In [1]:
```python
import pandas as pd
import numpy as np
```

In [2]:
```python
!conda install beautifulSoup4
!conda install lxml
!conda install html5lib
!conda install requests
```

```
Collecting package metadata (current_repodata.json): ...working... done
Solving environment: ...working... done

# All requested packages already installed.

Collecting package metadata (current_repodata.json): ...working... done
Solving environment: ...working... done

# All requested packages already installed.

Collecting package metadata (current_repodata.json): ...working... done
Solving environment: ...working... done

# All requested packages already installed.

Collecting package metadata (current_repodata.json): ...working... done
Solving environment: ...working... done

# All requested packages already installed.
```

In [3]:
```python
from bs4 import BeautifulSoup
import requests
```

Reading the Webpage

In [4]:
```python
source=requests.get('https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M').text
soup = BeautifulSoup(source,'lxml')
```

Extracting the table from the Webpage

In [5]:
```python
table=soup.find_all('table')[0]
```

In [6]:
```python
n_columns = 0
n_rows=0
column_names = ['PostalCode','Borough','Neighborhood']

for row in table.find_all('tr'):

                # Determine the number of rows in the table
                td_tags = row.find_all('td')
                if len(td_tags) > 0:
                    n_rows+=1
                    if n_columns == 0:
                        # Set the number of columns for our table
                        n_columns = len(td_tags)


columns = column_names if len(column_names) > 0 else range(0,n_columns)
df = pd.DataFrame(columns = columns,
                            index= range(0,n_rows))
row_marker = 0
for row in table.find_all('tr'):
                column_marker = 0
                columns = row.find_all('td')
                for column in columns:
                    df.iat[row_marker,column_marker] = column.get_text().strip
()

                    column_marker += 1
                if len(columns) > 0:
                    row_marker += 1
```

Dropping rows with Borough as Not Assigned

In [7]:
```python
df1=df[df.Borough!='Not assigned']
```

Replacing Neighborhood value if Not Assigned with same as Borough

In [8]:
```python
df1.loc[:,'Neighborhood'] = np.where(df1['Neighborhood'] == 'Not assigned', df
1['Borough'], df1['Neighborhood'])
```

```
C:\Users\punee\Anaconda4\lib\site-packages\pandas\core\indexing.py:635: Setti
ngWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame.
Try using .loc[row_indexer,col_indexer] = value instead

See the caveats in the documentation: http://pandas.pydata.org/pandas-docs/st
able/indexing.html#indexing-view-versus-copy
  self.obj[item_labels[indexer[info_axis]]] = value
```

Group by Postal code and reset the index

```
In [9]:   df1_groupby=df1[['PostalCode','Borough','Neighborhood']].groupby(['PostalCode'
          ,'Borough'])['Neighborhood'].apply(lambda Neighborhood: ','.join(Neighborhood
          ))
          df1_groupby=df1_groupby.reset_index()
```

```
In [10]:  df1_groupby.shape
```

```
Out[10]:  (103, 3)
```

```
In [11]:  !pip install wget
          import wget
          url = 'http://cocl.us/Geospatial_data'
          filename = wget.download(url)
```

```
Requirement already satisfied: wget in c:\users\punee\anaconda4\lib\site-pack
ages (3.2)
100%
[..........................................................................
 2891 / 2891
```

```
In [12]:  df_geo = pd.read_csv(filename)
          df_geo.head()
```

Out[12]:

	Postal Code	Latitude	Longitude
0	M1B	43.806686	-79.194353
1	M1C	43.784535	-79.160497
2	M1E	43.763573	-79.188711
3	M1G	43.770992	-79.216917
4	M1H	43.773136	-79.239476

```
In [14]:  df1_groupby_coord=pd.merge(df1_groupby, df_geo, left_on='PostalCode', right_on
          ='Postal Code')
```

In [15]:
```python
df1_groupby_coord.drop(columns=['Postal Code'])
```

Out[15]:

	PostalCode	Borough	Neighborhood	Latitude	Longitude
0	M1B	Scarborough	Rouge,Malvern	43.806686	-79.194353
1	M1C	Scarborough	Highland Creek,Rouge Hill,Port Union	43.784535	-79.160497
2	M1E	Scarborough	Guildwood,Morningside,West Hill	43.763573	-79.188711
3	M1G	Scarborough	Woburn	43.770992	-79.216917
4	M1H	Scarborough	Cedarbrae	43.773136	-79.239476
5	M1J	Scarborough	Scarborough Village	43.744734	-79.239476
6	M1K	Scarborough	East Birchmount Park,Ionview,Kennedy Park	43.727929	-79.262029
7	M1L	Scarborough	Clairlea,Golden Mile,Oakridge	43.711112	-79.284577
8	M1M	Scarborough	Cliffcrest,Cliffside,Scarborough Village West	43.716316	-79.239476
9	M1N	Scarborough	Birch Cliff,Cliffside West	43.692657	-79.264848
10	M1P	Scarborough	Dorset Park,Scarborough Town Centre,Wexford He...	43.757410	-79.273304
11	M1R	Scarborough	Maryvale,Wexford	43.750072	-79.295849
12	M1S	Scarborough	Agincourt	43.794200	-79.262029
13	M1T	Scarborough	Clarks Corners,Sullivan,Tam O'Shanter	43.781638	-79.304302
14	M1V	Scarborough	Agincourt North,L'Amoreaux East,Milliken,Steel...	43.815252	-79.284577
15	M1W	Scarborough	L'Amoreaux West	43.799525	-79.318389
16	M1X	Scarborough	Upper Rouge	43.836125	-79.205636
17	M2H	North York	Hillcrest Village	43.803762	-79.363452
18	M2J	North York	Fairview,Henry Farm,Oriole	43.778517	-79.346556
19	M2K	North York	Bayview Village	43.786947	-79.385975
20	M2L	North York	Silver Hills,York Mills	43.757490	-79.374714
21	M2M	North York	Newtonbrook,Willowdale	43.789053	-79.408493
22	M2N	North York	Willowdale South	43.770120	-79.408493
23	M2P	North York	York Mills West	43.752758	-79.400049
24	M2R	North York	Willowdale West	43.782736	-79.442259
25	M3A	North York	Parkwoods	43.753259	-79.329656
26	M3B	North York	Don Mills North	43.745906	-79.352188
27	M3C	North York	Flemingdon Park,Don Mills South	43.725900	-79.340923
28	M3H	North York	Bathurst Manor,Downsview North,Wilson Heights	43.754328	-79.442259
29	M3J	North York	Northwood Park,York University	43.767980	-79.487262
...	...	...	...	...	...
73	M6C	York	Humewood-Cedarvale	43.693781	-79.428191
74	M6E	York	Caledonia-Fairbanks	43.689026	-79.453512

	PostalCode	Borough	Neighborhood	Latitude	Longitude
75	M6G	Downtown Toronto	Christie	43.669542	-79.422564
76	M6H	West Toronto	Dovercourt Village,Dufferin	43.669005	-79.442259
77	M6J	West Toronto	Little Portugal,Trinity	43.647927	-79.419750
78	M6K	West Toronto	Brockton,Exhibition Place,Parkdale Village	43.636847	-79.428191
79	M6L	North York	Downsview,North Park,Upwood Park	43.713756	-79.490074
80	M6M	York	Del Ray,Keelesdale,Mount Dennis,Silverthorn	43.691116	-79.476013
81	M6N	York	The Junction North,Runnymede	43.673185	-79.487262
82	M6P	West Toronto	High Park,The Junction South	43.661608	-79.464763
83	M6R	West Toronto	Parkdale,Roncesvalles	43.648960	-79.456325
84	M6S	West Toronto	Runnymede,Swansea	43.651571	-79.484450
85	M7A	Queen's Park	Queen's Park	43.662301	-79.389494
86	M7R	Mississauga	Canada Post Gateway Processing Centre	43.636966	-79.615819
87	M7Y	East Toronto	Business Reply Mail Processing Centre 969 Eastern	43.662744	-79.321558
88	M8V	Etobicoke	Humber Bay Shores,Mimico South,New Toronto	43.605647	-79.501321
89	M8W	Etobicoke	Alderwood,Long Branch	43.602414	-79.543484
90	M8X	Etobicoke	The Kingsway,Montgomery Road,Old Mill North	43.653654	-79.506944
91	M8Y	Etobicoke	Humber Bay,King's Mill Park,Kingsway Park Sout...	43.636258	-79.498509
92	M8Z	Etobicoke	Kingsway Park South West,Mimico NW,The Queensw...	43.628841	-79.520999
93	M9A	Etobicoke	Islington Avenue	43.667856	-79.532242
94	M9B	Etobicoke	Cloverdale,Islington,Martin Grove,Princess Gar...	43.650943	-79.554724
95	M9C	Etobicoke	Bloordale Gardens,Eringate,Markland Wood,Old B...	43.643515	-79.577201
96	M9L	North York	Humber Summit	43.756303	-79.565963
97	M9M	North York	Emery,Humberlea	43.724766	-79.532242
98	M9N	York	Weston	43.706876	-79.518188
99	M9P	Etobicoke	Westmount	43.696319	-79.532242
100	M9R	Etobicoke	Kingsview Village,Martin Grove Gardens,Richvie...	43.688905	-79.554724
101	M9V	Etobicoke	Albion Gardens,Beaumond Heights,Humbergate,Jam...	43.739416	-79.588437
102	M9W	Etobicoke	Northwest	43.706748	-79.594054

103 rows × 5 columns

In [16]:
```python
import json # library to handle JSON files

#!conda install -c conda-forge geopy --yes # uncomment this line if you haven
't completed the Foursquare API lab
from geopy.geocoders import Nominatim # convert an address into latitude and l
ongitude values

import requests # library to handle requests
from pandas.io.json import json_normalize # tranform JSON file into a pandas d
ataframe

# Matplotlib and associated plotting modules
import matplotlib.cm as cm
import matplotlib.colors as colors

# import k-means from clustering stage
from sklearn.cluster import KMeans

#!conda install -c conda-forge folium=0.5.0 --yes # uncomment this line if you
haven't completed the Foursquare API lab
import folium # map rendering library
```

In [17]:
```python
def getNearbyVenues(names, latitudes, longitudes, radius=500):

    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/explore?&client_id={}&clie
nt_secret={}&v={}&ll={},{}&radius={}&limit={}'.format(
            CLIENT_ID,
            CLIENT_SECRET,
            VERSION,
            lat,
            lng,
            radius,
            LIMIT)

        # make the GET request
        results = requests.get(url).json()["response"]['groups'][0]['items']

        # return only relevant information for each nearby venue
        venues_list.append([(
            name,
            lat,
            lng,
            v['venue']['name'],
            v['venue']['location']['lat'],
            v['venue']['location']['lng'],
            v['venue']['categories'][0]['name']) for v in results])

    nearby_venues = pd.DataFrame([item for venue_list in venues_list for item
in venue_list])
    nearby_venues.columns = ['Neighborhood',
                  'Neighborhood Latitude',
                  'Neighborhood Longitude',
                  'Venue',
                  'Venue Latitude',
                  'Venue Longitude',
                  'Venue Category']

    return(nearby_venues)
```

In [18]:
```python
address = 'Toronto, ON'

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

