

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

```
In [2]: !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]: from bs4 import BeautifulSoup
import requests
```

Reading the Webpage

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

Extracting the table from the Webpage

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

```

In [6]: 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]: df1=df[df.Borough!='Not assigned']

```

Replacing Neighborhood value if Not Assigned with same as Borough

```

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

```

C:\Users\punee\Anaconda4\lib\site-packages\pandas\core\indexing.py:635: SettingWithCopyWarning:
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/stable/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://coc1.us/Geospatial_data'
filename = wget.download(url)
```

Requirement already satisfied: wget in c:\users\punee\anaconda4\lib\site-packages (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 [13]: df1_groupby

Out[13]:

	PostalCode	Borough	Neighborhood
0	M1B	Scarborough	Rouge,Malvern
1	M1C	Scarborough	Highland Creek,Rouge Hill,Port Union
2	M1E	Scarborough	Guildwood,Morningside,West Hill
3	M1G	Scarborough	Woburn
4	M1H	Scarborough	Cedarbrae
5	M1J	Scarborough	Scarborough Village
6	M1K	Scarborough	East Birchmount Park,Ionview,Kennedy Park
7	M1L	Scarborough	Clairlea,Golden Mile,Oakridge
8	M1M	Scarborough	Cliffcrest,Cliffside,Scarborough Village West
9	M1N	Scarborough	Birch Cliff,Cliffside West
10	M1P	Scarborough	Dorset Park,Scarborough Town Centre,Wexford He...
11	M1R	Scarborough	Maryvale,Wexford
12	M1S	Scarborough	Agincourt
13	M1T	Scarborough	Clarks Corners,Sullivan,Tam O'Shanter
14	M1V	Scarborough	Agincourt North,L'Amoreaux East,Milliken,Steel...
15	M1W	Scarborough	L'Amoreaux West
16	M1X	Scarborough	Upper Rouge
17	M2H	North York	Hillcrest Village
18	M2J	North York	Fairview,Henry Farm,Oriole
19	M2K	North York	Bayview Village
20	M2L	North York	Silver Hills,York Mills
21	M2M	North York	Newtonbrook,Willowdale
22	M2N	North York	Willowdale South
23	M2P	North York	York Mills West
24	M2R	North York	Willowdale West
25	M3A	North York	Parkwoods
26	M3B	North York	Don Mills North
27	M3C	North York	Flemingdon Park,Don Mills South
28	M3H	North York	Bathurst Manor,Downsview North,Wilson Heights
29	M3J	North York	Northwood Park,York University
...
73	M6C	York	Humewood-Cedarvale
74	M6E	York	Caledonia-Fairbanks
75	M6G	Downtown Toronto	Christie
76	M6H	West Toronto	Dovercourt Village,Dufferin

	PostalCode	Borough	Neighborhood
77	M6J	West Toronto	Little Portugal, Trinity
78	M6K	West Toronto	Brockton, Exhibition Place, Parkdale Village
79	M6L	North York	Downsview, North Park, Upwood Park
80	M6M	York	Del Ray, Keelesdale, Mount Dennis, Silverthorn
81	M6N	York	The Junction North, Runnymede
82	M6P	West Toronto	High Park, The Junction South
83	M6R	West Toronto	Parkdale, Roncesvalles
84	M6S	West Toronto	Runnymede, Swansea
85	M7A	Queen's Park	Queen's Park
86	M7R	Mississauga	Canada Post Gateway Processing Centre
87	M7Y	East Toronto	Business Reply Mail Processing Centre 969 Eastern
88	M8V	Etobicoke	Humber Bay Shores, Mimico South, New Toronto
89	M8W	Etobicoke	Alderwood, Long Branch
90	M8X	Etobicoke	The Kingsway, Montgomery Road, Old Mill North
91	M8Y	Etobicoke	Humber Bay, King's Mill Park, Kingsway Park South...
92	M8Z	Etobicoke	Kingsway Park South West, Mimico NW, The Queensw...
93	M9A	Etobicoke	Islington Avenue
94	M9B	Etobicoke	Cloverdale, Islington, Martin Grove, Princess Gar...
95	M9C	Etobicoke	Bloordale Gardens, Eringate, Markland Wood, Old B...
96	M9L	North York	Humber Summit
97	M9M	North York	Emery, Humberlea
98	M9N	York	Weston
99	M9P	Etobicoke	Westmount
100	M9R	Etobicoke	Kingsview Village, Martin Grove Gardens, Richvie...
101	M9V	Etobicoke	Albion Gardens, Beaumont Heights, Humbergate, Jam...
102	M9W	Etobicoke	Northwest

103 rows × 3 columns

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

```
In [15]: 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 South...	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,Beaumont Heights,Humbergate,Jam...	43.739416	-79.588437
102	M9W	Etobicoke	Northwest	43.706748	-79.594054

103 rows × 5 columns

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

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

import requests # library to handle requests
from pandas.io.json import json_normalize # transform JSON file into a pandas dataframe

# 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]: 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={}&client_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]: 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]: toronto_data = df1_groupby_coord[df1_groupby_coord['Borough'].str.contains('Toronto', regex=False)].reset_index(drop=True)
toronto_data.head()
toronto_data.shape
```

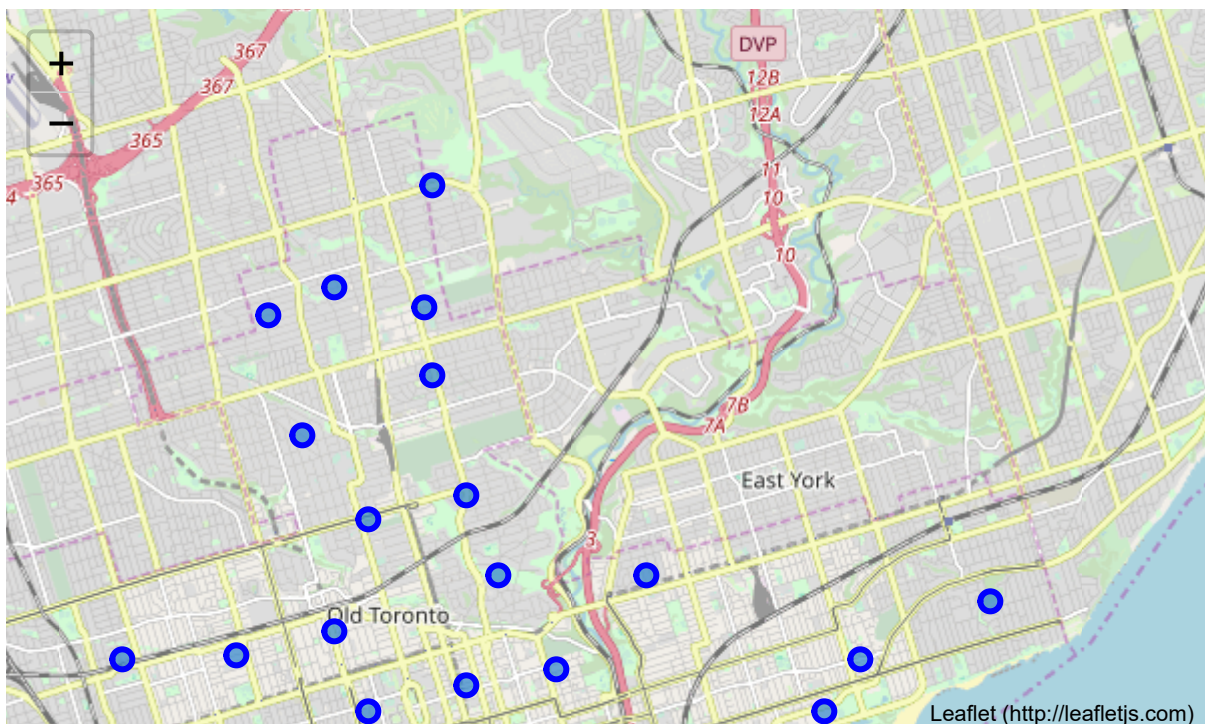
Out[19]: (38, 6)

create map of Toronto using latitude and longitude values

```
In [20]: map_toronto = folium.Map(location=[43.676357, -79.293031], zoom_start=12)
for lat, lng, borough, neighborhood in zip(toronto_data['Latitude'], toronto_data['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]:



```
In [40]: map_toronto.save("good_loans_map.html")
```

```
In [21]: CLIENT_ID = '2SDNAYRBFVGRV00MQ0BYRMGQZ4J55BF011VXIAJYOCZI4VVV' # your Foursquare ID
CLIENT_SECRET = 'TPGLM2GBMFLWEMYET0FAAS0B0F0NO1MMB3IBJYHWP0AOWEMO' # your Foursquare Secret
VERSION = '20180604'

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

Your credentials:

CLIENT_ID: 2SDNAYRBFVGRV00MQ0BYRMGQZ4J55BF011VXIAJYOCZI4VVV

CLIENT_SECRET:TPGLM2GBMFLWEMYET0FAAS0B0F0NO1MMB3IBJYHWP0AOWEMO

```
In [22]: toronto_data.loc[0, 'Neighborhood']
```

```
Out[22]: 'The Beaches'
```

```
In [23]: neighborhood_latitude = toronto_data.loc[0, 'Latitude'] # neighborhood Latitude value
neighborhood_longitude = toronto_data.loc[0, 'Longitude'] # neighborhood Longitude value

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

print('Latitude and longitude values of {} are {}, {}'.format(neighborhood_name,
                                                                neighborhood_latitude,
                                                                neighborhood_longitude))
```

Latitude and longitude values of The Beaches are 43.67635739999999, -79.2930312.

```
In [24]: 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_secret={}&v={}&ll={},{}&radius={}&limit={}'.format(
    CLIENT_ID,
    CLIENT_SECRET,
    VERSION,
    neighborhood_latitude,
    neighborhood_longitude,
    radius,
    LIMIT)
url # display URL
```

```
Out[24]: 'https://api.foursquare.com/v2/venues/explore?&client_id=2SDNAYRBFVGRV00MQ0BYRMGQZ4J55BF011VXIAJYOCZI4VVV&client_secret=TPGLM2GBMFLWEMYET0FAAS0B0F0NO1MMB3IBJYHWP0AOWEMO&v=20180604&ll=43.67635739999999,-79.2930312&radius=500&limit=100'
```

```
In [25]: results = requests.get(url).json()  
results
```

```

Out[25]: {'meta': {'code': 200, 'requestId': '5d5f4e4ef8953d0025ade92d'},
  'response': {'headerLocation': 'The Beaches',
    'headerFullLocation': 'The Beaches, Toronto',
    'headerLocationGranularity': 'neighborhood',
    'totalResults': 5,
    '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/food_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/nightlife/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'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason' } ]}],
    'venue': { 'id': '4bc7fcce6501c9b6bf813f29',
        'name': "Dip 'n Sip",
        'location': { 'address': '663 Kingston Road',
            'crossStreet': 'Main St',
            'lat': 43.67889707815811,
            'lng': -79.29774501670785,
            'labeledLatLngs': [{ 'label': 'display',
                'lat': 43.67889707815811,
                'lng': -79.29774501670785 } ]],
            'distance': 473,
            'cc': 'CA',
            'city': 'Toronto',
            'state': 'ON',
            'country': 'Canada',
            'formattedAddress': ['663 Kingston Road (Main St)',
                'Toronto ON',
                'Canada' ]}],
            'categories': [{ 'id': '4bf58dd8d48988d1e0931735',
                'name': 'Coffee Shop',
                'pluralName': 'Coffee Shops',
                'shortName': 'Coffee Shop',
                'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/coff
eeshop_',
                    'suffix': '.png'},
                'primary': True } ]],
            'photos': { 'count': 0, 'groups': [] } ],
            'referralId': 'e-0-4bc7fcce6501c9b6bf813f29-4' } ] ] ] ] }
```

```
In [26]: # 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 [27]: 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[27]:

	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
4	Dip 'n Sip	Coffee Shop	43.678897	-79.297745

```
In [28]: 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 [29]: print(toronto_venues.shape)
toronto_venues.head()
```

```
(1699, 7)
```

```
Out[29]:
```

	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 Beaches	43.676357	-79.293031	Dip 'n Sip	43.678897	-79.297745	Coffee Shop

```
In [30]: toronto_venues.groupby('Neighborhood').count()
```

Out[30]:

	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Neighborhood						
Adelaide,King,Richmond	100	100	100	100	100	100
Berczy Park	57	57	57	57	57	57
Brockton,Exhibition Place,Parkdale Village	21	21	21	21	21	21
Business Reply Mail Processing Centre 969 Eastern	19	19	19	19	19	19
CN Tower,Bathurst Quay,Island airport,Harbourfront West,King and Spadina,Railway Lands,South Niagara	14	14	14	14	14	14
Cabbagetown,St. James Town	45	45	45	45	45	45
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	35	35	35	35	35	35
Davisville North	9	9	9	9	9	9
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	16	16	16	16	16	16
First Canadian Place,Underground city	100	100	100	100	100	100
Forest Hill North,Forest Hill West	4	4	4	4	4	4
Harbord,University of Toronto	35	35	35	35	35	35
Harbourfront East,Toronto Islands,Union Station	100	100	100	100	100	100
Harbourfront,Regent Park	49	49	49	49	49	49
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 Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
Neighborhood						
Moore Park,Summerhill East	4	4	4	4	4	4
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	36	36	36	36	36	36
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	39	39	39	39	39	39
The Annex,North Midtown,Yorkville	24	24	24	24	24	24
The Beaches	5	5	5	5	5	5
The Beaches West,India Bazaar	18	18	18	18	18	18
The Danforth West,Riverdale	42	42	42	42	42	42

```
In [31]: 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[31]:

	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 × 239 columns


```
In [32]: toronto_grouped = toronto_onehot.groupby('Neighborhood').mean().reset_index()  
toronto_grouped
```

Out[32]:

	Neighborhood	Yoga Studio	Afghan Restaurant	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service
0	Adelaide,King,Richmond	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
1	Berczy Park	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
2	Brockton,Exhibition Place,Parkdale Village	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
3	Business Reply Mail Processing Centre 969 Eastern	0.052632	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
4	CN Tower,Bathurst Quay,Island airport,Harbourfront	0.000000	0.000000	0.071429	0.071429	0.071429	0.142857	0.142857
5	Cabbagetown,St. James Town	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
6	Central Bay Street	0.011905	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
7	Chinatown,Grange Park,Kensington Market	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
8	Christie	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
9	Church and Wellesley	0.011905	0.011905	0.000000	0.000000	0.000000	0.000000	0.000000
10	Commerce Court,Victoria Hotel	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
11	Davisville	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
12	Davisville North	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
13	Deer Park,Forest Hill SE,Rathnelly,South Hill,...	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
14	Design Exchange,Toronto Dominion Centre	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
15	Dovercourt Village,Dufferin	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
16	First Canadian Place,Underground city	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
17	Forest Hill North,Forest Hill West	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
18	Harbord,University of Toronto	0.028571	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
19	Harbourfront East,Toronto Islands,Union Station	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
20	Harbourfront,Regent Park	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
21	High Park,The Junction South	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
22	Lawrence Park	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
23	Little Portugal,Trinity	0.015385	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

	Neighborhood	Yoga Studio	Afghan Restaurant	Airport	Airport Food Court	Airport Gate	Airport Lounge	Airport Service
24	Moore Park,Summerhill East	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
25	North Toronto West	0.050000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
26	Parkdale,Roncesvalles	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
27	Rosedale	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
28	Roselawn	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
29	Runnymede,Swansea	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
30	Ryerson,Garden District	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
31	St. James Town	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
32	Stn A PO Boxes 25 The Esplanade	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
33	Studio District	0.025641	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
34	The Annex,North Midtown,Yorkville	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
35	The Beaches	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
36	The Beaches West,India Bazaar	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000
37	The Danforth West,Riverdale	0.023810	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000

38 rows × 239 columns

```
In [33]: 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	Steakhouse	0.04
3	Bar	0.04
4	Thai Restaurant	0.04

----Berczy Park----

	venue	freq
0	Coffee Shop	0.09
1	Cocktail Bar	0.05
2	Farmers Market	0.04
3	Steakhouse	0.04
4	Café	0.04

----Brockton,Exhibition Place,Parkdale Village----

	venue	freq
0	Café	0.10
1	Breakfast Spot	0.10
2	Coffee Shop	0.10
3	Gym	0.05
4	Burrito Place	0.05

----Business Reply Mail Processing Centre 969 Eastern----

	venue	freq
0	Light Rail Station	0.11
1	Yoga Studio	0.05
2	Park	0.05
3	Comic Shop	0.05
4	Recording Studio	0.05

----CN Tower,Bathurst Quay,Island airport,Harbourfront West,King and Spadina,
Railway Lands,South Niagara----

	venue	freq
0	Airport Lounge	0.14
1	Airport Service	0.14
2	Airport Terminal	0.14
3	Coffee Shop	0.07
4	Harbor / Marina	0.07

----Cabbagetown,St. James Town----

	venue	freq
0	Park	0.07
1	Coffee Shop	0.07
2	Bakery	0.04
3	Café	0.04
4	Italian Restaurant	0.04

----Central Bay Street----

	venue	freq
--	-------	------

0	Coffee Shop	0.14
1	Italian Restaurant	0.05
2	Ice Cream Shop	0.05
3	Sandwich Place	0.04
4	Burger Joint	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	Bar	0.04
4	Vietnamese Restaurant	0.04

----Christie----

	venue	freq
0	Café	0.20
1	Grocery Store	0.20
2	Park	0.13
3	Diner	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	Café	0.06
2	Hotel	0.06
3	American Restaurant	0.04
4	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	Café	0.06

----Davisville North----

	venue	freq
0	Hotel	0.11
1	Gym	0.11
2	Dance Studio	0.11

```

3      Park  0.11
4      Dog Run  0.11

```

----Deer Park,Forest Hill SE,Rathnelly,South Hill,Summerhill West----

```

      venue  freq
0      Pub  0.13
1      Coffee Shop  0.13
2      American Restaurant  0.07
3      Sushi 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      Bakery  0.12
1      Pharmacy  0.12
2      Supermarket  0.12
3      Middle Eastern Restaurant  0.06
4      Gym / Fitness Center  0.06

```

----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      Trail  0.25
1      Park  0.25
2      Sushi Restaurant  0.25
3      Jewelry Store  0.25
4      Middle Eastern Restaurant  0.00

```

----Harbord,University of Toronto----

```

      venue  freq
0      Café  0.11
1      Bar  0.06
2      Restaurant  0.06
3      Japanese Restaurant  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	Italian Restaurant	0.04
4	Café	0.04

----Harbourfront,Regent Park----

	venue	freq
0	Coffee Shop	0.16
1	Café	0.06
2	Park	0.06
3	Bakery	0.06
4	Pub	0.06

----High Park,The Junction South----

	venue	freq
0	Mexican Restaurant	0.09
1	Café	0.09
2	Thai Restaurant	0.04
3	Fried Chicken Joint	0.04
4	Speakeasy	0.04

----Lawrence Park----

	venue	freq
0	Park	0.25
1	Bus Line	0.25
2	Dim Sum Restaurant	0.25
3	Swim School	0.25
4	Yoga Studio	0.00

----Little Portugal,Trinity----

	venue	freq
0	Bar	0.12
1	Coffee Shop	0.06
2	Asian Restaurant	0.05
3	Pizza Place	0.03
4	Wine Bar	0.03

----Moore Park,Summerhill East----

	venue	freq
0	Playground	0.25
1	Gym	0.25
2	Restaurant	0.25
3	Park	0.25
4	Middle Eastern Restaurant	0.00

----North Toronto West----

	venue	freq
--	-------	------

0	Coffee Shop	0.10
1	Clothing Store	0.10
2	Sporting Goods Shop	0.10
3	Yoga Studio	0.05
4	Gift Shop	0.05

----Parkdale,Roncesvalles----

	venue	freq
0	Breakfast Spot	0.13
1	Gift Shop	0.13
2	Dessert Shop	0.07
3	Dog Run	0.07
4	Restaurant	0.07

----Rosedale----

	venue	freq
0	Park	0.4
1	Playground	0.2
2	Building	0.2
3	Trail	0.2
4	New American Restaurant	0.0

----Roselawn----

	venue	freq
0	Garden	1.0
1	Yoga Studio	0.0
2	Mediterranean Restaurant	0.0
3	Metro Station	0.0
4	Mexican Restaurant	0.0

----Runnymede,Swansea----

	venue	freq
0	Café	0.08
1	Coffee Shop	0.08
2	Sushi Restaurant	0.06
3	Pizza Place	0.06
4	Italian Restaurant	0.06

----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	Restaurant	0.05
1	Coffee Shop	0.05
2	Café	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 Beer Bar 0.03

```

----Studio District----

```

venue freq
0 Café 0.10
1 Coffee Shop 0.08
2 Italian Restaurant 0.05
3 Bakery 0.05
4 American Restaurant 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 Burger Joint 0.04

```

----The Beaches----

```

venue freq
0 Trail 0.2
1 Health Food Store 0.2
2 Coffee Shop 0.2
3 Pub 0.2
4 Monument / Landmark 0.0

```

----The Beaches West,India Bazaar----

```

venue freq
0 Pizza Place 0.11
1 Burrito Place 0.06
2 Gym 0.06
3 Sushi Restaurant 0.06
4 Sandwich Place 0.06

```

----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 [34]: 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 [35]: 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[35]:

	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	7th Most Common Venue
0	Adelaide,King,Richmond	Coffee Shop	Café	Bar	Steakhouse	Thai Restaurant	Restaurant	
1	Berczy Park	Coffee Shop	Cocktail Bar	Cheese Shop	Bakery	Steakhouse	Seafood Restaurant	
2	Brockton,Exhibition Place,Parkdale Village	Breakfast Spot	Café	Coffee Shop	Furniture / Home Store	Intersection	Caribbean Restaurant	Res
3	Business Reply Mail Processing Centre 969 Eastern	Light Rail Station	Yoga Studio	Auto Workshop	Garden Center	Garden	Fast Food Restaurant	F
4	CN Tower,Bathurst Quay,Island airport,Harbourf...	Airport Service	Airport Terminal	Airport Lounge	Plane	Sculpture Garden	Boat or Ferry	t

Set number of clusters

```
In [36]: 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_clustering)

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

Out[36]: array([0, 0, 0, 0, 0, 0, 0, 0, 0, 0])

Add clustering labels and merge the dataframes

```
In [37]: 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 neighborhood
toronto_merged = toronto_merged.join(neighborhoods_venues_sorted.set_index('Neighborhood'), on='Neighborhood')

toronto_merged.head() # check the
```

Out[37]:

	PostalCode	Borough	Neighborhood	Postal Code	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Common Venue
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	C
2	M4L	East Toronto	The Beaches West, India Bazaar	M4L	43.668999	-79.315572	0	Pizza Place	Fast Resta
3	M4M	East Toronto	Studio District	M4M	43.659526	-79.340923	0	Café	C
4	M4N	Central Toronto	Lawrence Park	M4N	43.728020	-79.388790	4	Park	Bus

create map

```
In [39]: 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=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
```

Out[39]:

