	0
34	0	0	0
35	0	0	0
36	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
37	Korean Restaurant	Hawaiian Restaurant	Grocery Store
38	Korean Restaurant	Hawaiian Restaurant	Grocery Store
39	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
40	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
41	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
42	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
43	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
44	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
45	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
46	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
47	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
48	Korean Restaurant	Hawaiian Restaurant	Grocery Store
49	Korean Restaurant	Hawaiian Restaurant	Grocery Store
50	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
51	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
52	Asian Restaurant	Thai Restaurant	Seafood Restaurant
53	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
54	Seafood Restaurant	Restaurant	Korean Restaurant
55	Thai Restaurant	Seafood Restaurant	Korean Restaurant
56	Seafood Restaurant	Korean Restaurant	Hawaiian Restaurant
57	Thai Restaurant	Seafood Restaurant	Restaurant
58	Thai Restaurant	Seafood Restaurant	Korean Restaurant
59	Korean Restaurant	Hawaiian Restaurant	Grocery Store
60	Thai Restaurant	Seafood Restaurant	Korean Restaurant

61	Thai Restaurant	Seafood Restaurant	Korean Restaurant
62	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
63	Korean Restaurant	Hawaiian Restaurant	Grocery Store
64	Korean Restaurant	Hawaiian Restaurant	Grocery Store
65	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
66	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
67	Restaurant	Korean Restaurant	Grocery Store
68	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
69	Seafood Restaurant	Korean Restaurant	Hawaiian Restaurant
70	Thai Restaurant	Seafood Restaurant	Korean Restaurant
71	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
72	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
73	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
74	0	0	0
75	Korean Restaurant	Hawaiian Restaurant	Grocery Store
76	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
77	Korean Restaurant	Hawaiian Restaurant	Grocery Store
78	Korean Restaurant	Hawaiian Restaurant	Grocery Store
79	0	0	0
80	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
81	0	0	0
82	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
83	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
84	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
85	Seafood Restaurant	Restaurant	Korean Restaurant
86	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
87	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
88	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
89	0	0	0
90	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
91	0	0	0
92	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
93	0	0	0
94	0	0	0
95	0	0	0
96	0	0	0
97	0	0	0
98	0	0	0
99	Japanese Restaurant	Hawaiian Restaurant	Grocery Store
100	0	0	0
101	0	0	0
102	0	0	0

	9th Most Common Venue	10th Most Common Venue
0	0	0
1	0	0
2	0	0

3		0		0
4	Fast Food Restaurant		Asian Restaurant	
5		0		0
6	Fast Food Restaurant		Asian Restaurant	
7		0		0
8		0		0
9		0		0
10	Fast Food Restaurant		Asian Restaurant	
11		0		0
12	Fast Food Restaurant		Asian Restaurant	
13	Fast Food Restaurant		Asian Restaurant	
14	Fast Food Restaurant		Asian Restaurant	
15		0		0
16		0		0
17	Fast Food Restaurant		Asian Restaurant	
18	Grocery Store		Fast Food Restaurant	
19	Fast Food Restaurant		Asian Restaurant	
20		0		0
21	Fast Food Restaurant		Asian Restaurant	
22	Fast Food Restaurant		Asian Restaurant	
23	Fast Food Restaurant		Asian Restaurant	
24	Fast Food Restaurant		Asian Restaurant	
25		0		0
26	Fast Food Restaurant		Asian Restaurant	
27	Fast Food Restaurant		Asian Restaurant	
28	Fast Food Restaurant		Asian Restaurant	
29	Fast Food Restaurant		Asian Restaurant	
30		0		0
31		0		0
32		0		0
33		0		0
34		0		0
35		0		0
36	Fast Food Restaurant		Asian Restaurant	
37	Fast Food Restaurant		Asian Restaurant	
38	Fast Food Restaurant		Asian Restaurant	
39	Fast Food Restaurant		Asian Restaurant	
40	Fast Food Restaurant		Asian Restaurant	
41	Fast Food Restaurant		Asian Restaurant	
42	Fast Food Restaurant		Asian Restaurant	
43	Fast Food Restaurant		Asian Restaurant	
44	Fast Food Restaurant		Asian Restaurant	
45	Fast Food Restaurant		Asian Restaurant	
46	Fast Food Restaurant		Asian Restaurant	
47	Fast Food Restaurant		Asian Restaurant	
48	Fast Food Restaurant		Asian Restaurant	
49	Fast Food Restaurant		Asian Restaurant	