```
The geograpical coordinate of Toronto City are 43.653963, -79.387207.
```

In [19]:
```python
toronto_data = df1_groupby_coord[df1_groupby_coord['Borough'].str.contains('To
ronto', regex=False)].reset_index(drop=True)
toronto_data.head()
toronto_data.shape
```

Out[19]: (38, 6)

create map of Toronto using latitude and longitude values

In [20]:
```python
map_toronto = folium.Map(location=[43.676357, -79.293031], zoom_start=12)
for lat, lng, borough, neighborhood in zip(toronto_data['Latitude'], toronto_d
ata['Longitude'], toronto_data['Borough'], toronto_data['Neighborhood']):
    label = '{}, {}'.format(neighborhood, 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
```

Out[20]:

Leaflet (http://leafletjs.com)
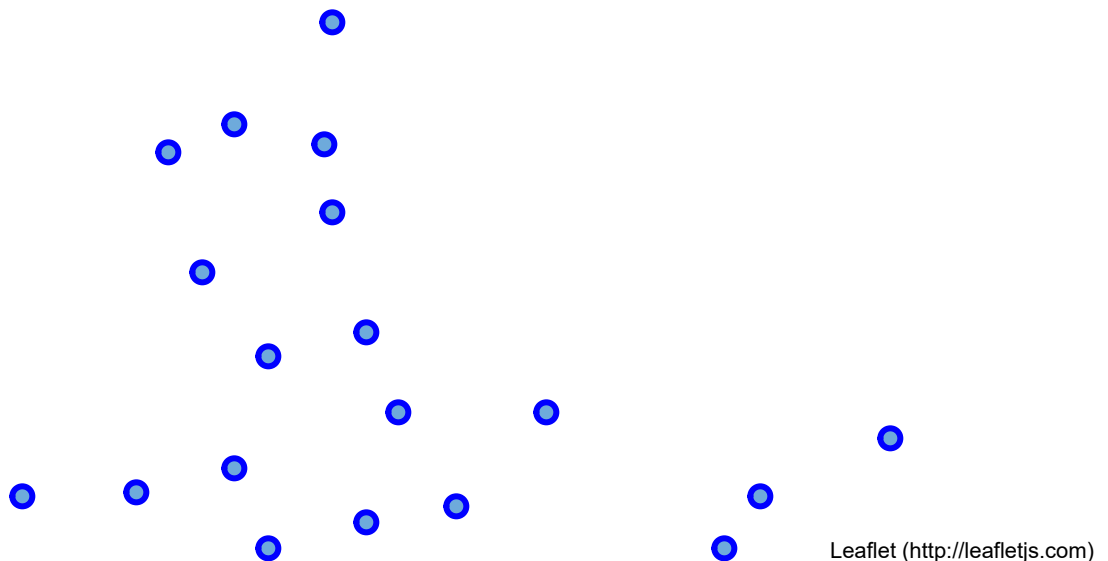
In [21]:
```python
map_toronto.save("good_loans_map.html")
```

In [22]:
```python
CLIENT_ID = '2SDNAYRBFVGRV00MQ0BYRMGQZ4J55BF011VXIAJYOCZI4VVV' # your Foursqua
re ID
CLIENT_SECRET = 'TPGLM2GBMFLWEMYET0FAAS0B0F0NO1MMB3IBJYHWB0AOWEMO' # your Four
square Secret
VERSION = '20180604'

print('Your credentails:')
print('CLIENT_ID: ' + CLIENT_ID)
print('CLIENT_SECRET:' + CLIENT_SECRET)
```

```
Your credentails:
CLIENT_ID: 2SDNAYRBFVGRV00MQ0BYRMGQZ4J55BF011VXIAJYOCZI4VVV
CLIENT_SECRET:TPGLM2GBMFLWEMYET0FAAS0B0F0NO1MMB3IBJYHWB0AOWEMO
```

In [23]:
```python
toronto_data.loc[0, 'Neighborhood']
```

Out[23]: `'The Beaches'`

In [24]:
```python
neighborhood_latitude = toronto_data.loc[0, 'Latitude'] # neighborhood latitud
e value
neighborhood_longitude = toronto_data.loc[0, 'Longitude'] # neighborhood longi
tude value

neighborhood_name = toronto_data.loc[0, 'Neighborhood'] # neighborhood name

print('Latitude and longitude values of {} are {}, {}.'.format(neighborhood_na
me,
                                                               neighborhood_la
titude,
                                                               neighborhood_lo
ngitude))
```

```
Latitude and longitude values of The Beaches are 43.67635739999999, -79.29303
12.
```

In [25]:
```python
LIMIT = 100 # limit of number of venues returned by Foursquare API

radius = 500 # define radius

url = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secre
t={}&v={}&ll={},{}&radius={}&limit={}'.format(
    CLIENT_ID,
    CLIENT_SECRET,
    VERSION,
    neighborhood_latitude,
    neighborhood_longitude,
    radius,
    LIMIT)
url # display URL
```

Out[25]: `'https://api.foursquare.com/v2/venues/explore?&client_id=2SDNAYRBFVGRV00MQ0BY`
`RMGQZ4J55BF011VXIAJYOCZI4VVV&client_secret=TPGLM2GBMFLWEMYET0FAAS0B0F0NO1MMB3`
`IBJYHWB0AOWEMO&v=20180604&ll=43.67635739999999,-79.2930312&radius=500&limit=1`
`00'`

In [26]:
```python
results = requests.get(url).json()
results
```

```
Out[26]: {'meta': {'code': 200, 'requestId': '5d634d895fc8ed0030fdf0ac'},
          'response': {'headerLocation': 'The Beaches',
           'headerFullLocation': 'The Beaches, Toronto',
           'headerLocationGranularity': 'neighborhood',
           'totalResults': 4,
           'suggestedBounds': {'ne': {'lat': 43.680857404499996,
             'lng': -79.28682091449052},
            'sw': {'lat': 43.67185739549999, 'lng': -79.29924148550948}},
           'groups': [{'type': 'Recommended Places',
             'name': 'recommended',
             'items': [{'reasons': {'count': 0,
                'items': [{'summary': 'This spot is popular',
                  'type': 'general',
                  'reasonName': 'globalInteractionReason'}]},
               'venue': {'id': '4bd461bc77b29c74a07d9282',
                'name': 'Glen Manor Ravine',
                'location': {'address': 'Glen Manor',
                 'crossStreet': 'Queen St.',
                 'lat': 43.67682094413784,
                 'lng': -79.29394208780985,
                 'labeledLatLngs': [{'label': 'display',
                   'lat': 43.67682094413784,
                   'lng': -79.29394208780985}],
                 'distance': 89,
                 'cc': 'CA',
                 'city': 'Toronto',
                 'state': 'ON',
                 'country': 'Canada',
                 'formattedAddress': ['Glen Manor (Queen St.)',
                  'Toronto ON',
                  'Canada']},
                'categories': [{'id': '4bf58dd8d48988d159941735',
                  'name': 'Trail',
                  'pluralName': 'Trails',
                  'shortName': 'Trail',
                  'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_out
doors/hikingtrail_',
                   'suffix': '.png'},
                  'primary': True}],
                'photos': {'count': 0, 'groups': []}},
               'referralId': 'e-0-4bd461bc77b29c74a07d9282-0'},
              {'reasons': {'count': 0,
                'items': [{'summary': 'This spot is popular',
                  'type': 'general',
                  'reasonName': 'globalInteractionReason'}]},
               'venue': {'id': '4ad4c062f964a52011f820e3',
                'name': 'The Big Carrot Natural Food Market',
                'location': {'address': '125 Southwood Dr',
                 'lat': 43.678879,
                 'lng': -79.297734,
                 'labeledLatLngs': [{'label': 'display',
                   'lat': 43.678879,
                   'lng': -79.297734}],
                 'distance': 471,
                 'postalCode': 'M4E 0B8',
                 'cc': 'CA',
                 'city': 'Toronto',
```

                                 'state': 'ON',
                                 'country': 'Canada',
                                 'formattedAddress': ['125 Southwood Dr',
                                  'Toronto ON M4E 0B8',
                                  'Canada']},
                              'categories': [{'id': '50aa9e744b90af0d42d5de0e',
                                 'name': 'Health Food Store',
                                 'pluralName': 'Health Food Stores',
                                 'shortName': 'Health Food Store',
                                 'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/shops/foo
        d_grocery_',
                                  'suffix': '.png'},
                                 'primary': True}],
                              'photos': {'count': 0, 'groups': []},
                              'venuePage': {'id': '75150878'}},
                           'referralId': 'e-0-4ad4c062f964a52011f820e3-1'},
                          {'reasons': {'count': 0,
                             'items': [{'summary': 'This spot is popular',
                                'type': 'general',
                                'reasonName': 'globalInteractionReason'}]},
                           'venue': {'id': '4b8daea1f964a520480833e3',
                             'name': 'Grover Pub and Grub',
                             'location': {'address': '676 Kingston Rd.',
                              'crossStreet': 'at Main St.',
                              'lat': 43.679181434941015,
                              'lng': -79.29721535878515,
                              'labeledLatLngs': [{'label': 'display',
                                 'lat': 43.679181434941015,
                                 'lng': -79.29721535878515}],
                              'distance': 460,
                              'postalCode': 'M4E 1R4',
                              'cc': 'CA',
                              'city': 'Toronto',
                              'state': 'ON',
                              'country': 'Canada',
                              'formattedAddress': ['676 Kingston Rd. (at Main St.)',
                               'Toronto ON M4E 1R4',
                               'Canada']},
                              'categories': [{'id': '4bf58dd8d48988d11b941735',
                                'name': 'Pub',
                                'pluralName': 'Pubs',
                                'shortName': 'Pub',
                                'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/nightlif
        e/pub_',
                                 'suffix': '.png'},
                                'primary': True}],
                              'photos': {'count': 0, 'groups': []}},
                           'referralId': 'e-0-4b8daea1f964a520480833e3-2'},
                          {'reasons': {'count': 0,
                             'items': [{'summary': 'This spot is popular',
                                'type': 'general',
                                'reasonName': 'globalInteractionReason'}]},
                           'venue': {'id': '4df91c4bae60f95f82229ad5',
                             'name': 'Upper Beaches',
                             'location': {'lat': 43.68056321147582,
                              'lng': -79.2928688743688,
                              'labeledLatLngs': [{'label': 'display',

```
                    'lat': 43.68056321147582,
                    'lng': -79.2928688743688}],
                'distance': 468,
                'cc': 'CA',
                'city': 'Toronto',
                'state': 'ON',
                'country': 'Canada',
                'formattedAddress': ['Toronto ON', 'Canada']},
              'categories': [{'id': '4f2a25ac4b909258e854f55f',
                'name': 'Neighborhood',
                'pluralName': 'Neighborhoods',
                'shortName': 'Neighborhood',
                'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/parks_out
        doors/neighborhood_',
                 'suffix': '.png'},
                'primary': True}],
              'photos': {'count': 0, 'groups': []}},
            'referralId': 'e-0-4df91c4bae60f95f82229ad5-3'}]}]}}
```

In [27]:
```python
# function that extracts the category of the venue
def get_category_type(row):
    try:
        categories_list = row['categories']
    except:
        categories_list = row['venue.categories']

    if len(categories_list) == 0:
        return None
    else:
        return categories_list[0]['name']
```

In [28]:
```python
venues = results['response']['groups'][0]['items']

nearby_venues = json_normalize(venues) # flatten JSON

# filter columns
filtered_columns = ['venue.name', 'venue.categories', 'venue.location.lat', 'venue.location.lng']
nearby_venues =nearby_venues.loc[:, filtered_columns]

# filter the category for each row
nearby_venues['venue.categories'] = nearby_venues.apply(get_category_type, axis=1)

# clean columns
nearby_venues.columns = [col.split(".")[-1] for col in nearby_venues.columns]

nearby_venues.head()
```

Out[28]:

	name	categories	lat	lng
0	Glen Manor Ravine	Trail	43.676821	-79.293942
1	The Big Carrot Natural Food Market	Health Food Store	43.678879	-79.297734
2	Grover Pub and Grub	Pub	43.679181	-79.297215
3	Upper Beaches	Neighborhood	43.680563	-79.292869

In [29]:
```python
toronto_venues = getNearbyVenues(names=toronto_data['Neighborhood'],
                                 latitudes=toronto_data['Latitude'],
                                 longitudes=toronto_data['Longitude']
                                )
```

