

Capstone_SegmentingClusteringNeighborhoods

October 22, 2020

1 My Task Segmenting and Clustering Neighborhoods in Toronto

1.1 Step 1 - Install and Import Libraries

Library	Description
numpy	NumPy is a library for the Python programming language, adding support for large, multi-dimensional arrays and matrices, along with a large collection of high-level mathematical functions to operate on these arrays.
pandas	In computer programming, pandas is a software library written for the Python programming language for data manipulation and analysis. In particular, it offers data structures and operations for manipulating numerical tables and time series.
matplotlib	Matplotlib is a comprehensive library for creating static, animated, and interactive visualizations in Python. Matplotlib makes easy things easy and hard things possible.
json	json exposes an API familiar to users of the standard library marshal and pickle modules.
lxml	lxml is the most feature-rich and easy-to-use library for processing XML and HTML in the Python language.
geopy	geopy is a Python client for several popular geocoding web services. The geopy makes it easy for Python developers to locate the coordinates of addresses, cities, countries, and landmarks across the globe using third-party geocoders and other data sources.
requests	Requests is an elegant and simple HTTP library for Python, built for human beings.

Library	Description
sklearn	Scikit-learn is an open source machine learning library that supports supervised and unsupervised learning. It also provides various tools for model fitting, data preprocessing, model selection and evaluation, and many other utilities.
bs4	Beautiful Soup is a Python library for pulling data out of HTML and XML files. It works with your favorite parser to provide idiomatic ways of navigating, searching, and modifying the parse tree. It commonly saves programmers hours or days of work.
warnings	Warning messages are typically issued in situations where it is useful to alert the user of some condition in a program, where that condition (normally) doesn't warrant raising an exception and terminating the program. For example, one might want to issue a warning when a program uses an obsolete module.

```
[1]: ## My Installs
!pip install lxml
!pip install geopy
!pip install beautifulsoup4
!pip install folium
## My Imports
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import json
import lxml
from geopy.geocoders import Nominatim
import requests
from pandas.io.json import json_normalize
import matplotlib.cm as cm
import matplotlib.colors as colors
from sklearn.cluster import KMeans
from bs4 import BeautifulSoup
import folium
import warnings
warnings.filterwarnings('ignore')
```

Requirement already satisfied: lxml in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (4.6.1)

Requirement already satisfied: geopy in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (2.0.0)

Requirement already satisfied: geographiclib<2,>=1.49 in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from geopy)
(1.50)

Requirement already satisfied: beautifulsoup4 in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (4.9.3)

Requirement already satisfied: soupsieve>1.2; python_version >= "3.0" in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from
beautifulsoup4) (2.0.1)

Requirement already satisfied: folium in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (0.5.0)

Requirement already satisfied: branca in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from folium)
(0.4.1)

Requirement already satisfied: jinja2 in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from folium)
(2.11.2)

Requirement already satisfied: requests in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from folium)
(2.24.0)

Requirement already satisfied: six in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from folium)
(1.15.0)

Requirement already satisfied: MarkupSafe>=0.23 in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from
jinja2->folium) (1.1.1)

Requirement already satisfied: idna<3,>=2.5 in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from
requests->folium) (2.10)

Requirement already satisfied: certifi>=2017.4.17 in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from
requests->folium) (2020.6.20)

Requirement already satisfied: urllib3!=1.25.0,!1.25.1,<1.26,>=1.21.1 in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from
requests->folium) (1.25.10)

Requirement already satisfied: chardet<4,>=3.0.2 in
/home/jupyterlab/conda/envs/python/lib/python3.6/site-packages (from
requests->folium) (3.0.4)

1.2 Step 2 - Reading Datas on Page Wikipedia

```
[2]: origin = 'https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M'
      source = requests.get(origin).text
      soup = BeautifulSoup(source)

      table_data = soup.find('div', class_='mw-parser-output')
```

```

table = table_data.table.tbody

columns = ['PostalCode', 'Borough', 'Neighbourhood']
data = dict({key:[] * len(columns) for key in columns})

for row in table.find_all('tr'):
    for i,column in zip(row.find_all('td'),columns):
        i = i.text
        i = i.replace('\n', '')
        data[column].append(i)

df = pd.DataFrame.from_dict(data = data)[columns]
print('Original Data Frame --> Shape is: ', df.shape)
df.head(10)

```

Original Data Frame --> Shape is: (180, 3)

```

[2]:   PostalCode      Borough      Neighbourhood
0      M1A      Not assigned      Not assigned
1      M2A      Not assigned      Not assigned
2      M3A      North York      Parkwoods
3      M4A      North York      Victoria Village
4      M5A      Downtown Toronto      Regent Park, Harbourfront
5      M6A      North York      Lawrence Manor, Lawrence Heights
6      M7A      Downtown Toronto      Queen's Park, Ontario Provincial Government
7      M8A      Not assigned      Not assigned
8      M9A      Etobicoke      Islington Avenue, Humber Valley Village
9      M1B      Scarborough      Malvern, Rouge

```

1.3 Step 3 - Cleaning Data Frame

```

[3]: df = df[df.Borough != 'Not assigned'].reset_index(drop = True)
print('After Clean Data Frame --> Shape is: ', df.shape)
df.head(10)

```

After Clean Data Frame --> Shape is: (103, 3)

```

[3]:   PostalCode      Borough      Neighbourhood
0      M3A      North York      Parkwoods
1      M4A      North York      Victoria Village
2      M5A      Downtown Toronto      Regent Park, Harbourfront
3      M6A      North York      Lawrence Manor, Lawrence Heights
4      M7A      Downtown Toronto      Queen's Park, Ontario Provincial Government
5      M9A      Etobicoke      Islington Avenue, Humber Valley Village
6      M1B      Scarborough      Malvern, Rouge
7      M3B      North York      Don Mills
8      M4B      East York      Parkview Hill, Woodbine Gardens

```

1.4 Step 4 - Reading Datas on File CSV

```
[4]: lat_lon = pd.read_csv('https://cocl.us/Geospatial_data')
lat_lon.rename(columns = {'Postal Code':'PostalCode'}, inplace = True) ##
↳Preparing Column for Merge
lat_lon.head(10)
```

```
[4]:   PostalCode  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
5      M1J    43.744734  -79.239476
6      M1K    43.727929  -79.262029
7      M1L    43.711112  -79.284577
8      M1M    43.716316  -79.239476
9      M1N    43.692657  -79.264848
```

1.5 Step 5 - Merging Tables - Creating Final Dataset

```
[5]: ds = pd.merge(df,lat_lon, on = 'PostalCode')
ds.head(50)
```

```
[5]:   PostalCode      Borough \
0      M3A      North York
1      M4A      North York
2      M5A  Downtown Toronto
3      M6A      North York
4      M7A  Downtown Toronto
5      M9A      Etobicoke
6      M1B      Scarborough
7      M3B      North York
8      M4B      East York
9      M5B  Downtown Toronto
10     M6B      North York
11     M9B      Etobicoke
12     M1C      Scarborough
13     M3C      North York
14     M4C      East York
15     M5C  Downtown Toronto
16     M6C      York
17     M9C      Etobicoke
18     M1E      Scarborough
```

19	M4E	East Toronto
20	M5E	Downtown Toronto
21	M6E	York
22	M1G	Scarborough
23	M4G	East York
24	M5G	Downtown Toronto
25	M6G	Downtown Toronto
26	M1H	Scarborough
27	M2H	North York
28	M3H	North York
29	M4H	East York
30	M5H	Downtown Toronto
31	M6H	West Toronto
32	M1J	Scarborough
33	M2J	North York
34	M3J	North York
35	M4J	East York
36	M5J	Downtown Toronto
37	M6J	West Toronto
38	M1K	Scarborough
39	M2K	North York
40	M3K	North York
41	M4K	East Toronto
42	M5K	Downtown Toronto
43	M6K	West Toronto
44	M1L	Scarborough
45	M2L	North York
46	M3L	North York
47	M4L	East Toronto
48	M5L	Downtown Toronto
49	M6L	North York

	Neighbourhood	Latitude	Longitude
0	Parkwoods	43.753259	-79.329656
1	Victoria Village	43.725882	-79.315572
2	Regent Park, Harbourfront	43.654260	-79.360636
3	Lawrence Manor, Lawrence Heights	43.718518	-79.464763
4	Queen's Park, Ontario Provincial Government	43.662301	-79.389494
5	Islington Avenue, Humber Valley Village	43.667856	-79.532242
6	Malvern, Rouge	43.806686	-79.194353
7	Don Mills	43.745906	-79.352188
8	Parkview Hill, Woodbine Gardens	43.706397	-79.309937
9	Garden District, Ryerson	43.657162	-79.378937
10	Glencairn	43.709577	-79.445073
11	West Deane Park, Princess Gardens, Martin Grov...	43.650943	-79.554724
12	Rouge Hill, Port Union, Highland Creek	43.784535	-79.160497
13	Don Mills	43.725900	-79.340923