50	Fast Food Restaurant	Asian Restaurant
51	Fast Food Restaurant	Asian Restaurant
52	Hawaiian Restaurant	Grocery Store
53	Fast Food Restaurant	Asian Restaurant
54	Hawaiian Restaurant	Grocery Store
55	Hawaiian Restaurant	Fast Food Restaurant
56	Grocery Store	Fast Food Restaurant
57	Korean Restaurant	Hawaiian Restaurant
58	Hawaiian Restaurant	Fast Food Restaurant
59	Fast Food Restaurant	Asian Restaurant
60	Hawaiian Restaurant	Fast Food Restaurant
61	Hawaiian Restaurant	Fast Food Restaurant
62	Fast Food Restaurant	Asian Restaurant
63	Fast Food Restaurant	Asian Restaurant
64	Fast Food Restaurant	Asian Restaurant
65	Fast Food Restaurant	Asian Restaurant
66	Fast Food Restaurant	Asian Restaurant
67	Fast Food Restaurant	Asian Restaurant
68	Fast Food Restaurant	Asian Restaurant
69	Grocery Store	Fast Food Restaurant
70	Hawaiian Restaurant	Fast Food Restaurant
71	Fast Food Restaurant	Asian Restaurant
72	Fast Food Restaurant	Asian Restaurant
73	Fast Food Restaurant	Asian Restaurant
74	0	0
75	Fast Food Restaurant	Asian Restaurant
76	Fast Food Restaurant	Asian Restaurant
77	Fast Food Restaurant	Asian Restaurant
78	Fast Food Restaurant	Asian Restaurant
79	0	0
80	Fast Food Restaurant	Asian Restaurant
81	0	0
82	Fast Food Restaurant	Asian Restaurant
83	Fast Food Restaurant	Asian Restaurant
84	Fast Food Restaurant	Asian Restaurant
85	Hawaiian Restaurant	Grocery Store
86	Fast Food Restaurant	Asian Restaurant
87	Fast Food Restaurant	Asian Restaurant
88	Fast Food Restaurant	Asian Restaurant
89	0	0
90	Fast Food Restaurant	Asian Restaurant
91	0	0
92	Grocery Store	Fast Food Restaurant
93	0	0
94	0	0
95	0	0
96	0	0

97	0	0
98	0	0
99	Fast Food Restaurant	Asian Restaurant
100	0	0
101	0	0
102	0	0

```
[66]: # create map
map_clusters = folium.Map(location=[latitude, longitude], zoom_start=11)

# set color scheme for the clusters
x = np.arange(kclusters)
ys = [i + x + (i*x)**2 for i in range(kclusters)]
colors_array = cm.rainbow(np.linspace(0, 1, len(ys)))
rainbow = [colors.rgb2hex(i) for i in colors_array]

# add markers to the map
markers_colors = []
for lat, lon, poi, cluster in zip(toronto_merged['Latitude'],
    ↪toronto_merged['Longitude'], toronto_merged['Neighbourhood'],
    ↪toronto_merged['Cluster Labels']):
    label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse_html=True)
    folium.CircleMarker(
        [lat, lon],
        radius=5,
        popup=label,
        color=rainbow[cluster-1],
        fill=True,
        fill_color=rainbow[cluster-1],
        fill_opacity=0.7).add_to(map_clusters)

map_clusters
```

```
[66]: <folium.folium.Map at 0x7fc3587970b8>
```

```
[67]: print('There are {} uniques cluster labels.'.format(len(toronto_merged['Cluster_
    ↪Labels']).unique()))
```

There are 6 uniques cluster labels.

```
[68]: toronto_merged.loc[toronto_merged['Cluster Labels'] == 0, toronto_merged.
    ↪columns[[1] + list(range(5, toronto_merged.shape[1]))]]
```

```
[68]:
```

	Borough	Cluster Labels	1st Most Common Venue	\
0	Scarborough	0	0	
1	Scarborough	0	0	
2	Scarborough	0	0	

3	Scarborough	0	0
4	Scarborough	0	Sushi Restaurant
5	Scarborough	0	0
6	Scarborough	0	Sushi Restaurant
7	Scarborough	0	0
8	Scarborough	0	0
9	Scarborough	0	0
11	Scarborough	0	0
12	Scarborough	0	Sushi Restaurant
13	Scarborough	0	Sushi Restaurant
14	Scarborough	0	Sushi Restaurant
15	Scarborough	0	0
16	Scarborough	0	0
17	North York	0	Sushi Restaurant
19	North York	0	Sushi Restaurant
20	North York	0	0
21	North York	0	Sushi Restaurant
22	North York	0	Sushi Restaurant
23	North York	0	Sushi Restaurant
24	North York	0	Sushi Restaurant
25	North York	0	0
28	North York	0	Sushi Restaurant
30	North York	0	0
31	North York	0	0
32	North York	0	0
33	North York	0	0
34	North York	0	0
35	East York	0	0
36	East York	0	Sushi Restaurant
39	East York	0	Sushi Restaurant
40	East York	0	Sushi Restaurant
41	East Toronto	0	Sushi Restaurant
42	East Toronto	0	Sushi Restaurant
43	East Toronto	0	Sushi Restaurant
44	Central Toronto	0	Sushi Restaurant
45	Central Toronto	0	Sushi Restaurant
47	Central Toronto	0	Sushi Restaurant
53	Downtown Toronto	0	Sushi Restaurant
62	North York	0	Sushi Restaurant
65	Central Toronto	0	Sushi Restaurant
66	Downtown Toronto	0	Sushi Restaurant
68	Downtown Toronto	0	Sushi Restaurant
71	North York	0	Sushi Restaurant
72	North York	0	Sushi Restaurant
73	York	0	Sushi Restaurant
74	York	0	0
76	West Toronto	0	Sushi Restaurant

79	North York	0	0
80	York	0	Sushi Restaurant
81	York	0	0
82	West Toronto	0	Sushi Restaurant
83	West Toronto	0	Sushi Restaurant
84	West Toronto	0	Sushi Restaurant
86	Mississauga	0	Sushi Restaurant
87	East Toronto	0	Sushi Restaurant
88	Etobicoke	0	Sushi Restaurant
89	Etobicoke	0	0
90	Etobicoke	0	Sushi Restaurant
91	Etobicoke	0	0
93	Etobicoke	0	0
94	Etobicoke	0	0
95	Etobicoke	0	0
96	North York	0	0
97	North York	0	0
98	York	0	0
99	Etobicoke	0	Sushi Restaurant
100	Etobicoke	0	0
101	Etobicoke	0	0
102	Etobicoke	0	0

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	\
0	0	0	0	
1	0	0	0	
2	0	0	0	
3	0	0	0	
4	Thai Restaurant	Seafood Restaurant	Restaurant	
5	0	0	0	
6	Thai Restaurant	Seafood Restaurant	Restaurant	
7	0	0	0	
8	0	0	0	
9	0	0	0	
11	0	0	0	
12	Thai Restaurant	Seafood Restaurant	Restaurant	
13	Thai Restaurant	Seafood Restaurant	Restaurant	
14	Thai Restaurant	Seafood Restaurant	Restaurant	
15	0	0	0	
16	0	0	0	
17	Thai Restaurant	Seafood Restaurant	Restaurant	
19	Thai Restaurant	Seafood Restaurant	Restaurant	
20	0	0	0	
21	Thai Restaurant	Seafood Restaurant	Restaurant	
22	Japanese Restaurant	Thai Restaurant	Seafood Restaurant	
23	Thai Restaurant	Seafood Restaurant	Restaurant	
24	Japanese Restaurant	Thai Restaurant	Seafood Restaurant	



25		0	0	0
28	Thai Restaurant	Seafood Restaurant		Restaurant
30		0	0	0
31		0	0	0
32		0	0	0
33		0	0	0
34		0	0	0
35		0	0	0
36	Thai Restaurant	Seafood Restaurant		Restaurant
39	Thai Restaurant	Seafood Restaurant		Restaurant
40	Thai Restaurant	Seafood Restaurant		Restaurant
41	Thai Restaurant	Seafood Restaurant		Restaurant
42	Thai Restaurant	Seafood Restaurant		Restaurant
43	Thai Restaurant	Seafood Restaurant		Restaurant
44	Thai Restaurant	Seafood Restaurant		Restaurant
45	Restaurant	Thai Restaurant	Seafood Restaurant	
47	Thai Restaurant	Seafood Restaurant		Restaurant
53	Thai Restaurant	Seafood Restaurant		Restaurant
62	Thai Restaurant	Seafood Restaurant		Restaurant
65	Thai Restaurant	Seafood Restaurant		Restaurant
66	Thai Restaurant	Seafood Restaurant		Restaurant
68	Thai Restaurant	Seafood Restaurant		Restaurant
71	Thai Restaurant	Seafood Restaurant		Restaurant
72	Thai Restaurant	Seafood Restaurant		Restaurant
73	Thai Restaurant	Seafood Restaurant		Restaurant
74		0	0	0
76	Thai Restaurant	Seafood Restaurant		Restaurant
79		0	0	0
80	Thai Restaurant	Seafood Restaurant		Restaurant
81		0	0	0
82	Thai Restaurant	Seafood Restaurant		Restaurant
83	Thai Restaurant	Seafood Restaurant		Restaurant
84	Thai Restaurant	Seafood Restaurant		Restaurant
86	Thai Restaurant	Seafood Restaurant		Restaurant
87	Thai Restaurant	Seafood Restaurant		Restaurant
88	Thai Restaurant	Seafood Restaurant		Restaurant
89		0	0	0
90	Thai Restaurant	Seafood Restaurant		Restaurant
91		0	0	0
93		0	0	0
94		0	0	0
95		0	0	0
96		0	0	0
97		0	0	0
98		0	0	0
99	Thai Restaurant	Seafood Restaurant		Restaurant
100		0	0	0

101	0	0	0
102	0	0	0

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue \
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
5	0	0	0
6	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
7	0	0	0
8	0	0	0
9	0	0	0
11	0	0	0
12	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
13	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
14	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
15	0	0	0
16	0	0	0
17	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
19	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
20	0	0	0
21	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
22	Restaurant	Korean Restaurant	Hawaiian Restaurant
23	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
24	Restaurant	Korean Restaurant	Hawaiian Restaurant
25	0	0	0
28	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
30	0	0	0
31	0	0	0
32	0	0	0
33	0	0	0
34	0	0	0
35	0	0	0
36	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
39	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
40	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
41	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
42	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
43	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
44	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
45	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
47	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
53	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
62	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
65	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant

66	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
68	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
71	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
72	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
73	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
74	0	0	0
76	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
79	0	0	0
80	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
81	0	0	0
82	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
83	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
84	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
86	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
87	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
88	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
89	0	0	0
90	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
91	0	0	0
93	0	0	0
94	0	0	0
95	0	0	0
96	0	0	0
97	0	0	0
98	0	0	0
99	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant
100	0	0	0
101	0	0	0
102	0	0	0

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	0	0	0
1	0	0	0
2	0	0	0
3	0	0	0
4	Grocery Store	Fast Food Restaurant	Asian Restaurant
5	0	0	0
6	Grocery Store	Fast Food Restaurant	Asian Restaurant
7	0	0	0
8	0	0	0
9	0	0	0
11	0	0	0
12	Grocery Store	Fast Food Restaurant	Asian Restaurant
13	Grocery Store	Fast Food Restaurant	Asian Restaurant
14	Grocery Store	Fast Food Restaurant	Asian Restaurant
15	0	0	0
16	0	0	0

17	Grocery Store	Fast Food Restaurant	Asian Restaurant
19	Grocery Store	Fast Food Restaurant	Asian Restaurant
20	0	0	0
21	Grocery Store	Fast Food Restaurant	Asian Restaurant
22	Grocery Store	Fast Food Restaurant	Asian Restaurant
23	Grocery Store	Fast Food Restaurant	Asian Restaurant
24	Grocery Store	Fast Food Restaurant	Asian Restaurant
25	0	0	0
28	Grocery Store	Fast Food Restaurant	Asian Restaurant
30	0	0	0
31	0	0	0
32	0	0	0
33	0	0	0
34	0	0	0
35	0	0	0
36	Grocery Store	Fast Food Restaurant	Asian Restaurant
39	Grocery Store	Fast Food Restaurant	Asian Restaurant
40	Grocery Store	Fast Food Restaurant	Asian Restaurant
41	Grocery Store	Fast Food Restaurant	Asian Restaurant
42	Grocery Store	Fast Food Restaurant	Asian Restaurant
43	Grocery Store	Fast Food Restaurant	Asian Restaurant
44	Grocery Store	Fast Food Restaurant	Asian Restaurant
45	Grocery Store	Fast Food Restaurant	Asian Restaurant
47	Grocery Store	Fast Food Restaurant	Asian Restaurant
53	Grocery Store	Fast Food Restaurant	Asian Restaurant
62	Grocery Store	Fast Food Restaurant	Asian Restaurant
65	Grocery Store	Fast Food Restaurant	Asian Restaurant
66	Grocery Store	Fast Food Restaurant	Asian Restaurant
68	Grocery Store	Fast Food Restaurant	Asian Restaurant
71	Grocery Store	Fast Food Restaurant	Asian Restaurant
72	Grocery Store	Fast Food Restaurant	Asian Restaurant
73	Grocery Store	Fast Food Restaurant	Asian Restaurant
74	0	0	0
76	Grocery Store	Fast Food Restaurant	Asian Restaurant
79	0	0	0
80	Grocery Store	Fast Food Restaurant	Asian Restaurant
81	0	0	0
82	Grocery Store	Fast Food Restaurant	Asian Restaurant
83	Grocery Store	Fast Food Restaurant	Asian Restaurant
84	Grocery Store	Fast Food Restaurant	Asian Restaurant
86	Grocery Store	Fast Food Restaurant	Asian Restaurant
87	Grocery Store	Fast Food Restaurant	Asian Restaurant
88	Grocery Store	Fast Food Restaurant	Asian Restaurant
89	0	0	0
90	Grocery Store	Fast Food Restaurant	Asian Restaurant
91	0	0	0
93	0	0	0

94		0	0	0
95		0	0	0
96		0	0	0
97		0	0	0
98		0	0	0
99	Grocery Store	Fast Food Restaurant	Asian Restaurant	
100		0	0	0
101		0	0	0
102		0	0	0

```
[69]: toronto_merged.loc[toronto_merged['Cluster Labels'] == 1, toronto_merged.
      ↪columns[[1] + list(range(5, toronto_merged.shape[1]))]]
```

```
[69]:      Borough Cluster Labels 1st Most Common Venue 2nd Most Common Venue \
18 North York          1 Japanese Restaurant      Sushi Restaurant

      3rd Most Common Venue 4th Most Common Venue 5th Most Common Venue \
18 Restaurant      Asian Restaurant      Thai Restaurant

      6th Most Common Venue 7th Most Common Venue 8th Most Common Venue \
18 Seafood Restaurant      Korean Restaurant      Hawaiian Restaurant

      9th Most Common Venue 10th Most Common Venue
18 Grocery Store      Fast Food Restaurant
```

```
[70]: toronto_merged.loc[toronto_merged['Cluster Labels'] == 2, toronto_merged.
      ↪columns[[1] + list(range(5, toronto_merged.shape[1]))]]
```

```
[70]:      Borough Cluster Labels 1st Most Common Venue \
26 North York          2 Sushi Restaurant
27 North York          2 Sushi Restaurant
37 East Toronto        2 Sushi Restaurant
38 East York           2 Sushi Restaurant
48 Central Toronto     2 Sushi Restaurant
49 Central Toronto     2 Sushi Restaurant
51 Downtown Toronto    2 Sushi Restaurant
52 Downtown Toronto    2 Sushi Restaurant
54 Downtown Toronto    2 Sushi Restaurant
55 Downtown Toronto    2 Sushi Restaurant
57 Downtown Toronto    2 Sushi Restaurant
58 Downtown Toronto    2 Sushi Restaurant
60 Downtown Toronto    2 Sushi Restaurant
61 Downtown Toronto    2 Sushi Restaurant
63 Central Toronto     2 Sushi Restaurant
64 Central Toronto     2 Sushi Restaurant
67 Downtown Toronto    2 Sushi Restaurant
70 Downtown Toronto    2 Sushi Restaurant
```

77	West Toronto	2	Sushi Restaurant
78	West Toronto	2	Sushi Restaurant
85	Downtown Toronto	2	Sushi Restaurant
92	Etobicoke	2	Sushi Restaurant

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue \
26	Japanese Restaurant	Thai Restaurant	Seafood Restaurant
27	Japanese Restaurant	Thai Restaurant	Seafood Restaurant
37	Japanese Restaurant	Thai Restaurant	Seafood Restaurant
38	Japanese Restaurant	Thai Restaurant	Seafood Restaurant
48	Japanese Restaurant	Thai Restaurant	Seafood Restaurant
49	Japanese Restaurant	Thai Restaurant	Seafood Restaurant
51	Korean Restaurant	Thai Restaurant	Seafood Restaurant
52	Japanese Restaurant	Restaurant	Korean Restaurant
54	Japanese Restaurant	Fast Food Restaurant	Asian Restaurant
55	Restaurant	Japanese Restaurant	Grocery Store
57	Japanese Restaurant	Grocery Store	Fast Food Restaurant
58	Japanese Restaurant	Restaurant	Grocery Store
60	Japanese Restaurant	Restaurant	Grocery Store
61	Japanese Restaurant	Restaurant	Grocery Store
63	Japanese Restaurant	Thai Restaurant	Seafood Restaurant
64	Japanese Restaurant	Thai Restaurant	Seafood Restaurant
67	Thai Restaurant	Seafood Restaurant	Japanese Restaurant
70	Japanese Restaurant	Restaurant	Grocery Store
77	Japanese Restaurant	Thai Restaurant	Seafood Restaurant
78	Japanese Restaurant	Thai Restaurant	Seafood Restaurant
85	Japanese Restaurant	Fast Food Restaurant	Asian Restaurant
92	Asian Restaurant	Thai Restaurant	Seafood Restaurant

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue \
26	Restaurant	Korean Restaurant	Hawaiian Restaurant
27	Restaurant	Korean Restaurant	Hawaiian Restaurant
37	Restaurant	Korean Restaurant	Hawaiian Restaurant
38	Restaurant	Korean Restaurant	Hawaiian Restaurant
48	Restaurant	Korean Restaurant	Hawaiian Restaurant
49	Restaurant	Korean Restaurant	Hawaiian Restaurant
51	Restaurant	Japanese Restaurant	Hawaiian Restaurant
52	Fast Food Restaurant	Asian Restaurant	Thai Restaurant
54	Thai Restaurant	Seafood Restaurant	Restaurant
55	Asian Restaurant	Thai Restaurant	Seafood Restaurant
57	Asian Restaurant	Thai Restaurant	Seafood Restaurant
58	Asian Restaurant	Thai Restaurant	Seafood Restaurant
60	Asian Restaurant	Thai Restaurant	Seafood Restaurant
61	Asian Restaurant	Thai Restaurant	Seafood Restaurant
63	Restaurant	Korean Restaurant	Hawaiian Restaurant
64	Restaurant	Korean Restaurant	Hawaiian Restaurant
67	Hawaiian Restaurant	Restaurant	Korean Restaurant

70	Asian Restaurant	Thai Restaurant	Seafood Restaurant
77	Restaurant	Korean Restaurant	Hawaiian Restaurant
78	Restaurant	Korean Restaurant	Hawaiian Restaurant
85	Thai Restaurant	Seafood Restaurant	Restaurant
92	Restaurant	Korean Restaurant	Japanese Restaurant

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
26	Grocery Store	Fast Food Restaurant	Asian Restaurant
27	Grocery Store	Fast Food Restaurant	Asian Restaurant
37	Grocery Store	Fast Food Restaurant	Asian Restaurant
38	Grocery Store	Fast Food Restaurant	Asian Restaurant
48	Grocery Store	Fast Food Restaurant	Asian Restaurant
49	Grocery Store	Fast Food Restaurant	Asian Restaurant
51	Grocery Store	Fast Food Restaurant	Asian Restaurant
52	Seafood Restaurant	Hawaiian Restaurant	Grocery Store
54	Korean Restaurant	Hawaiian Restaurant	Grocery Store
55	Korean Restaurant	Hawaiian Restaurant	Fast Food Restaurant
57	Restaurant	Korean Restaurant	Hawaiian Restaurant
58	Korean Restaurant	Hawaiian Restaurant	Fast Food Restaurant
60	Korean Restaurant	Hawaiian Restaurant	Fast Food Restaurant
61	Korean Restaurant	Hawaiian Restaurant	Fast Food Restaurant
63	Grocery Store	Fast Food Restaurant	Asian Restaurant
64	Grocery Store	Fast Food Restaurant	Asian Restaurant
67	Grocery Store	Fast Food Restaurant	Asian Restaurant
70	Korean Restaurant	Hawaiian Restaurant	Fast Food Restaurant
77	Grocery Store	Fast Food Restaurant	Asian Restaurant
78	Grocery Store	Fast Food Restaurant	Asian Restaurant
85	Korean Restaurant	Hawaiian Restaurant	Grocery Store
92	Hawaiian Restaurant	Grocery Store	Fast Food Restaurant

```
[71]: toronto_merged.loc[toronto_merged['Cluster Labels'] == 3, toronto_merged.
      ↪columns[[1] + list(range(5, toronto_merged.shape[1]))]]
```

```
[71]:
```

	Borough	Cluster Labels	1st Most Common Venue	\
29	North York	3	Sushi Restaurant	
46	Central Toronto	3	Sushi Restaurant	
56	Downtown Toronto	3	Sushi Restaurant	
59	Downtown Toronto	3	Sushi Restaurant	
69	Downtown Toronto	3	Sushi Restaurant	

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	\
29	Restaurant	Thai Restaurant	Seafood Restaurant	
46	Restaurant	Thai Restaurant	Seafood Restaurant	
56	Restaurant	Japanese Restaurant	Asian Restaurant	
59	Restaurant	Japanese Restaurant	Thai Restaurant	
69	Restaurant	Japanese Restaurant	Asian Restaurant	

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	\
29	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant	
46	Korean Restaurant	Japanese Restaurant	Hawaiian Restaurant	
56	Thai Restaurant	Seafood Restaurant	Korean Restaurant	
59	Seafood Restaurant	Korean Restaurant	Hawaiian Restaurant	
69	Thai Restaurant	Seafood Restaurant	Korean Restaurant	

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
29	Grocery Store	Fast Food Restaurant	Asian Restaurant
46	Grocery Store	Fast Food Restaurant	Asian Restaurant
56	Hawaiian Restaurant	Grocery Store	Fast Food Restaurant
59	Grocery Store	Fast Food Restaurant	Asian Restaurant
69	Hawaiian Restaurant	Grocery Store	Fast Food Restaurant

```
[72]: toronto_merged.loc[toronto_merged['Cluster Labels'] == 4, toronto_merged.
      ↪columns[[1] + list(range(5, toronto_merged.shape[1]))]]
```

```
[72]:
```

	Borough	Cluster Labels	1st Most Common Venue	\
10	Scarborough	4	Japanese Restaurant	
75	Downtown Toronto	4	Japanese Restaurant	

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	\
10	Thai Restaurant	Sushi Restaurant	Seafood Restaurant	
75	Thai Restaurant	Sushi Restaurant	Seafood Restaurant	

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	\
10	Restaurant	Korean Restaurant	Hawaiian Restaurant	
75	Restaurant	Korean Restaurant	Hawaiian Restaurant	

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
10	Grocery Store	Fast Food Restaurant	Asian Restaurant
75	Grocery Store	Fast Food Restaurant	Asian Restaurant

```
[73]: toronto_merged.loc[toronto_merged['Cluster Labels'] == 5, toronto_merged.
      ↪columns[[1] + list(range(5, toronto_merged.shape[1]))]]
```

```
[73]:
```

	Borough	Cluster Labels	1st Most Common Venue	\
50	Downtown Toronto	5	Sushi Restaurant	

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	\
50	Korean Restaurant	Thai Restaurant	Seafood Restaurant	

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	\
50	Restaurant	Japanese Restaurant	Hawaiian Restaurant	

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
50	Grocery Store	Fast Food Restaurant	Asian Restaurant



## 0.8 Results and Discussion

Our analysis shows that although there is a great number of Sushi restaurants in Toronto (~800 in our initial area of interest which was radius 1000 around each neighbourhood), there are pockets of low restaurant density fairly close to city center. Highest concentration of restaurants was detected in downtown Toronto area, so we focused our attention to areas north, north-east, far away from downtown area.

Those location candidates were then clustered to create zones of interest which contain greatest number of location candidates. Purpose of this analysis was to only provide info on areas in Toronto but not crowded with existing restaurants (particularly Sushi) - it is entirely possible that there is a very good reason for small number of restaurants in any of those areas, reasons which would make them unsuitable for a new restaurant regardless of lack of competition in the area. Recommended zones should therefore be considered only as a starting point for more detailed analysis which could eventually result in location which has not only no nearby competition but also other factors taken into account and all other relevant conditions met.

## 0.9 Conclusion

Purpose of this project was to identify Toronto areas close to center with low number of restaurants (particularly SUshi restaurants) in order to aid stakeholders in narrowing down the search for optimal location for a new Sushi restaurant. By calculating restaurant density distribution from Foursquare data we have first identified general avenues that justify further analysis. Clustering of those locations was then performed in order to create major zones of interest (containing greatest number of potential locations) and addresses of those zone centers were created to be used as starting points for final exploration by stakeholders. From the clustering results, area near cluster 2, cluster 4 and cluster 5 might be good to open a new restaurant. However, since cluster 5 is a address in Downtown, it's better to drop this choice. So let's choose cluster 2 and cluster 4 as candidates.

Final decision on optimal restaurant location will be made by stakeholders based on specific characteristics of neighborhoods and locations in every recommended zone, taking into consideration additional factors like attractiveness of each location (proximity to park or water), levels of noise / proximity to major roads, real estate availability, prices, social and economic dynamics of every neighborhood etc.