```
The Beaches
The Danforth West,Riverdale
The Beaches West,India Bazaar
Studio District
Lawrence Park
Davisville North
North Toronto West
Davisville
Moore Park,Summerhill East
Deer Park,Forest Hill SE,Rathnelly,South Hill,Summerhill West
Rosedale
Cabbagetown,St. James Town
Church and Wellesley
Harbourfront,Regent Park
Ryerson,Garden District
St. James Town
Berczy Park
Central Bay Street
Adelaide,King,Richmond
Harbourfront East,Toronto Islands,Union Station
Design Exchange,Toronto Dominion Centre
Commerce Court,Victoria Hotel
Roselawn
Forest Hill North,Forest Hill West
The Annex,North Midtown,Yorkville
Harbord,University of Toronto
Chinatown,Grange Park,Kensington Market
CN Tower,Bathurst Quay,Island airport,Harbourfront West,King and Spadina,Rail
way Lands,South Niagara
Stn A PO Boxes 25 The Esplanade
First Canadian Place,Underground city
Christie
Dovercourt Village,Dufferin
Little Portugal,Trinity
Brockton,Exhibition Place,Parkdale Village
High Park,The Junction South
Parkdale,Roncesvalles
Runnymede,Swansea
Business Reply Mail Processing Centre 969 Eastern
```

In [30]:
```python
print(toronto_venues.shape)
toronto_venues.head()
```

(1700, 7)

Out[30]:

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	The Beaches	43.676357	-79.293031	Glen Manor Ravine	43.676821	-79.293942	Trail
1	The Beaches	43.676357	-79.293031	The Big Carrot Natural Food Market	43.678879	-79.297734	Health Food Store
2	The Beaches	43.676357	-79.293031	Grover Pub and Grub	43.679181	-79.297215	Pub
3	The Beaches	43.676357	-79.293031	Upper Beaches	43.680563	-79.292869	Neighborhood
4	The Danforth West,Riverdale	43.679557	-79.352188	Pantheon	43.677621	-79.351434	Greek Restaurant

In [31]:
```python
toronto_venues.groupby('Neighborhood').count()
```

Out[31]:

Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Adelaide,King,Richmond	100	100	100	100	100	100
Berczy Park	56	56	56	56	56	56
Brockton,Exhibition Place,Parkdale Village	22	22	22	22	22	22
Business Reply Mail Processing Centre 969 Eastern	17	17	17	17	17	17
CN Tower,Bathurst Quay,Island airport,Harbourfront West,King and Spadina,Railway Lands,South Niagara	16	16	16	16	16	16
Cabbagetown,St. James Town	46	46	46	46	46	46
Central Bay Street	84	84	84	84	84	84
Chinatown,Grange Park,Kensington Market	100	100	100	100	100	100
Christie	15	15	15	15	15	15
Church and Wellesley	84	84	84	84	84	84
Commerce Court,Victoria Hotel	100	100	100	100	100	100
Davisville	34	34	34	34	34	34
Davisville North	8	8	8	8	8	8
Deer Park,Forest Hill SE,Rathnelly,South Hill,Summerhill West	15	15	15	15	15	15
Design Exchange,Toronto Dominion Centre	100	100	100	100	100	100
Dovercourt Village,Dufferin	14	14	14	14	14	14
First Canadian Place,Underground city	100	100	100	100	100	100
Forest Hill North,Forest Hill West	5	5	5	5	5	5
Harbord,University of Toronto	34	34	34	34	34	34
Harbourfront East,Toronto Islands,Union Station	100	100	100	100	100	100
Harbourfront,Regent Park	50	50	50	50	50	50
High Park,The Junction South	23	23	23	23	23	23
Lawrence Park	4	4	4	4	4	4
Little Portugal,Trinity	65	65	65	65	65	65

Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Moore Park,Summerhill East	2	2	2	2	2	2
North Toronto West	20	20	20	20	20	20
Parkdale,Roncesvalles	15	15	15	15	15	15
Rosedale	5	5	5	5	5	5
Roselawn	1	1	1	1	1	1
Runnymede,Swansea	37	37	37	37	37	37
Ryerson,Garden District	100	100	100	100	100	100
St. James Town	100	100	100	100	100	100
Stn A PO Boxes 25 The Esplanade	96	96	96	96	96	96
Studio District	41	41	41	41	41	41
The Annex,North Midtown,Yorkville	24	24	24	24	24	24
The Beaches	4	4	4	4	4	4
The Beaches West,India Bazaar	21	21	21	21	21	21
The Danforth West,Riverdale	42	42	42	42	42	42

In [32]:
```python
toronto_onehot = pd.get_dummies(toronto_venues[['Venue Category']], prefix="",
prefix_sep="")

# add neighborhood column back to dataframe
toronto_onehot['Neighborhood'] = toronto_venues['Neighborhood']

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

toronto_onehot.head()
```

Out[32]:

	Yoga Studio	Afghan Restaurant	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service	Airport Terminal	American Restaurant	Antique Shop
0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0

5 rows × 234 columns

In [33]:
```python
toronto_grouped = toronto_onehot.groupby('Neighborhood').mean().reset_index()
toronto_grouped
```

Out[33]:

	Neighborhood	Yoga Studio	Afghan Restaurant	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service	Ai Term
0	Adelaide,King,Richmond	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
1	Berczy Park	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
2	Brockton,Exhibition Place,Parkdale Village	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
3	Business Reply Mail Processing Centre 969 Eastern	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
4	CN Tower,Bathurst Quay,Island airport,Harbourf...	0.000000	0.000000	0.0625	0.0625	0.0625	0.125	0.1875	(
5	Cabbagetown,St. James Town	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
6	Central Bay Street	0.011905	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
7	Chinatown,Grange Park,Kensington Market	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
8	Christie	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
9	Church and Wellesley	0.011905	0.011905	0.0000	0.0000	0.0000	0.000	0.0000	(
10	Commerce Court,Victoria Hotel	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
11	Davisville	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
12	Davisville North	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
13	Deer Park,Forest Hill SE,Rathnelly,South Hill,...	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
14	Design Exchange,Toronto Dominion Centre	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
15	Dovercourt Village,Dufferin	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
16	First Canadian Place,Underground city	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
17	Forest Hill North,Forest Hill West	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
18	Harbord,University of Toronto	0.029412	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
19	Harbourfront East,Toronto Islands,Union Station	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
20	Harbourfront,Regent Park	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
21	High Park,The Junction South	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
22	Lawrence Park	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(
23	Little Portugal,Trinity	0.015385	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	(

	Neighborhood	Yoga Studio	Afghan Restaurant	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service	Airport Term
24	Moore Park,Summerhill East	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
25	North Toronto West	0.050000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
26	Parkdale,Roncesvalles	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
27	Rosedale	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
28	Roselawn	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
29	Runnymede,Swansea	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
30	Ryerson,Garden District	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
31	St. James Town	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
32	Stn A PO Boxes 25 The Esplanade	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
33	Studio District	0.024390	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
34	The Annex,North Midtown,Yorkville	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
35	The Beaches	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
36	The Beaches West,India Bazaar	0.000000	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0
37	The Danforth West,Riverdale	0.023810	0.000000	0.0000	0.0000	0.0000	0.000	0.0000	0

38 rows × 234 columns

In [34]:
```python
num_top_venues = 5

for hood in toronto_grouped['Neighborhood']:
    print("----"+hood+"----")
    temp = toronto_grouped[toronto_grouped['Neighborhood'] == hood].T.reset_index()
    temp.columns = ['venue','freq']
    temp = temp.iloc[1:]
    temp['freq'] = temp['freq'].astype(float)
    temp = temp.round({'freq': 2})
    print(temp.sort_values('freq', ascending=False).reset_index(drop=True).head(num_top_venues))
    print('\n')
```

```
        ----Adelaide,King,Richmond----
              venue  freq
0      Coffee Shop  0.08
1             Café  0.05
2              Bar  0.04
3  Thai Restaurant  0.04
4       Steakhouse  0.04


        ----Berczy Park----
           venue  freq
0   Coffee Shop  0.09
1  Cocktail Bar  0.05
2    Steakhouse  0.04
3          Café  0.04
4   Cheese Shop  0.04


        ----Brockton,Exhibition Place,Parkdale Village----
             venue  freq
0  Breakfast Spot  0.09
1     Coffee Shop  0.09
2            Café  0.09
3             Bar  0.05
4       Pet Store  0.05


        ----Business Reply Mail Processing Centre 969 Eastern----
               venue  freq
0  Light Rail Station  0.12
1         Pizza Place  0.06
2      Auto Workshop  0.06
3            Brewery  0.06
4         Skate Park  0.06


        ----CN Tower,Bathurst Quay,Island airport,Harbourfront West,King and Spadina,
Railway Lands,South Niagara----
              venue  freq
0    Airport Service  0.19
1    Airport Lounge  0.12
2  Airport Terminal  0.12
3             Plane  0.06
4    Harbor / Marina  0.06


        ----Cabbagetown,St. James Town----
               venue  freq
0       Coffee Shop  0.09
1              Café  0.04
2       Pizza Place  0.04
3  Italian Restaurant  0.04
4              Park  0.04


        ----Central Bay Street----
                  venue   freq
```

```
0              Coffee Shop   0.14
1           Ice Cream Shop   0.05
2        Italian Restaurant  0.05
3  Middle Eastern Restaurant 0.04
4                     Café   0.04
```

```
----Chinatown,Grange Park,Kensington Market----
                           venue  freq
0                           Café  0.07
1  Vegetarian / Vegan Restaurant  0.06
2             Chinese Restaurant  0.05
3                        Bakery   0.04
4          Vietnamese Restaurant  0.04
```

```
----Christie----
                  venue  freq
0        Grocery Store   0.20
1                 Café   0.20
2                 Park   0.13
3    Convenience Store   0.07
4           Baby Store   0.07
```

```
----Church and Wellesley----
                  venue  freq
0          Coffee Shop   0.07
1   Japanese Restaurant  0.06
2     Sushi Restaurant   0.05
3            Restaurant  0.04
4              Gay Bar   0.04
```

```
----Commerce Court,Victoria Hotel----
                  venue  freq
0          Coffee Shop   0.09
1                Hotel   0.06
2                 Café   0.06
3           Restaurant  0.04
4  American Restaurant   0.04
```

```
----Davisville----
                 venue  freq
0          Pizza Place  0.09
1        Dessert Shop   0.09
2       Sandwich Place  0.09
3    Sushi Restaurant   0.06
4          Coffee Shop  0.06
```

```
----Davisville North----
                 venue  freq
0  Food & Drink Shop    0.12
1                  Gym  0.12
2      Breakfast Spot   0.12
```

```
3     Clothing Store  0.12
4       Dance Studio  0.12


----Deer Park,Forest Hill SE,Rathnelly,South Hill,Summerhill West----
                 venue  freq
0           Coffee Shop  0.13
1                   Pub  0.13
2            Bagel Shop  0.07
3   American Restaurant  0.07
4           Supermarket  0.07


----Design Exchange,Toronto Dominion Centre----
          venue  freq
0   Coffee Shop  0.12
1          Café  0.08
2         Hotel  0.06
3    Restaurant  0.05
4  Deli / Bodega  0.03


----Dovercourt Village,Dufferin----
                      venue  freq
0                  Pharmacy  0.14
1               Supermarket  0.14
2                    Bakery  0.14
3                   Brewery  0.07
4  Middle Eastern Restaurant  0.07


----First Canadian Place,Underground city----
         venue  freq
0  Coffee Shop  0.09
1         Café  0.07
2   Restaurant  0.04
3   Steakhouse  0.04
4        Hotel  0.04


----Forest Hill North,Forest Hill West----
              venue  freq
0              Park  0.2
1             Trail  0.2
2          Bus Line  0.2
3  Sushi Restaurant  0.2
4     Jewelry Store  0.2


----Harbord,University of Toronto----
                 venue  freq
0                 Café  0.12
1  Japanese Restaurant  0.06
2                  Bar  0.06
3             Bookstore  0.06
4               Bakery  0.06
```

```
        ----Harbourfront East,Toronto Islands,Union Station----
                      venue   freq
0              Coffee Shop   0.11
1                    Hotel   0.05
2                  Aquarium  0.05
3                     Café   0.04
4     Italian Restaurant    0.04


        ----Harbourfront,Regent Park----
              venue   freq
0       Coffee Shop   0.18
1               Pub   0.06
2              Café   0.06
3              Park   0.06
4            Bakery   0.06


        ----High Park,The Junction South----
                        venue   freq
0          Mexican Restaurant  0.09
1                        Café  0.09
2             Thai Restaurant  0.04
3   Cajun / Creole Restaurant  0.04
4          Fried Chicken Joint 0.04


        ----Lawrence Park----
                        venue   freq
0   Construction & Landscaping  0.25
1                        Park  0.25
2                    Bus Line  0.25
3                 Swim School  0.25
4                 Music Store  0.00


        ----Little Portugal,Trinity----
                  venue   freq
0                   Bar  0.12
1           Coffee Shop  0.06
2       Asian Restaurant 0.05
3                Bakery  0.03
4               Boutique 0.03


        ----Moore Park,Summerhill East----
                        venue   freq
0                  Playground  0.5
1                  Restaurant  0.5
2                 Yoga Studio  0.0
3                 Music Venue  0.0
4      Mediterranean Restaurant 0.0


        ----North Toronto West----
                      venue   freq
```

```
0     Sporting Goods Shop  0.15
1              Coffee Shop  0.10
2           Clothing Store  0.10
3             Yoga Studio  0.05
4             Burger Joint  0.05
```

```
----Parkdale,Roncesvalles----
                           venue  freq
0                 Breakfast Spot  0.13
1                      Gift Shop  0.13
2                Cuban Restaurant  0.07
3                            Bar  0.07
4   Eastern European Restaurant  0.07
```

```
----Rosedale----
          venue  freq
0          Park   0.4
1    Playground   0.2
2      Building   0.2
3         Trail   0.2
4   Music Store   0.0
```

```
----Roselawn----
                      venue  freq
0                    Garden   1.0
1               Yoga Studio   0.0
2               Music Store   0.0
3          Martial Arts Dojo   0.0
4   Mediterranean Restaurant   0.0
```

```
----Runnymede,Swansea----
                 venue  freq
0          Coffee Shop  0.08
1                 Café  0.08
2     Sushi Restaurant  0.05
3          Pizza Place  0.05
4            Bookstore  0.05
```

```
----Ryerson,Garden District----
                         venue  freq
0                  Coffee Shop  0.10
1               Clothing Store  0.06
2               Cosmetics Shop  0.04
3                         Café  0.03
4   Middle Eastern Restaurant  0.03
```

```
----St. James Town----
                  venue  freq
0                   Café  0.05
1             Restaurant  0.05
2            Coffee Shop  0.05
```

```
3      Italian Restaurant  0.05
4                  Hotel  0.05


----Stn A PO Boxes 25 The Esplanade----
                venue  freq
0          Coffee Shop  0.11
1                 Café  0.04
2           Restaurant  0.04
3                Hotel  0.03
4    Seafood Restaurant  0.03


----Studio District----
                  venue  freq
0                  Café  0.10
1           Coffee Shop  0.07
2     Italian Restaurant  0.05
3    American Restaurant  0.05
4                Bakery  0.05


----The Annex,North Midtown,Yorkville----
               venue  freq
0        Coffee Shop  0.12
1     Sandwich Place  0.12
2               Café  0.12
3        Pizza Place  0.08
4     History Museum  0.04


----The Beaches----
                 venue  freq
0     Health Food Store  0.25
1                 Trail  0.25
2                   Pub  0.25
3           Music Venue  0.00
4     Martial Arts Dojo  0.00


----The Beaches West,India Bazaar----
                 venue  freq
0                  Park  0.10
1        Sandwich Place  0.10
2           Pizza Place  0.05
3           Coffee Shop  0.05
4     Fish & Chips Shop  0.05


----The Danforth West,Riverdale----
                   venue  freq
0        Greek Restaurant  0.21
1             Coffee Shop  0.10
2      Italian Restaurant  0.07
3          Ice Cream Shop  0.05
4    Furniture / Home Store  0.05
```

In [35]:
```python
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]
```

In [36]:
```python
num_top_venues = 10

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

# create columns according to number of top venues
columns = ['Neighborhood']
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['Neighborhood'] = toronto_grouped['Neighborhood']

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

neighborhoods_venues_sorted.head()
```

Out[36]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7 C
0	Adelaide,King,Richmond	Coffee Shop	Café	Bar	Steakhouse	Thai Restaurant	Restaurant	
1	Berczy Park	Coffee Shop	Cocktail Bar	Seafood Restaurant	Farmers Market	Beer Bar	Bakery	Ste
2	Brockton,Exhibition Place,Parkdale Village	Breakfast Spot	Café	Coffee Shop	Pet Store	Bar	Burrito Place	Re
3	Business Reply Mail Processing Centre 969 Eastern	Light Rail Station	Farmers Market	Auto Workshop	Park	Pizza Place	Restaurant	
4	CN Tower,Bathurst Quay,Island airport,Harbourf...	Airport Service	Airport Terminal	Airport Lounge	Harbor / Marina	Coffee Shop	Boat or Ferry	

Set number of clusters

In [37]:
```python
kclusters = 5

toronto_grouped_clustering = toronto_grouped.drop('Neighborhood', 1)

# run k-means clustering
kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(toronto_grouped_clus
tering)

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

Out[37]: array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0])

Add clustering labels and merge the dataframes

In [38]:
```python
neighborhoods_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)

toronto_merged = toronto_data

# merge toronto_grouped with toronto_data to add latitude/longitude for each n
eighborhood
toronto_merged = toronto_merged.join(neighborhoods_venues_sorted.set_index('Ne
ighborhood'), on='Neighborhood')

toronto_merged.head() # check the
```

Out[38]:

|	PostalCode	Borough	Neighborhood	Postal Code	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Co
0	M4E	East Toronto	The Beaches	M4E	43.676357	-79.293031	0	Health Food Store	
1	M4K	East Toronto	The Danforth West,Riverdale	M4K	43.679557	-79.352188	0	Greek Restaurant	
2	M4L	East Toronto	The Beaches West,India Bazaar	M4L	43.668999	-79.315572	0	Park	Sar
3	M4M	East Toronto	Studio District	M4M	43.659526	-79.340923	0	Café	
4	M4N	Central Toronto	Lawrence Park	M4N	43.728020	-79.388790	4	Construction & Landscaping	

create map

In [39]:
```python
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['Neighborhood'], toronto_merged['Cluster Labels'
]):
    label = folium.Popup(str(poi) + ' Cluster ' + str(cluster), parse_html=Tru
e)
    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
```

Out[39]:

Leaflet (http://leafletjs.com)
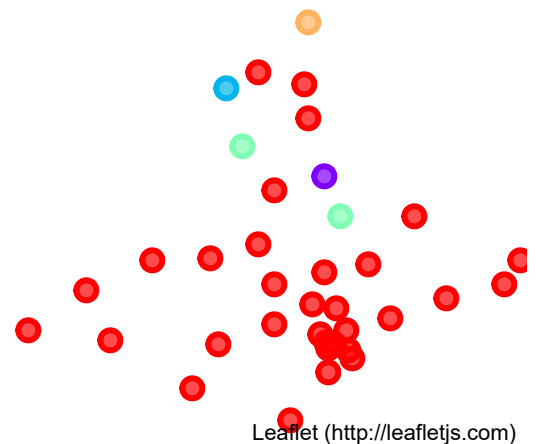
Examine Clusters