14	Woodbine Heights	43.695344	-79.318389
15	St. James Town	43.651494	-79.375418
16	Humewood-Cedarvale	43.693781	-79.428191
17	Eringate, Bloordale Gardens, Old Burnhamthorpe...	43.643515	-79.577201
18	Guildwood, Morningside, West Hill	43.763573	-79.188711
19	The Beaches	43.676357	-79.293031
20	Berczy Park	43.644771	-79.373306
21	Caledonia-Fairbanks	43.689026	-79.453512
22	Woburn	43.770992	-79.216917
23	Leaside	43.709060	-79.363452
24	Central Bay Street	43.657952	-79.387383
25	Christie	43.669542	-79.422564
26	Cedarbrae	43.773136	-79.239476
27	Hillcrest Village	43.803762	-79.363452
28	Bathurst Manor, Wilson Heights, Downsview North	43.754328	-79.442259
29	Thorncliffe Park	43.705369	-79.349372
30	Richmond, Adelaide, King	43.650571	-79.384568
31	Dufferin, Dovercourt Village	43.669005	-79.442259
32	Scarborough Village	43.744734	-79.239476
33	Fairview, Henry Farm, Oriole	43.778517	-79.346556
34	Northwood Park, York University	43.767980	-79.487262
35	East Toronto, Broadview North (Old East York)	43.685347	-79.338106
36	Harbourfront East, Union Station, Toronto Islands	43.640816	-79.381752
37	Little Portugal, Trinity	43.647927	-79.419750
38	Kennedy Park, Ionview, East Birchmount Park	43.727929	-79.262029
39	Bayview Village	43.786947	-79.385975
40	Downsview	43.737473	-79.464763
41	The Danforth West, Riverdale	43.679557	-79.352188
42	Toronto Dominion Centre, Design Exchange	43.647177	-79.381576
43	Brockton, Parkdale Village, Exhibition Place	43.636847	-79.428191
44	Golden Mile, Clairlea, Oakridge	43.711112	-79.284577
45	York Mills, Silver Hills	43.757490	-79.374714
46	Downsview	43.739015	-79.506944
47	India Bazaar, The Beaches West	43.668999	-79.315572
48	Commerce Court, Victoria Hotel	43.648198	-79.379817
49	North Park, Maple Leaf Park, Upwood Park	43.713756	-79.490074

1.6 Step 6 - Preparing Location

```
[6]: ## Location: Toronto, Ontario
address_toronto = 'Toronto, Ontario'
geolocator_toronto = Nominatim(user_agent="ny_explorer")
location_toronto = geolocator_toronto.geocode(address_toronto)
latitude_toronto = location_toronto.latitude
longitude_toronto = location_toronto.longitude
print('The geographical coordinate of Toronto, Ontario are {}, {}'.format(
    latitude_toronto, longitude_toronto))
```

```

## Location: Downtown Toronto ,Toronto, Ontario
address_downtown = 'Downtown Toronto ,Toronto, Ontario'
geolocator_downtown = Nominatim(user_agent = "ny_explorer")
location_downtown = geolocator_downtown.geocode(address_downtown)
latitude_downtown = location_downtown.latitude
longitude_downtown = location_downtown.longitude
print('The geograpical coordinate of Downtown Toronto ,Toronto, Ontario are {},\n
      ↳{}'.format(latitude_downtown, longitude_downtown))

```

The geograpical coordinate of Toronto, Ontario are 43.6534817, -79.3839347.
 The geograpical coordinate of Downtown Toronto ,Toronto, Ontario are 43.6563221, -79.3809161.

1.7 Step 7 - Show Maps with Folium

1.7.1 Map Toronto

```

[7]: map_toronto = folium.Map(location = [latitude_toronto, longitude_toronto],\n
      ↳zoom_start = 10)

# add markers to map
for lat, lng, borough, neighborhood in zip(ds['Latitude'], ds['Longitude'],\n
      ↳ds['Borough'], ds['Neighbourhood']):
    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

```

[7]: <folium.folium.Map at 0x7fd99dcd2160>

```

[8]: map_toronto = folium.Map(location = [latitude_toronto, longitude_toronto],\n
      ↳zoom_start = 10)

for lat, lng, borough, neighborhood in zip(ds['Latitude'], ds['Longitude'],\n
      ↳ds['Borough'], ds['Neighbourhood']):
    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

```

[8]: <folium.folium.Map at 0x7fd99dae4400>

1.7.2 Map Downtown

```

[9]: ds_downtown = ds[ds['Borough'] == 'Downtown Toronto'].reset_index(drop = True)
print(ds_downtown.shape)
ds_downtown.head(10)

```

(19, 5)

```

[9]: PostalCode      Borough \
0      M5A  Downtown Toronto
1      M7A  Downtown Toronto
2      M5B  Downtown Toronto
3      M5C  Downtown Toronto
4      M5E  Downtown Toronto
5      M5G  Downtown Toronto
6      M6G  Downtown Toronto
7      M5H  Downtown Toronto
8      M5J  Downtown Toronto
9      M5K  Downtown Toronto

                                Neighbourhood  Latitude  Longitude
0                                Regent Park, Harbourfront  43.654260  -79.360636
1      Queen's Park, Ontario Provincial Government  43.662301  -79.389494
2                                Garden District, Ryerson  43.657162  -79.378937
3                                St. James Town  43.651494  -79.375418
4                                Berczy Park  43.644771  -79.373306
5                                Central Bay Street  43.657952  -79.387383
6                                Christie  43.669542  -79.422564
7                                Richmond, Adelaide, King  43.650571  -79.384568
8  Harbourfront East, Union Station, Toronto Islands  43.640816  -79.381752
9      Toronto Dominion Centre, Design Exchange  43.647177  -79.381576

```

```
[10]: map_downtown = folium.Map(location=[latitude_downtown, longitude_downtown],
    ↪zoom_start= 11)

for lat, lng, borough, neighborhood in zip(ds_downtown['Latitude'],
    ↪ds_downtown['Longitude'],
                                ds_downtown['Borough'],
    ↪ds_downtown['Neighbourhood']):
    label = '{} , {}'.format(neighborhood, borough)
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [lat, lng],
        radius=5,
        popup=label,
        color='red',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_downtown)

map_downtown
```

```
[10]: <folium.folium.Map at 0x7fd99c112f98>
```

1.8 Step 8 - Passing Credentials Foursquare

```
[11]: CLIENT_ID = 'FW4LQTK3S5SUA0CARVEFH4SC3PKQKCZRBPT02DBRIPVMOT' # your
    ↪Foursquare ID
CLIENT_SECRET = 'MTU22W5KUID5MW1UK3QDVLOB0CBJ4QCJBFDLUPINJFK3ZSQA' # your
    ↪Foursquare Secret
VERSION = '20180605' # Foursquare API version

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

Your credentails:

CLIENT_ID: FW4LQTK3S5SUA0CARVEFH4SC3PKQKCZRBPT02DBRIPVMOT

CLIENT_SECRET: MTU22W5KUID5MW1UK3QDVLOB0CBJ4QCJBFDLUPINJFK3ZSQA

1.9 Step 9 - Exploring Details of Donwtown Toronto

```
[12]: RADIUS = 500 # define radius
LIMIT = 100 # limit of number of venues returned by Foursquare API

url = 'https://api.foursquare.com/v2/venues/explore?
    ↪&client_id={}&client_secret={}&v={}&ll={},{}&radius={}&limit={}' .format(
```

```
CLIENT_ID,  
CLIENT_SECRET,  
VERSION,  
latitude_downtown,  
longitude_downtown,  
RADIUS,  
LIMIT)  
url
```

```
[12]: 'https://api.foursquare.com/v2/venues/explore?&client_id=FW4LQTK3S5SUAACARVEFH4  
SC3PKQKCZRPXT02DBRIPVMOT&client_secret=MTU22W5KUID5MW1UK3QDVLOB0CBJ4QCJBFDLUPIN  
JFK3ZSQA&v=20180605&ll=43.6563221,-79.3809161&radius=500&limit=100'
```

1.10 Step 10 - Exposing Explore Datas in JSON

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

```
[13]: {'meta': {'code': 200, 'requestId': '5f9202c490fd6244ffd00331'},  
      'response': {'suggestedFilters': {'header': 'Tap to show:',  
    'filters': [{'name': 'Open now', 'key': 'openNow'}]},  
    'headerLocation': 'Bay Street Corridor',  
    'headerFullLocation': 'Bay Street Corridor, Toronto',  
    'headerLocationGranularity': 'neighborhood',  
    'totalResults': 108,  
    'suggestedBounds': {'ne': {'lat': 43.6608221045, 'lng': -79.37470788695488},  
    'sw': {'lat': 43.651822095499995, 'lng': -79.3871243130451}},  
    'groups': [{'type': 'Recommended Places',  
    'name': 'recommended',  
    'items': [{'reasons': {'count': 0,  
    'items': [{'summary': 'This spot is popular',  
    'type': 'general',  
    'reasonName': 'globalInteractionReason'}]}],  
    'venue': {'id': '57eda381498ebe0e6ef40972',  
    'name': 'UNIQLO',  
    'location': {'address': '220 Yonge St',  
    'crossStreet': 'at Dundas St W',  
    'lat': 43.65591027779457,  
    'lng': -79.38064099181345,  
    'labeledLatLngs': [{'label': 'display',  
    'lat': 43.65591027779457,  
    'lng': -79.38064099181345}]},  
    'distance': 50,  
    'postalCode': 'M5B 2H1',  
    'cc': 'CA',  
    'neighborhood': 'Downtown Toronto',  
    'city': 'Toronto',
```

```

    'state': 'ON',
    'country': 'Canada',
    'formattedAddress': ['220 Yonge St (at Dundas St W)',
        'Toronto ON M5B 2H1',
        'Canada']],
    'categories': [{ 'id': '4bf58dd8d48988d103951735',
        'name': 'Clothing Store',
        'pluralName': 'Clothing Stores',
        'shortName': 'Apparel',
        'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/shops/apparel_',
        'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': [] },
    'referralId': 'e-0-57eda381498ebe0e6ef40972-0'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason' } ] },
    'venue': { 'id': '4ad4c062f964a5200bf820e3',
        'name': 'Silver Snail Comics',
        'location': { 'address': '329 Yonge St',
            'crossStreet': 'at Dundas St E',
            'lat': 43.65703137958407,
            'lng': -79.38140310220501,
            'labeledLatLngs': [{ 'label': 'display',
                'lat': 43.65703137958407,
                'lng': -79.38140310220501 } ] },
        'distance': 88,
        'postalCode': 'M5B 1R7',
        'cc': 'CA',
        'city': 'Toronto',
        'state': 'ON',
        'country': 'Canada',
        'formattedAddress': ['329 Yonge St (at Dundas St E)',
            'Toronto ON M5B 1R7',
            'Canada']],
        'categories': [{ 'id': '52f2ab2ebcbcb57f1066b8b18',
            'name': 'Comic Shop',
            'pluralName': 'Comic Shops',
            'shortName': 'Comic Shop',
            'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/shops/comic_',
            'suffix': '.png'},
            'primary': True}],
        'photos': { 'count': 0, 'groups': [] },
        'referralId': 'e-0-4ad4c062f964a5200bf820e3-1'},

```

```

    {'reasons': {'count': 0,
      'items': [{'summary': 'This spot is popular',
        'type': 'general',
        'reasonName': 'globalInteractionReason'}]}},
    'venue': {'id': '4ad4c062f964a520c5f720e3',
      'name': 'Ed Mirvish Theatre',
      'location': {'address': '244 Victoria St.',
        'crossStreet': 'btwn Dundas St E and Shuter St',
        'lat': 43.655101567321054,
        'lng': -79.37976762131545,
        'labeledLatLngs': [{'label': 'display',
          'lat': 43.655101567321054,
          'lng': -79.37976762131545}]},
      'distance': 164,
      'postalCode': 'M5B 1V8',
      'cc': 'CA',
      'city': 'Toronto',
      'state': 'ON',
      'country': 'Canada',
      'formattedAddress': ['244 Victoria St. (btwn Dundas St E and Shuter
St)',
        'Toronto ON M5B 1V8',
        'Canada']},
    'categories': [{'id': '4bf58dd8d48988d137941735',
      'name': 'Theater',
      'pluralName': 'Theaters',
      'shortName': 'Theater',
      'icon': {'prefix': 'https://ss3.4sqi.net/img/categories_v2/arts_enterta
inment/performingarts_theater_',
        'suffix': '.png'},
      'primary': True}],
    'photos': {'count': 0, 'groups': []}},
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    'Canada']],
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    'name': 'Coffee Shop',
    'pluralName': 'Coffee Shops',
    'shortName': 'Coffee Shop',
    'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/food/coffeeshop_',
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    'primary': True}],
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                'labeledLatLngs': [{'label': 'display',
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        'suffix': '.png'},
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    'country': 'Canada',
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    'lat': 43.653936903308185,
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        'lng': -79.38246987630343,
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        'lng': -79.38246987630343}]},
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        'Canada']},
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        'shortName': 'Office',
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'cc': 'CA',
'city': 'Toronto',
'state': 'ON',
'country': 'Canada',
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  'Toronto ON M5G 1Z4',
  'Canada']],
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  'shortName': 'Japanese',
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  'suffix': '.png'},
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  'location': {'address': '100 Queen St W',
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    'lng': -79.38351631164551,
    'labeledLatLngs': [{'label': 'display',
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    'cc': 'CA',
    'city': 'Toronto',
    'state': 'ON',
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    'formattedAddress': ['100 Queen St W (at Bay St)',
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      'Canada']}]},

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        'primary': True}],
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    'venue': { 'id': '56ccd5cfcd1069ca160a797e',
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        'location': { 'address': '147 Dundas St W',
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            'lat': 43.65537430780922,
            'lng': -79.38535434742991,
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        'city': 'Toronto',
        'state': 'ON',
        'country': 'Canada',
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            'Canada' ] },
    'categories': [{ 'id': '4bf58dd8d48988d1dc931735',
        'name': 'Tea Room',
        'pluralName': 'Tea Rooms',
        'shortName': 'Tea Room',
        'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/food/tearoom_',
        'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': [] },
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            'type': 'general',
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    'venue': { 'id': '4b40f62ef964a52050be25e3',

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'state': 'ON',
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'Toronto ON M5B 2H1',
'Canada']},
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'name': 'Clothing Store',
'pluralName': 'Clothing Stores',
'shortName': 'Apparel',
'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/shops/apparel_',
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'primary': True}],
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'lng': -79.38533765920816}]},
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    'Canada']},
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                'Canada']},
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'https://ss3.4sqi.net/img/categories_v2/shops/technology_',
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        'state': 'ON',
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        'Canada']},
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'lng': -79.38650010906946,
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            'shortName': 'Video Games',
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            'suffix': '.png'},
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'Canada']],
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'https://ss3.4sqi.net/img/categories_v2/food/middleeastern_',
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        'pluralName': 'Clothing Stores',
        'shortName': 'Apparel',
        'icon': { 'prefix':
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        'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': []}],
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            'lng': -79.38244024080487,
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                'Canada']}],
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    'shortName': 'Gym / Fitness',
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    'Canada']},
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    'state': 'ON',
    'country': 'Canada',
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'Canada']},

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'city': 'Toronto',
'state': 'ON',
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'Canada']],
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'lng': -79.3827044}]},
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'cc': 'CA',
'city': 'Toronto',
'state': 'ON',
'country': 'Canada',
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'Toronto ON M5B 1S8',
'Canada']},
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'pluralName': 'Furniture / Home Stores',
'shortName': 'Furniture / Home',
'icon': {'prefix':
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'primary': True}],
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'city': 'Toronto',
'state': 'ON',
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            'lat': 43.65690736298195,
            'lng': -79.3773287381231,
            'labeledLatLngs': [{ 'label': 'display',
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                'lng': -79.3773287381231 } ] },
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        'cc': 'CA',
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        'state': 'ON',
        'country': 'Canada',
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            'Canada' ] },
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    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason' } ] },
    'venue': { 'id': '4ae61cf6f964a520caa421e3',

```

```

'name': 'Pantages Hotel & Spa',
'location': {'address': '200 Victoria St',
'crossStreet': 'at Shuter St',
'lat': 43.65449797039222,
'lng': -79.37903488923283,
'labeledLatLngs': [{'label': 'display',
'lat': 43.65449797039222,
'lng': -79.37903488923283}]},
'distance': 253,
'cc': 'CA',
'city': 'Toronto',
'state': 'ON',
'country': 'Canada',
'formattedAddress': ['200 Victoria St (at Shuter St)',
'Toronto ON',
'Canada']],
'categories': [{'id': '4bf58dd8d48988d1fa931735',
'name': 'Hotel',
'pluralName': 'Hotels',
'shortName': 'Hotel',
'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/travel/hotel_',
'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []},
'referralId': 'e-0-4ae61cf6f964a520caa421e3-94'},
'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]},
'venue': {'id': '4b6a0069f964a520f3c02be3',
'name': 'Pantages Lounge & Bar',
'location': {'address': '200 Victoria St.',
'crossStreet': 'at Shuter St.',
'lat': 43.654493431269564,
'lng': -79.3789996004105,
'labeledLatLngs': [{'label': 'display',
'lat': 43.654493431269564,
'lng': -79.3789996004105}]},
'distance': 255,
'postalCode': 'M5B 1W8',
'cc': 'CA',
'city': 'Toronto',
'state': 'ON',
'country': 'Canada',
'formattedAddress': ['200 Victoria St. (at Shuter St.)',
'Toronto ON M5B 1W8',

```

```

    'Canada']},
    'categories': [{ 'id': '4bf58dd8d48988d11e941735',
        'name': 'Cocktail Bar',
        'pluralName': 'Cocktail Bars',
        'shortName': 'Cocktail',
        'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/nightlife/cocktails_',
        'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': []},
    'referralId': 'e-0-4b6a0069f964a520f3c02be3-95'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason' } ]},
    'venue': { 'id': '53a85b39498e80b97c5bffd',
        'name': "It's All Grk",
        'location': { 'address': '101 Dundas St E',
            'crossStreet': 'Church',
            'lat': 43.65678120012301,
            'lng': -79.37682835542365,
            'labeledLatLngs': [{ 'label': 'display',
                'lat': 43.65678120012301,
                'lng': -79.37682835542365 } ]},
        'distance': 333,
        'cc': 'CA',
        'city': 'Toronto',
        'state': 'ON',
        'country': 'Canada',
        'formattedAddress': [ '101 Dundas St E (Church)',
            'Toronto ON',
            'Canada' ]},
    'categories': [{ 'id': '4bf58dd8d48988d10e941735',
        'name': 'Greek Restaurant',
        'pluralName': 'Greek Restaurants',
        'shortName': 'Greek',
        'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/food/greek_',
        'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': []},
    'referralId': 'e-0-53a85b39498e80b97c5bffd-96'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason' } ]},
    'venue': { 'id': '4bddd88f0ee3a593d7e12eb0',

```

```

'name': 'Ryerson Theatre',
'location': {'address': '43 Gerrard St. E, KHN-162',
'crossStreet': 'btwn Yonge & Church',
'lat': 43.65941278506566,
'lng': -79.37999674976807,
'labeledLatLngs': [{'label': 'display',
'lat': 43.65941278506566,
'lng': -79.37999674976807}]},
'distance': 351,
'postalCode': 'M5B 2K8',
'cc': 'CA',
'city': 'Toronto',
'state': 'ON',
'country': 'Canada',
'formattedAddress': ['43 Gerrard St. E, KHN-162 (btwn Yonge & Church)',
'Toronto ON M5B 2K8',
'Canada']],
'categories': [{'id': '4bf58dd8d48988d17f941735',
'name': 'Movie Theater',
'pluralName': 'Movie Theaters',
'shortName': 'Movie Theater',
'icon': {'prefix':
'https://ss3.4sqi.net/img/categories_v2/arts_entertainment/movietheater_',
'suffix': '.png'},
'primary': True}],
'photos': {'count': 0, 'groups': []}},
'referralId': 'e-0-4bddd88f0ee3a593d7e12eb0-97'},
'reasons': {'count': 0,
'items': [{'summary': 'This spot is popular',
'type': 'general',
'reasonName': 'globalInteractionReason'}]},
'venue': {'id': '4d964b2397d06ea8849fff0a',
'name': 'Subway',
'location': {'address': '173 Church Street, Unit #4',
'crossStreet': 'at Shuter St.',
'lat': 43.65461271472636,
'lng': -79.37618851036927,
'labeledLatLngs': [{'label': 'display',
'lat': 43.65461271472636,
'lng': -79.37618851036927}]},
'distance': 425,
'postalCode': 'M5B 1Y4',
'cc': 'CA',
'city': 'Toronto',
'state': 'ON',
'country': 'Canada',
'formattedAddress': ['173 Church Street, Unit #4 (at Shuter St.)',

```

```

    'Toronto ON M5B 1Y4',
    'Canada']},
    'categories': [{ 'id': '4bf58dd8d48988d1c5941735',
        'name': 'Sandwich Place',
        'pluralName': 'Sandwich Places',
        'shortName': 'Sandwiches',
        'icon': { 'prefix': 'https://ss3.4sqi.net/img/categories_v2/food/deli_',
            'suffix': '.png'},
        'primary': True}],
    'photos': { 'count': 0, 'groups': []},
    'referralId': 'e-0-4d964b2397d06ea8849fff0a-98'},
    { 'reasons': { 'count': 0,
        'items': [{ 'summary': 'This spot is popular',
            'type': 'general',
            'reasonName': 'globalInteractionReason' } ]},
    'venue': { 'id': '4adfbe44f964a5202d7d21e3',
        'name': 'The Ram in the Rye',
        'location': { 'address': '63 Gould St.',
            'crossStreet': 'Church',
            'lat': 43.65794559312108,
            'lng': -79.37783573199916,
            'labeledLatLngs': [{ 'label': 'display',
                'lat': 43.65794559312108,
                'lng': -79.37783573199916 } ]},
        'distance': 306,
        'postalCode': 'M5B 1E9',
        'cc': 'CA',
        'city': 'Toronto',
        'state': 'ON',
        'country': 'Canada',
        'formattedAddress': [ '63 Gould St. (Church)',
            'Toronto ON M5B 1E9',
            'Canada' ]},
        'categories': [{ 'id': '4bf58dd8d48988d116941735',
            'name': 'Bar',
            'pluralName': 'Bars',
            'shortName': 'Bar',
            'icon': { 'prefix':
'https://ss3.4sqi.net/img/categories_v2/nightlife/pub_',
                'suffix': '.png'},
            'primary': True } ]},
        'photos': { 'count': 0, 'groups': []},
        'venuePage': { 'id': '81783148' } },
    'referralId': 'e-0-4adfbe44f964a5202d7d21e3-99' } ] ] ] ] }

```

1.11 Step 11 - Functions and Pre-adjust Util

```
[14]: ## REASONING COPIED FROM PREVIOUS EXERCISE
      ## Support Functions

      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']

      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 = ['Neighbourhood',
                        'Neighbourhood Latitude',
                        'Neighbourhood Longitude',
                        'Venue',
                        'Venue Latitude',
                        'Venue Longitude',
                        'Venue Category']

return(nearby_venues)

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]

```

```

[15]: ## REASONING COPIED FROM PREVIOUS EXERCISE

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(25)

```

```

[15]:

```

	name	categories \
0	UNIQLO	Clothing Store
1	Silver Snail Comics	Comic Shop
2	Ed Mirvish Theatre	Theater
3	Blaze Pizza	Pizza Place
4	Yonge-Dundas Square	Plaza
5	CF Toronto Eaton Centre	Shopping Mall
6	Red Lobster	Seafood Restaurant
7	The Queen and Beaver Public House	Gastropub

8	Burrito Boyz	Burrito Place
9	MUJI	Miscellaneous Shop
10	Crepe Delicious	Fast Food Restaurant
11	Danish Pastry House	Bakery
12	Salad King	Thai Restaurant
13	Samsung Experience Store (Eaton Centre)	Electronics Store
14	Jazz Bistro	Music Venue
15	The Senator Restaurant	Diner
16	The Elm Tree Restaurant	Modern European Restaurant
17	Ryerson Image Centre	Art Gallery
18	Solei Tanning Salon	Tanning Salon
19	LUSH	Cosmetics Shop
20	Indigo	Bookstore
21	Banh Mi Boys	Sandwich Place
22	Hailed Coffee	Coffee Shop
23	Hokkaido Ramen Santouka	Ramen Restaurant
24	Elgin And Winter Garden Theatres	Theater

	lat	lng
0	43.655910	-79.380641
1	43.657031	-79.381403
2	43.655102	-79.379768
3	43.656518	-79.380015
4	43.656054	-79.380495
5	43.654646	-79.381139
6	43.656328	-79.383621
7	43.657472	-79.383524
8	43.656265	-79.378343
9	43.656024	-79.383284
10	43.654536	-79.380889
11	43.654574	-79.380740
12	43.657601	-79.381620
13	43.655648	-79.381011
14	43.655678	-79.379276
15	43.655641	-79.379199
16	43.657397	-79.383761
17	43.657523	-79.379460
18	43.654734	-79.380248
19	43.653557	-79.380400
20	43.653515	-79.380696
21	43.659292	-79.381949
22	43.658833	-79.383684
23	43.656435	-79.377586
24	43.653394	-79.378507

```
[16]: print('{} venues were returned by Foursquare.'.format(nearby_venues.shape[0]))
```

100 venues were returned by Foursquare.

```
[17]: downtown_venues = getNearbyVenues(names = ds_downtown['Neighbourhood'],
                                         latitudes = ds_downtown['Latitude'],
                                         longitudes = ds_downtown['Longitude']
                                         )
```

Regent Park, Harbourfront
Queen's Park, Ontario Provincial Government
Garden District, Ryerson
St. James Town
Berczy Park
Central Bay Street
Christie
Richmond, Adelaide, King
Harbourfront East, Union Station, Toronto Islands
Toronto Dominion Centre, Design Exchange
Commerce Court, Victoria Hotel
University of Toronto, Harbord
Kensington Market, Chinatown, Grange Park
CN Tower, King and Spadina, Railway Lands, Harbourfront West, Bathurst Quay,
South Niagara, Island airport
Rosedale
Stn A PO Boxes
St. James Town, Cabbagetown
First Canadian Place, Underground city
Church and Wellesley

1.12 Step 12 - Checking Result in Data Frame

```
[18]: print(downtown_venues.shape)
      downtown_venues.head(25)
```

(1248, 7)

```
[18]:
```

	Neighbourhood	Neighbourhood	Latitude	\
0	Regent Park, Harbourfront		43.65426	
1	Regent Park, Harbourfront		43.65426	
2	Regent Park, Harbourfront		43.65426	
3	Regent Park, Harbourfront		43.65426	
4	Regent Park, Harbourfront		43.65426	
5	Regent Park, Harbourfront		43.65426	
6	Regent Park, Harbourfront		43.65426	
7	Regent Park, Harbourfront		43.65426	
8	Regent Park, Harbourfront		43.65426	
9	Regent Park, Harbourfront		43.65426	
10	Regent Park, Harbourfront		43.65426	
11	Regent Park, Harbourfront		43.65426	

12	Regent Park, Harbourfront	43.65426
13	Regent Park, Harbourfront	43.65426
14	Regent Park, Harbourfront	43.65426
15	Regent Park, Harbourfront	43.65426
16	Regent Park, Harbourfront	43.65426
17	Regent Park, Harbourfront	43.65426
18	Regent Park, Harbourfront	43.65426
19	Regent Park, Harbourfront	43.65426
20	Regent Park, Harbourfront	43.65426
21	Regent Park, Harbourfront	43.65426
22	Regent Park, Harbourfront	43.65426
23	Regent Park, Harbourfront	43.65426
24	Regent Park, Harbourfront	43.65426

	Neighbourhood Longitude	Venue \
0	-79.360636	Roselle Desserts
1	-79.360636	Tandem Coffee
2	-79.360636	Cooper Koo Family YMCA
3	-79.360636	Body Blitz Spa East
4	-79.360636	Impact Kitchen
5	-79.360636	Corktown Common
6	-79.360636	Dominion Pub and Kitchen
7	-79.360636	The Distillery Historic District
8	-79.360636	Morning Glory Cafe
9	-79.360636	The Extension Room
10	-79.360636	Distillery Sunday Market
11	-79.360636	SOMA chocolatemaker
12	-79.360636	Figs Breakfast & Lunch
13	-79.360636	Arvo
14	-79.360636	Rooster Coffee
15	-79.360636	Sumach Espresso
16	-79.360636	Starbucks
17	-79.360636	Cacao 70
18	-79.360636	Underpass Park
19	-79.360636	Young Centre for the Performing Arts
20	-79.360636	Alumnae Theatre
21	-79.360636	El Catrin
22	-79.360636	Cluny Bistro & Boulangerie
23	-79.360636	Brick Street Bakery
24	-79.360636	The Yoga Lounge

	Venue Latitude	Venue Longitude	Venue Category
0	43.653447	-79.362017	Bakery
1	43.653559	-79.361809	Coffee Shop
2	43.653249	-79.358008	Distribution Center
3	43.654735	-79.359874	Spa
4	43.656369	-79.356980	Restaurant

5	43.655618	-79.356211	Park
6	43.656919	-79.358967	Pub
7	43.650244	-79.359323	Historic Site
8	43.653947	-79.361149	Breakfast Spot
9	43.653313	-79.359725	Gym / Fitness Center
10	43.650075	-79.361832	Farmers Market
11	43.650622	-79.358127	Chocolate Shop
12	43.655675	-79.364503	Breakfast Spot
13	43.649963	-79.361442	Coffee Shop
14	43.651900	-79.365609	Coffee Shop
15	43.658135	-79.359515	Coffee Shop
16	43.651613	-79.364917	Coffee Shop
17	43.650067	-79.360723	Dessert Shop
18	43.655764	-79.354806	Park
19	43.650825	-79.357593	Performing Arts Venue
20	43.652756	-79.364753	Theater
21	43.650601	-79.358920	Mexican Restaurant
22	43.650565	-79.357843	French Restaurant
23	43.650574	-79.359539	Bakery
24	43.655515	-79.364955	Yoga Studio

```
[19]: downtown_venues.groupby('Neighbourhood').count()
```

```
[19]:
```

Neighbourhood	Neighbourhood Latitude \
Berczy Park	55
CN Tower, King and Spadina, Railway Lands, Harb...	16
Central Bay Street	68
Christie	16
Church and Wellesley	75
Commerce Court, Victoria Hotel	100
First Canadian Place, Underground city	100
Garden District, Ryerson	100
Harbourfront East, Union Station, Toronto Islands	100
Kensington Market, Chinatown, Grange Park	74
Queen's Park, Ontario Provincial Government	33
Regent Park, Harbourfront	44
Richmond, Adelaide, King	100
Rosedale	4
St. James Town	85
St. James Town, Cabbagetown	48
Stn A PO Boxes	96
Toronto Dominion Centre, Design Exchange	100
University of Toronto, Harbord	34

Neighbourhood	Neighbourhood Longitude \
---------------	---------------------------

Berczy Park	55
CN Tower, King and Spadina, Railway Lands, Harb...	16
Central Bay Street	68
Christie	16
Church and Wellesley	75
Commerce Court, Victoria Hotel	100
First Canadian Place, Underground city	100
Garden District, Ryerson	100
Harbourfront East, Union Station, Toronto Islands	100
Kensington Market, Chinatown, Grange Park	74
Queen's Park, Ontario Provincial Government	33
Regent Park, Harbourfront	44
Richmond, Adelaide, King	100
Rosedale	4
St. James Town	85
St. James Town, Cabbagetown	48
Stn A PO Boxes	96
Toronto Dominion Centre, Design Exchange	100
University of Toronto, Harbord	34

	Venue	Venue Latitude \
Neighbourhood		
Berczy Park	55	55
CN Tower, King and Spadina, Railway Lands, Harb...	16	16
Central Bay Street	68	68
Christie	16	16
Church and Wellesley	75	75
Commerce Court, Victoria Hotel	100	100
First Canadian Place, Underground city	100	100
Garden District, Ryerson	100	100
Harbourfront East, Union Station, Toronto Islands	100	100
Kensington Market, Chinatown, Grange Park	74	74
Queen's Park, Ontario Provincial Government	33	33
Regent Park, Harbourfront	44	44
Richmond, Adelaide, King	100	100
Rosedale	4	4
St. James Town	85	85
St. James Town, Cabbagetown	48	48
Stn A PO Boxes	96	96
Toronto Dominion Centre, Design Exchange	100	100
University of Toronto, Harbord	34	34

	Venue Longitude \
Neighbourhood	
Berczy Park	55
CN Tower, King and Spadina, Railway Lands, Harb...	16
Central Bay Street	68

Christie	16
Church and Wellesley	75
Commerce Court, Victoria Hotel	100
First Canadian Place, Underground city	100
Garden District, Ryerson	100
Harbourfront East, Union Station, Toronto Islands	100
Kensington Market, Chinatown, Grange Park	74
Queen's Park, Ontario Provincial Government	33
Regent Park, Harbourfront	44
Richmond, Adelaide, King	100
Rosedale	4
St. James Town	85
St. James Town, Cabbagetown	48
Stn A PO Boxes	96
Toronto Dominion Centre, Design Exchange	100
University of Toronto, Harbord	34

	Venue Category
Neighbourhood	
Berczy Park	55
CN Tower, King and Spadina, Railway Lands, Harb...	16
Central Bay Street	68
Christie	16
Church and Wellesley	75
Commerce Court, Victoria Hotel	100
First Canadian Place, Underground city	100
Garden District, Ryerson	100
Harbourfront East, Union Station, Toronto Islands	100
Kensington Market, Chinatown, Grange Park	74
Queen's Park, Ontario Provincial Government	33
Regent Park, Harbourfront	44
Richmond, Adelaide, King	100
Rosedale	4
St. James Town	85
St. James Town, Cabbagetown	48
Stn A PO Boxes	96
Toronto Dominion Centre, Design Exchange	100
University of Toronto, Harbord	34

1.13 Step 13 - Check Unique Categories

```
[20]: print('There are {} uniques categories.'.format(len(downtown_venues['Venue_
      ↪Category'].unique())))
```

There are 213 uniques categories.

1.14 Step 14 - Analyzing Each Neighborhood

```
[21]: # one hot encoding
downtown_onehot = pd.get_dummies(downtown_venues[['Venue Category']],
    ↪ prefix="", prefix_sep="")

# add neighborhood column back to dataframe
downtown_onehot['Neighbourhood'] = downtown_venues['Neighbourhood']

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

downtown_onehot.head(25)
```

```
[21]:
```

	Neighbourhood	Afghan Restaurant	Airport	Airport Food Court	\
0	Regent Park, Harbourfront	0	0	0	
1	Regent Park, Harbourfront	0	0	0	
2	Regent Park, Harbourfront	0	0	0	
3	Regent Park, Harbourfront	0	0	0	
4	Regent Park, Harbourfront	0	0	0	
5	Regent Park, Harbourfront	0	0	0	
6	Regent Park, Harbourfront	0	0	0	
7	Regent Park, Harbourfront	0	0	0	
8	Regent Park, Harbourfront	0	0	0	
9	Regent Park, Harbourfront	0	0	0	
10	Regent Park, Harbourfront	0	0	0	
11	Regent Park, Harbourfront	0	0	0	
12	Regent Park, Harbourfront	0	0	0	
13	Regent Park, Harbourfront	0	0	0	
14	Regent Park, Harbourfront	0	0	0	
15	Regent Park, Harbourfront	0	0	0	
16	Regent Park, Harbourfront	0	0	0	
17	Regent Park, Harbourfront	0	0	0	
18	Regent Park, Harbourfront	0	0	0	
19	Regent Park, Harbourfront	0	0	0	
20	Regent Park, Harbourfront	0	0	0	
21	Regent Park, Harbourfront	0	0	0	
22	Regent Park, Harbourfront	0	0	0	
23	Regent Park, Harbourfront	0	0	0	
24	Regent Park, Harbourfront	0	0	0	

	Airport Gate	Airport Lounge	Airport Service	Airport Terminal	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	

3	0	0	0	0
4	0	0	0	0
5	0	0	0	0
6	0	0	0	0
7	0	0	0	0
8	0	0	0	0
9	0	0	0	0
10	0	0	0	0
11	0	0	0	0
12	0	0	0	0
13	0	0	0	0
14	0	0	0	0
15	0	0	0	0
16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0

	American Restaurant	Antique Shop	...	Theme Restaurant	\
0	0	0	...	0	
1	0	0	...	0	
2	0	0	...	0	
3	0	0	...	0	
4	0	0	...	0	
5	0	0	...	0	
6	0	0	...	0	
7	0	0	...	0	
8	0	0	...	0	
9	0	0	...	0	
10	0	0	...	0	
11	0	0	...	0	
12	0	0	...	0	
13	0	0	...	0	
14	0	0	...	0	
15	0	0	...	0	
16	0	0	...	0	
17	0	0	...	0	
18	0	0	...	0	
19	0	0	...	0	
20	0	0	...	0	
21	0	0	...	0	
22	0	0	...	0	

23	0	0 ...	0
24	0	0 ...	0

	Toy / Game Store	Trail	Train Station	Vegetarian / Vegan Restaurant	\
0	0	0	0		0
1	0	0	0		0
2	0	0	0		0
3	0	0	0		0
4	0	0	0		0
5	0	0	0		0
6	0	0	0		0
7	0	0	0		0
8	0	0	0		0
9	0	0	0		0
10	0	0	0		0
11	0	0	0		0
12	0	0	0		0
13	0	0	0		0
14	0	0	0		0
15	0	0	0		0
16	0	0	0		0
17	0	0	0		0
18	0	0	0		0
19	0	0	0		0
20	0	0	0		0
21	0	0	0		0
22	0	0	0		0
23	0	0	0		0
24	0	0	0		0

	Video Game Store	Vietnamese Restaurant	Wine Bar	Women's Store	\
0	0	0	0	0	
1	0	0	0	0	
2	0	0	0	0	
3	0	0	0	0	
4	0	0	0	0	
5	0	0	0	0	
6	0	0	0	0	
7	0	0	0	0	
8	0	0	0	0	
9	0	0	0	0	
10	0	0	0	0	
11	0	0	0	0	
12	0	0	0	0	
13	0	0	0	0	
14	0	0	0	0	
15	0	0	0	0	

16	0	0	0	0
17	0	0	0	0
18	0	0	0	0
19	0	0	0	0
20	0	0	0	0
21	0	0	0	0
22	0	0	0	0
23	0	0	0	0
24	0	0	0	0

	Yoga Studio
0	0
1	0
2	0
3	0
4	0
5	0
6	0
7	0
8	0
9	0
10	0
11	0
12	0
13	0
14	0
15	0
16	0
17	0
18	0
19	0
20	0
21	0
22	0
23	0
24	1

[25 rows x 214 columns]

```
[22]: downtown_onehot.shape
```

```
[22]: (1248, 214)
```

```
[23]: downtown_grouped = downtown_onehot.groupby('Neighbourhood').mean().reset_index()
downtown_grouped
```

[23] :

	Neighbourhood	Afghan Restaurant \
0	Berczy Park	0.000000
1	CN Tower, King and Spadina, Railway Lands, Har...	0.000000
2	Central Bay Street	0.000000
3	Christie	0.000000
4	Church and Wellesley	0.013333
5	Commerce Court, Victoria Hotel	0.000000
6	First Canadian Place, Underground city	0.000000
7	Garden District, Ryerson	0.000000
8	Harbourfront East, Union Station, Toronto Islands	0.000000
9	Kensington Market, Chinatown, Grange Park	0.000000
10	Queen's Park, Ontario Provincial Government	0.000000
11	Regent Park, Harbourfront	0.000000
12	Richmond, Adelaide, King	0.000000
13	Rosedale	0.000000
14	St. James Town	0.000000
15	St. James Town, Cabbagetown	0.000000
16	Stn A PO Boxes	0.000000
17	Toronto Dominion Centre, Design Exchange	0.000000
18	University of Toronto, Harbord	0.000000

	Airport	Airport Food Court	Airport Gate	Airport Lounge \
0	0.0000	0.0000	0.0000	0.000
1	0.0625	0.0625	0.0625	0.125
2	0.0000	0.0000	0.0000	0.000
3	0.0000	0.0000	0.0000	0.000
4	0.0000	0.0000	0.0000	0.000
5	0.0000	0.0000	0.0000	0.000
6	0.0000	0.0000	0.0000	0.000
7	0.0000	0.0000	0.0000	0.000
8	0.0000	0.0000	0.0000	0.000
9	0.0000	0.0000	0.0000	0.000
10	0.0000	0.0000	0.0000	0.000
11	0.0000	0.0000	0.0000	0.000
12	0.0000	0.0000	0.0000	0.000
13	0.0000	0.0000	0.0000	0.000
14	0.0000	0.0000	0.0000	0.000
15	0.0000	0.0000	0.0000	0.000
16	0.0000	0.0000	0.0000	0.000
17	0.0000	0.0000	0.0000	0.000
18	0.0000	0.0000	0.0000	0.000

	Airport Service	Airport Terminal	American Restaurant	Antique Shop ... \
0	0.000	0.0000	0.000000	0.000000 ...
1	0.125	0.0625	0.000000	0.000000 ...
2	0.000	0.0000	0.000000	0.000000 ...
3	0.000	0.0000	0.000000	0.000000 ...

4	0.000	0.0000	0.013333	0.000000	...
5	0.000	0.0000	0.040000	0.000000	...
6	0.000	0.0000	0.040000	0.000000	...
7	0.000	0.0000	0.000000	0.000000	...
8	0.000	0.0000	0.000000	0.000000	...
9	0.000	0.0000	0.000000	0.000000	...
10	0.000	0.0000	0.000000	0.000000	...
11	0.000	0.0000	0.000000	0.022727	...
12	0.000	0.0000	0.020000	0.000000	...
13	0.000	0.0000	0.000000	0.000000	...
14	0.000	0.0000	0.035294	0.000000	...
15	0.000	0.0000	0.000000	0.000000	...
16	0.000	0.0000	0.010417	0.010417	...
17	0.000	0.0000	0.030000	0.000000	...
18	0.000	0.0000	0.000000	0.000000	...

	Theme Restaurant	Toy / Game Store	Trail	Train Station \
0	0.000000	0.00	0.00	0.00
1	0.000000	0.00	0.00	0.00
2	0.000000	0.00	0.00	0.00
3	0.000000	0.00	0.00	0.00
4	0.013333	0.00	0.00	0.00
5	0.000000	0.00	0.00	0.00
6	0.000000	0.00	0.00	0.01
7	0.000000	0.01	0.00	0.00
8	0.000000	0.00	0.00	0.01
9	0.000000	0.00	0.00	0.00
10	0.000000	0.00	0.00	0.00
11	0.000000	0.00	0.00	0.00
12	0.000000	0.00	0.00	0.00
13	0.000000	0.00	0.25	0.00
14	0.000000	0.00	0.00	0.00
15	0.000000	0.00	0.00	0.00
16	0.000000	0.00	0.00	0.00
17	0.000000	0.00	0.00	0.01
18	0.000000	0.00	0.00	0.00

	Vegetarian / Vegan Restaurant	Video Game Store	Vietnamese Restaurant \
0	0.018182	0.000000	0.000000
1	0.000000	0.000000	0.000000
2	0.014706	0.000000	0.000000
3	0.000000	0.000000	0.000000
4	0.000000	0.000000	0.013333
5	0.020000	0.000000	0.000000
6	0.010000	0.000000	0.000000
7	0.000000	0.010000	0.010000
8	0.010000	0.000000	0.000000

9	0.054054	0.000000	0.040541
10	0.000000	0.000000	0.000000
11	0.000000	0.000000	0.000000
12	0.010000	0.000000	0.000000
13	0.000000	0.000000	0.000000
14	0.011765	0.000000	0.000000
15	0.000000	0.000000	0.000000
16	0.010417	0.000000	0.000000
17	0.010000	0.000000	0.000000
18	0.000000	0.029412	0.000000

	Wine Bar	Women's Store	Yoga Studio
0	0.000000	0.00	0.000000
1	0.000000	0.00	0.000000
2	0.014706	0.00	0.014706
3	0.000000	0.00	0.000000
4	0.000000	0.00	0.026667
5	0.010000	0.00	0.000000
6	0.010000	0.00	0.000000
7	0.010000	0.00	0.000000
8	0.010000	0.00	0.000000
9	0.013514	0.00	0.000000
10	0.000000	0.00	0.030303
11	0.000000	0.00	0.022727
12	0.000000	0.01	0.000000
13	0.000000	0.00	0.000000
14	0.011765	0.00	0.000000
15	0.000000	0.00	0.000000
16	0.000000	0.00	0.010417
17	0.010000	0.00	0.000000
18	0.000000	0.00	0.029412

[19 rows x 214 columns]

```
[24]: downtown_grouped.shape
```

```
[24]: (19, 214)
```

```
[25]: num_top_venues = 5

for hood in downtown_grouped['Neighbourhood']:
    print("----"+hood+"----")
    temp = downtown_grouped[downtown_grouped['Neighbourhood'] == 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')

```

----Berczy Park----

	venue	freq
0	Coffee Shop	0.09
1	Seafood Restaurant	0.04
2	Cheese Shop	0.04
3	Cocktail Bar	0.04
4	Beer Bar	0.04

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

	venue	freq
0	Airport Lounge	0.12
1	Airport Service	0.12
2	Harbor / Marina	0.06
3	Airport	0.06
4	Rental Car Location	0.06

----Central Bay Street----

	venue	freq
0	Coffee Shop	0.18
1	Café	0.06
2	Italian Restaurant	0.04
3	Sandwich Place	0.04
4	Bubble Tea Shop	0.03

----Christie----

	venue	freq
0	Grocery Store	0.25
1	Café	0.19
2	Park	0.12
3	Restaurant	0.06
4	Baby Store	0.06

----Church and Wellesley----

	venue	freq
0	Coffee Shop	0.09
1	Japanese Restaurant	0.05
2	Sushi Restaurant	0.05

3	Gay Bar	0.05
4	Restaurant	0.04

----Commerce Court, Victoria Hotel----

	venue	freq
0	Coffee Shop	0.13
1	Restaurant	0.07
2	Café	0.06
3	Hotel	0.06
4	American Restaurant	0.04

----First Canadian Place, Underground city----

	venue	freq
0	Coffee Shop	0.10
1	Café	0.07
2	Hotel	0.06
3	Gym	0.04
4	Japanese Restaurant	0.04

----Garden District, Ryerson----

	venue	freq
0	Clothing Store	0.10
1	Coffee Shop	0.09
2	Café	0.04
3	Cosmetics Shop	0.03
4	Japanese Restaurant	0.03

----Harbourfront East, Union Station, Toronto Islands----

	venue	freq
0	Coffee Shop	0.13
1	Aquarium	0.05
2	Café	0.04
3	Hotel	0.04
4	Scenic Lookout	0.03

----Kensington Market, Chinatown, Grange Park----

	venue	freq
0	Café	0.05
1	Vegetarian / Vegan Restaurant	0.05
2	Coffee Shop	0.05
3	Mexican Restaurant	0.05
4	Bar	0.05

----Queen's Park, Ontario Provincial Government----

	venue	freq
0	Coffee Shop	0.24
1	Yoga Studio	0.03
2	Music Venue	0.03
3	Sushi Restaurant	0.03
4	Beer Bar	0.03

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

	venue	freq
0	Coffee Shop	0.18
1	Bakery	0.07
2	Pub	0.07
3	Park	0.07
4	Breakfast Spot	0.05

----Richmond, Adelaide, King----

	venue	freq
0	Coffee Shop	0.08
1	Café	0.05
2	Bar	0.04
3	Hotel	0.04
4	Restaurant	0.04

----Rosedale----

	venue	freq
0	Park	0.50
1	Playground	0.25
2	Trail	0.25
3	Afghan Restaurant	0.00
4	Museum	0.00

----St. James Town----

	venue	freq
0	Coffee Shop	0.07
1	Café	0.06
2	Restaurant	0.05
3	Cocktail Bar	0.05
4	Beer Bar	0.04

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

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

0	Coffee Shop	0.08
1	Restaurant	0.06
2	Pizza Place	0.06
3	Café	0.06
4	Italian Restaurant	0.04

----Stn A PO Boxes----

	venue	freq
0	Coffee Shop	0.10
1	Italian Restaurant	0.04
2	Japanese Restaurant	0.03
3	Café	0.03
4	Hotel	0.03

----Toronto Dominion Centre, Design Exchange----

	venue	freq
0	Coffee Shop	0.14
1	Hotel	0.08
2	Restaurant	0.05
3	Café	0.05
4	Japanese Restaurant	0.03

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

	venue	freq
0	Café	0.15
1	Bookstore	0.09
2	Bakery	0.06
3	Japanese Restaurant	0.06
4	Sandwich Place	0.06

```
[26]: 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'] = downtown_grouped['Neighbourhood']

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

neighborhoods_venues_sorted.head()
```

```
[26]:
```

	Neighbourhood	1st Most Common Venue	\
0	Berczy Park	Coffee Shop	
1	CN Tower, King and Spadina, Railway Lands, Har...	Airport Lounge	
2	Central Bay Street	Coffee Shop	
3	Christie	Grocery Store	
4	Church and Wellesley	Coffee Shop	

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	\
0	Cheese Shop	Bakery	Cocktail Bar	
1	Airport Service	Harbor / Marina	Bar	
2	Café	Sandwich Place	Italian Restaurant	
3	Café	Park	Athletics & Sports	
4	Japanese Restaurant	Gay Bar	Sushi Restaurant	

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	\
0	Seafood Restaurant	Beer Bar	Farmers Market	
1	Plane	Rental Car Location	Sculpture Garden	
2	Salad Place	Department Store	Japanese Restaurant	
3	Italian Restaurant	Candy Store	Restaurant	
4	Restaurant	Pub	Men's Store	

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Restaurant	Breakfast Spot	Shopping Mall
1	Boutique	Boat or Ferry	Coffee Shop
2	Bubble Tea Shop	Burger Joint	Thai Restaurant
3	Baby Store	Nightclub	Coffee Shop
4	Mediterranean Restaurant	Hotel	Yoga Studio

1.15 Step 15 - Cluster Neighborhoods

```
[27]: # set number of clusters
kclusters = 5

downtown_grouped_clustering = downtown_grouped.drop('Neighbourhood', 1)

# run k-means clustering
```

```

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

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

```

```
[27]: array([4, 3, 0, 2, 4, 4, 4, 4, 0, 4], dtype=int32)
```

```

[28]: # add clustering labels
downtown_merged = ds_downtown
downtown_merged.head(25)

```

```

[28]:   PostalCode      Borough \
0      M5A  Downtown Toronto
1      M7A  Downtown Toronto
2      M5B  Downtown Toronto
3      M5C  Downtown Toronto
4      M5E  Downtown Toronto
5      M5G  Downtown Toronto
6      M6G  Downtown Toronto
7      M5H  Downtown Toronto
8      M5J  Downtown Toronto
9      M5K  Downtown Toronto
10     M5L  Downtown Toronto
11     M5S  Downtown Toronto
12     M5T  Downtown Toronto
13     M5V  Downtown Toronto
14     M4W  Downtown Toronto
15     M5W  Downtown Toronto
16     M4X  Downtown Toronto
17     M5X  Downtown Toronto
18     M4Y  Downtown Toronto

```

	Neighbourhood	Latitude	Longitude
0	Regent Park, Harbourfront	43.654260	-79.360636
1	Queen's Park, Ontario Provincial Government	43.662301	-79.389494
2	Garden District, Ryerson	43.657162	-79.378937
3	St. James Town	43.651494	-79.375418
4	Berczy Park	43.644771	-79.373306
5	Central Bay Street	43.657952	-79.387383
6	Christie	43.669542	-79.422564
7	Richmond, Adelaide, King	43.650571	-79.384568
8	Harbourfront East, Union Station, Toronto Islands	43.640816	-79.381752
9	Toronto Dominion Centre, Design Exchange	43.647177	-79.381576
10	Commerce Court, Victoria Hotel	43.648198	-79.379817
11	University of Toronto, Harbord	43.662696	-79.400049
12	Kensington Market, Chinatown, Grange Park	43.653206	-79.400049

13	CN Tower, King and Spadina, Railway Lands, Har...	43.628947	-79.394420
14		Rosedale	43.679563 -79.377529
15		Stn A PO Boxes	43.646435 -79.374846
16		St. James Town, Cabbagetown	43.667967 -79.367675
17	First Canadian Place, Underground city	43.648429	-79.382280
18		Church and Wellesley	43.665860 -79.383160

```
[29]: neighborhoods_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)
downtown_merged = ds_downtown
downtown_merged = downtown_merged.join(neighborhoods_venues_sorted.
    ↳set_index('Neighbourhood'), on = 'Neighbourhood')
downtown_merged.head()
```

[29]:	PostalCode	Borough	Neighbourhood \
0	M5A	Downtown Toronto	Regent Park, Harbourfront
1	M7A	Downtown Toronto	Queen's Park, Ontario Provincial Government
2	M5B	Downtown Toronto	Garden District, Ryerson
3	M5C	Downtown Toronto	St. James Town
4	M5E	Downtown Toronto	Berczy Park

	Latitude	Longitude	Cluster Labels	1st Most Common Venue \
0	43.654260	-79.360636	0	Coffee Shop
1	43.662301	-79.389494	0	Coffee Shop
2	43.657162	-79.378937	4	Clothing Store
3	43.651494	-79.375418	4	Coffee Shop
4	43.644771	-79.373306	4	Coffee Shop

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue \
0	Bakery	Pub	Park
1	Yoga Studio	Portuguese Restaurant	Italian Restaurant
2	Coffee Shop	Café	Cosmetics Shop
3	Café	Cocktail Bar	Restaurant
4	Cheese Shop	Bakery	Cocktail Bar

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue \
0	Breakfast Spot	Café	Theater
1	Smoothie Shop	Beer Bar	Sandwich Place
2	Bubble Tea Shop	Japanese Restaurant	Middle Eastern Restaurant
3	Gastropub	Beer Bar	American Restaurant
4	Seafood Restaurant	Beer Bar	Farmers Market

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Beer Store	Mexican Restaurant	Spa
1	Distribution Center	Restaurant	Diner
2	Hotel	Fast Food Restaurant	Bookstore
3	Gym	Farmers Market	Hotel
4	Restaurant	Breakfast Spot	Shopping Mall

1.16 Step 16 - Show Cluster on Map

```
[30]: # create map
map_clusters = folium.Map(location = [latitude_downtown, longitude_downtown],
    ↪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(downtown_merged['Latitude'],
    ↪downtown_merged['Longitude'], downtown_merged['Neighbourhood'],
    ↪downtown_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
```

```
[30]: <folium.folium.Map at 0x7fd997fdf828>
```

1.17 Step Final - Cluster Tables

1.17.1 Cluster 1

```
[31]: ## Cluster 1 in downtown_merged
downtown_merged.loc[downtown_merged['Cluster Labels'] == 0,
    ↪downtown_merged.columns[[0] + list(range(5,
    ↪downtown_merged.shape[1]))]]
```

```
[31]:
```

	PostalCode	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	\
0	M5A	0	Coffee Shop	Bakery	
1	M7A	0	Coffee Shop	Yoga Studio	
5	M5G	0	Coffee Shop	Café	
8	M5J	0	Coffee Shop	Aquarium	

	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	\
0	Pub	Park	Breakfast Spot	
1	Portuguese Restaurant	Italian Restaurant	Smoothie Shop	
5	Sandwich Place	Italian Restaurant	Salad Place	
8	Hotel	Café	Fried Chicken Joint	

	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	\
0	Café	Theater	Beer Store	
1	Beer Bar	Sandwich Place	Distribution Center	
5	Department Store	Japanese Restaurant	Bubble Tea Shop	
8	Scenic Lookout	Brewery	Restaurant	

	9th Most Common Venue	10th Most Common Venue
0	Mexican Restaurant	Spa
1	Restaurant	Diner
5	Burger Joint	Thai Restaurant
8	Park	Plaza

1.17.2 Cluster 2

```
[32]: ## Cluster 2 in downtown_merged
downtown_merged.loc[downtown_merged['Cluster Labels'] == 0,
                    downtown_merged.columns[[1] + list(range(5,
↳downtown_merged.shape[1]))]]
```

	Borough	Cluster Labels	1st Most Common Venue	\
0	Downtown Toronto	0	Coffee Shop	
1	Downtown Toronto	0	Coffee Shop	
5	Downtown Toronto	0	Coffee Shop	
8	Downtown Toronto	0	Coffee Shop	

	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	\
0	Bakery	Pub	Park	
1	Yoga Studio	Portuguese Restaurant	Italian Restaurant	
5	Café	Sandwich Place	Italian Restaurant	
8	Aquarium	Hotel	Café	

	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	\
0	Breakfast Spot	Café	Theater	
1	Smoothie Shop	Beer Bar	Sandwich Place	
5	Salad Place	Department Store	Japanese Restaurant	
8	Fried Chicken Joint	Scenic Lookout	Brewery	

	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Beer Store	Mexican Restaurant	Spa
1	Distribution Center	Restaurant	Diner
5	Bubble Tea Shop	Burger Joint	Thai Restaurant

8	Restaurant	Park	Plaza
---	------------	------	-------

1.17.3 Cluster 3

```
[33]: ## Cluster 3 in downtown_merged
downtown_merged.loc[downtown_merged['Cluster Labels'] == 0,
                    downtown_merged.columns[[2] + list(range(5,
↪downtown_merged.shape[1]))]]
```

```
[33]:
```

	Neighbourhood	Cluster Labels	\
0	Regent Park, Harbourfront	0	
1	Queen's Park, Ontario Provincial Government	0	
5	Central Bay Street	0	
8	Harbourfront East, Union Station, Toronto Islands	0	

	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	\
0	Coffee Shop	Bakery	Pub	
1	Coffee Shop	Yoga Studio	Portuguese Restaurant	
5	Coffee Shop	Café	Sandwich Place	
8	Coffee Shop	Aquarium	Hotel	

	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	\
0	Park	Breakfast Spot	Café	
1	Italian Restaurant	Smoothie Shop	Beer Bar	
5	Italian Restaurant	Salad Place	Department Store	
8	Café	Fried Chicken Joint	Scenic Lookout	

	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	\
0	Theater	Beer Store	Mexican Restaurant	
1	Sandwich Place	Distribution Center	Restaurant	
5	Japanese Restaurant	Bubble Tea Shop	Burger Joint	
8	Brewery	Restaurant	Park	

	10th Most Common Venue
0	Spa
1	Diner
5	Thai Restaurant
8	Plaza

1.17.4 Cluster 4

```
[34]: ## Cluster 4 in downtown_merged
downtown_merged.loc[downtown_merged['Cluster Labels'] == 0,
                    downtown_merged.columns[[3] + list(range(5,
↪downtown_merged.shape[1]))]]
```

```
[34]:      Latitude  Cluster Labels 1st Most Common Venue 2nd Most Common Venue \
0  43.654260          0          Coffee Shop          Bakery
1  43.662301          0          Coffee Shop          Yoga Studio
5  43.657952          0          Coffee Shop          Café
8  43.640816          0          Coffee Shop          Aquarium

      3rd Most Common Venue 4th Most Common Venue 5th Most Common Venue \
0          Pub          Park          Breakfast Spot
1  Portuguese Restaurant  Italian Restaurant  Smoothie Shop
5          Sandwich Place  Italian Restaurant  Salad Place
8          Hotel          Café  Fried Chicken Joint

      6th Most Common Venue 7th Most Common Venue 8th Most Common Venue \
0          Café          Theater          Beer Store
1          Beer Bar          Sandwich Place  Distribution Center
5  Department Store  Japanese Restaurant  Bubble Tea Shop
8  Scenic Lookout          Brewery          Restaurant

      9th Most Common Venue 10th Most Common Venue
0  Mexican Restaurant          Spa
1          Restaurant          Diner
5          Burger Joint  Thai Restaurant
8          Park          Plaza
```

1.17.5 Cluster 5

```
[35]: ## Cluster 5 in downtown_merged
downtown_merged.loc[downtown_merged['Cluster Labels'] == 0,
                    downtown_merged.columns[[4] + list(range(5,
↳downtown_merged.shape[1]))]]
```

```
[35]:      Longitude  Cluster Labels 1st Most Common Venue 2nd Most Common Venue \
0 -79.360636          0          Coffee Shop          Bakery
1 -79.389494          0          Coffee Shop          Yoga Studio
5 -79.387383          0          Coffee Shop          Café
8 -79.381752          0          Coffee Shop          Aquarium

      3rd Most Common Venue 4th Most Common Venue 5th Most Common Venue \
0          Pub          Park          Breakfast Spot
1  Portuguese Restaurant  Italian Restaurant  Smoothie Shop
5          Sandwich Place  Italian Restaurant  Salad Place
8          Hotel          Café  Fried Chicken Joint

      6th Most Common Venue 7th Most Common Venue 8th Most Common Venue \
0          Café          Theater          Beer Store
1          Beer Bar          Sandwich Place  Distribution Center
5  Department Store  Japanese Restaurant  Bubble Tea Shop
```


8	Scenic Lookout	Brewery	Restaurant
	9th Most Common Venue	10th Most Common Venue	
0	Mexican Restaurant	Spa	
1	Restaurant	Diner	
5	Burger Joint	Thai Restaurant	
8	Park	Plaza	

This notebook is part of a course on Coursera called Applied Data Science Capstone. This was done by Anderson Braz de Sousa.