Cluster 1

In [40]:
```python
toronto_merged.loc[toronto_merged['Cluster Labels'] == 0, toronto_merged.colum
ns[[1] + list(range(5, toronto_merged.shape[1]))]]
```

Out[40]:

	Borough	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	East Toronto	-79.293031	0	Health Food Store	Trail	Pub	Women's Store	Donut Shop
1	East Toronto	-79.352188	0	Greek Restaurant	Coffee Shop	Italian Restaurant	Furniture / Home Store	Ice Cream Shop
2	East Toronto	-79.315572	0	Park	Sandwich Place	Sushi Restaurant	Ice Cream Shop	Brewery
3	East Toronto	-79.340923	0	Café	Coffee Shop	Italian Restaurant	Bakery	American Restaurant
5	Central Toronto	-79.390197	0	Gym	Hotel	Sandwich Place	Food & Drink Shop	Dance Studio
6	Central Toronto	-79.405678	0	Sporting Goods Shop	Coffee Shop	Clothing Store	Yoga Studio	Chinese Restaurant
7	Central Toronto	-79.388790	0	Dessert Shop	Sandwich Place	Pizza Place	Coffee Shop	Restaurant
9	Central Toronto	-79.400049	0	Coffee Shop	Pub	Vietnamese Restaurant	Fried Chicken Joint	Liquor Store
11	Downtown Toronto	-79.367675	0	Coffee Shop	Park	Pub	Italian Restaurant	Bakery
12	Downtown Toronto	-79.383160	0	Coffee Shop	Japanese Restaurant	Sushi Restaurant	Gay Bar	Restaurant
13	Downtown Toronto	-79.360636	0	Coffee Shop	Bakery	Pub	Café	Park
14	Downtown Toronto	-79.378937	0	Coffee Shop	Clothing Store	Cosmetics Shop	Middle Eastern Restaurant	Café
15	Downtown Toronto	-79.375418	0	Coffee Shop	Café	Hotel	Restaurant	Italian Restaurant
16	Downtown Toronto	-79.373306	0	Coffee Shop	Cocktail Bar	Seafood Restaurant	Farmers Market	Beer Bar
17	Downtown Toronto	-79.387383	0	Coffee Shop	Italian Restaurant	Ice Cream Shop	Sandwich Place	Burger Joint
18	Downtown Toronto	-79.384568	0	Coffee Shop	Café	Bar	Steakhouse	Thai Restaurant
19	Downtown Toronto	-79.381752	0	Coffee Shop	Aquarium	Hotel	Italian Restaurant	Café
20	Downtown Toronto	-79.381576	0	Coffee Shop	Café	Hotel	Restaurant	Italian Restaurant
21	Downtown Toronto	-79.379817	0	Coffee Shop	Café	Hotel	Restaurant	American Restaurant

	Borough	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
24	Central Toronto	-79.405678	0	Sandwich Place	Café	Coffee Shop	Pizza Place	BBQ Joint
25	Downtown Toronto	-79.400049	0	Café	Bar	Bookstore	Japanese Restaurant	Restaurant
26	Downtown Toronto	-79.400049	0	Café	Vegetarian / Vegan Restaurant	Chinese Restaurant	Bar	Mexican Restaurant
27	Downtown Toronto	-79.394420	0	Airport Service	Airport Terminal	Airport Lounge	Harbor / Marina	Coffee Shop
28	Downtown Toronto	-79.374846	0	Coffee Shop	Café	Restaurant	Cocktail Bar	Italian Restaurant
29	Downtown Toronto	-79.382280	0	Coffee Shop	Café	Steakhouse	Hotel	Restaurant
30	Downtown Toronto	-79.422564	0	Grocery Store	Café	Park	Nightclub	Italian Restaurant
31	West Toronto	-79.442259	0	Pharmacy	Supermarket	Bakery	Middle Eastern Restaurant	Music Venue
32	West Toronto	-79.419750	0	Bar	Coffee Shop	Asian Restaurant	French Restaurant	Restaurant
33	West Toronto	-79.428191	0	Breakfast Spot	Café	Coffee Shop	Pet Store	Bar
34	West Toronto	-79.464763	0	Mexican Restaurant	Café	Bookstore	Flea Market	Italian Restaurant
35	West Toronto	-79.456325	0	Breakfast Spot	Gift Shop	Dessert Shop	Bookstore	Eastern European Restaurant
36	West Toronto	-79.484450	0	Café	Coffee Shop	Bookstore	Pizza Place	Italian Restaurant
37	East Toronto	-79.321558	0	Light Rail Station	Farmers Market	Auto Workshop	Park	Pizza Place

Cluster 2

In [41]:
```
toronto_merged.loc[toronto_merged['Cluster Labels'] == 1, toronto_merged.colum
ns[[1] + list(range(5, toronto_merged.shape[1]))]]
```

Out[41]:

	Borough	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venu
8	Central Toronto	-79.38316	1	Playground	Restaurant	Women's Store	Dim Sum Restaurant	Event Space	Ethiopia Restaurar

Cluster 3

In [42]:
```
toronto_merged.loc[toronto_merged['Cluster Labels'] == 2, toronto_merged.colum
ns[[1] + list(range(5, toronto_merged.shape[1]))]]
```

Out[42]:

	Borough	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th M Comm Ver
22	Central Toronto	-79.416936	2	Garden	Dim Sum Restaurant	Falafel Restaurant	Event Space	Ethiopian Restaurant	Electron St

Cluster 4

In [43]:
```
toronto_merged.loc[toronto_merged['Cluster Labels'] == 3, toronto_merged.colum
ns[[1] + list(range(5, toronto_merged.shape[1]))]]
```

Out[43]:

	Borough	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Mo Comm Venu
10	Downtown Toronto	-79.377529	3	Park	Playground	Trail	Building	Women's Store	Din
23	Central Toronto	-79.411307	3	Park	Trail	Jewelry Store	Bus Line	Sushi Restaurant	Women Sto

Cluster 5

In [44]:
```
toronto_merged.loc[toronto_merged['Cluster Labels'] == 4, toronto_merged.colum
ns[[1] + list(range(5, toronto_merged.shape[1]))]]
```

Out[44]:

	Borough	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue
4	Central Toronto	-79.38879	4	Construction & Landscaping	Park	Bus Line	Swim School	Women's Store	Discount Store

In [ ]: