The similarity between Manhattan, New York, and Downtown, Toronto

1. Introduction

Tourism is a complex set of industries, including accommodation, recreation & entertainment, and food & beverage services. These days, people would like to visit different places like New York and Toronto to experience and explore their lives, heritage, and culture. Tourists need information regarding the nearby coffee shops, restaurants, hotels/accommodation, places to visit, and many more. These days information about locations is readily available to explore.

This project aims to determine how similar these two cities are when it comes to tourism. It will assist tourists by providing them with the information needed to travel, comparing two places Manhattan, New York, and Downtown, Toronto, to make their decision depending on their choice.

2. Stakeholders

The project will help the tourists who are planning a trip to North America and want to visit one of these two locations.

A Data Analyst or a Data Scientist wants to compare the two places to identify tourist areas and the similarities of Manhattan, New York, and Downtown, Toronto.

3. Data sources

For New York city data available at https://geo.nyu.edu/catalog/nyu_2451_34572. and

For Toronto, we will web scrape city data from
https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M

4. Methodology

The data extracted from the above webpages will have neighborhood data of different places in Toronto and New York. This project focuses on Manhattan, New York, and Downtown Toronto using the Foursquare API services.

We will apply a K-means Clustering machine learning algorithm to compare the two places Manhattan, New York, and Downtown, Toronto, and find the similarities.

5. Exploration

5.1 Downtown Toronto

- Extract Data of Toronto from the Wikipedia page.
- Eliminate "Not assigned" values.
- Combine neighborhoods that have the same geographical coordinates at each borough and sorted against the concerned borough.
- Use Foursquare API for data verification and to get the coordinates of Downtown Toronto and explore its neighborhoods.
- Characterize the neighborhoods as venues and venue categories.

```
[7]: downtown_toronto_data = df_toronto[df_toronto['Borough'] == 'Downtown Toronto'].reset_index(drop=True)
downtown_toronto_data.head()
```

[7]:

	Postal Code	Borough	Neighbourhood	Latitude	Longitude
0	M5A	Downtown Toronto	Regent Park, Harbourfront	43.654260	-79.360636
1	M7A	Downtown Toronto	Queen's Park, Ontario Provincial Government	43.662301	-79.389494
2	M5B	Downtown Toronto	Garden District, Ryerson	43.657162	-79.378937
3	M5C	Downtown Toronto	St. James Town	43.651494	-79.375418
4	M5E	Downtown Toronto	Berczy Park	43.644771	-79.373306

5.2 Manhattan, New York

- Extract Data of New York from the New York University webpage.
- Combine neighborhoods that have the same geographical coordinates at each borough and sorted against the concerned borough.
- Use Foursquare API for data verification and to get the coordinates of Downtown Toronto and explore its neighborhoods.
- Characterize the neighborhoods as venues and venue categories.

```
[15]: manhattan_data = neighborhoods[neighborhoods['Borough'] == 'Manhattan'].reset_index(drop=True)
manhattan_data.head()
```

[15]:

	Borough	Neighborhood	Latitude	Longitude
0	Manhattan	Marble Hill	40.876551	-73.910660
1	Manhattan	Chinatown	40.715618	-73.994279
2	Manhattan	Washington Heights	40.851903	-73.936900
3	Manhattan	Inwood	40.867684	-73.921210
4	Manhattan	Hamilton Heights	40.823604	-73.949688

6. Foursquare API

Provide the Foursquare API credentials in the code to explore the neighborhoods in Downtown Toronto and Manhattan, New York.

```
[18]: CLIENT_ID = ''
CLIENT_SECRET = ''
VERSION = ''
#On the public repository on Github, I am removing the credentials for the sake of privacy!
```

```
[20]: limit= 100
radius = 500
url1 = 'https://api.foursquare.com/v2/venues/explore?&client_id={}&client_secret={}&v={}&ll={},{}&radius={}&limit={}'.format(
    CLIENT_ID,
    CLIENT_SECRET,
    VERSION,
    latitude_Downtown_Toronto,
    longitude_Downtown_Toronto,
    radius,
    limit)
url1
```

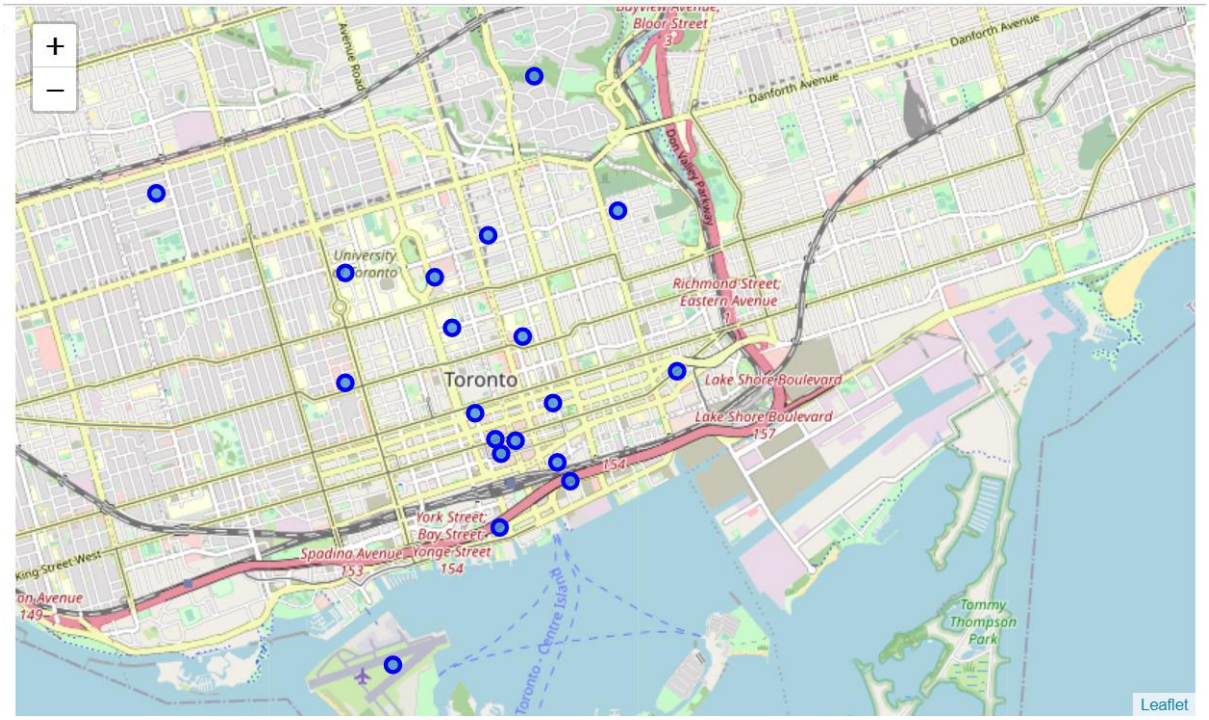
```
[20]: 'https://api.foursquare.com/v2/venues/explore?&client_id=IUHADV5THX5MFY4YRLDERP5FO5ZHPY3RM3FTGQRZKP3EQFXJ&client_secret=AYZKDN1IMA0IW3E3MTQEZ2Y4XVXEEDTP
03NIYBVEW5RUNPA0&v=20201030&ll=43.6563221,-79.3809161&radius=500&limit=100'
```

7. Visualization

7.1 Downtown Toronto Before Clustering

[8]:
```
# create map of Toronto using latitude and longitude values
map_downtown_toronto = folium.Map(location=[latitude_Downtown_Toronto, longitude_Downtown_Toronto], zoom_start=10)
# add markers to map

for lat, lng, label in zip(downtown_toronto_data['Latitude'], downtown_toronto_data['Longitude'], downtown_toronto_data['Neighbourhood']):
    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_downtown_toronto)
map_downtown_toronto
```



7.2 Downtown Toronto After Clustering

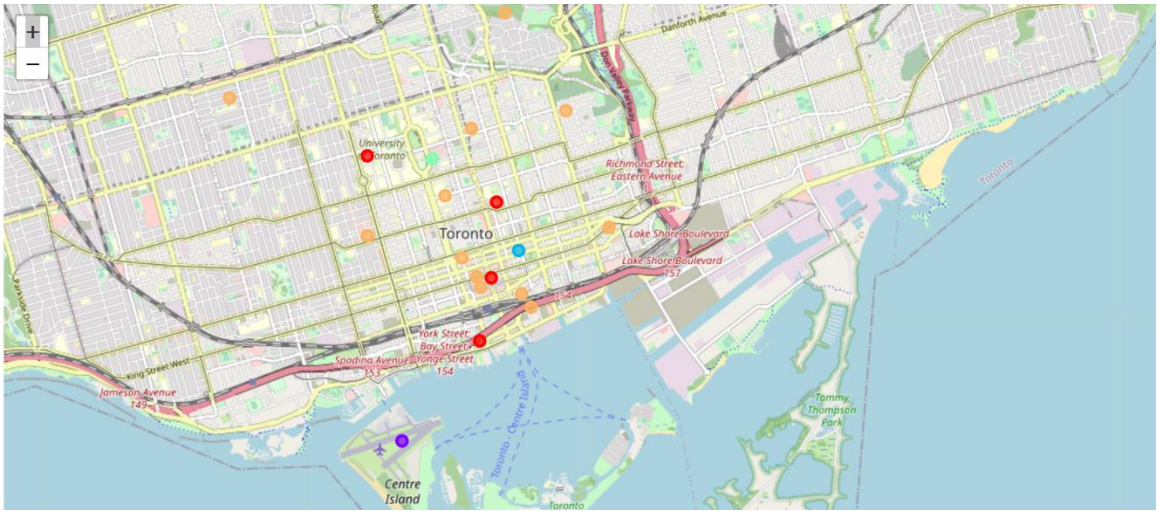
[49]:
```
# create map
map_clusters = folium.Map(location=[latitude_Downtown_Toronto, longitude_Downtown_Toronto], zoom_start=11)

# 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_toronto_merged['Latitude'], downtown_toronto_merged['Longitude'], downtown_toronto_merged['Neighbourhood'], d
    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
```

[49]:



7.3 Manhattan Before Clustering

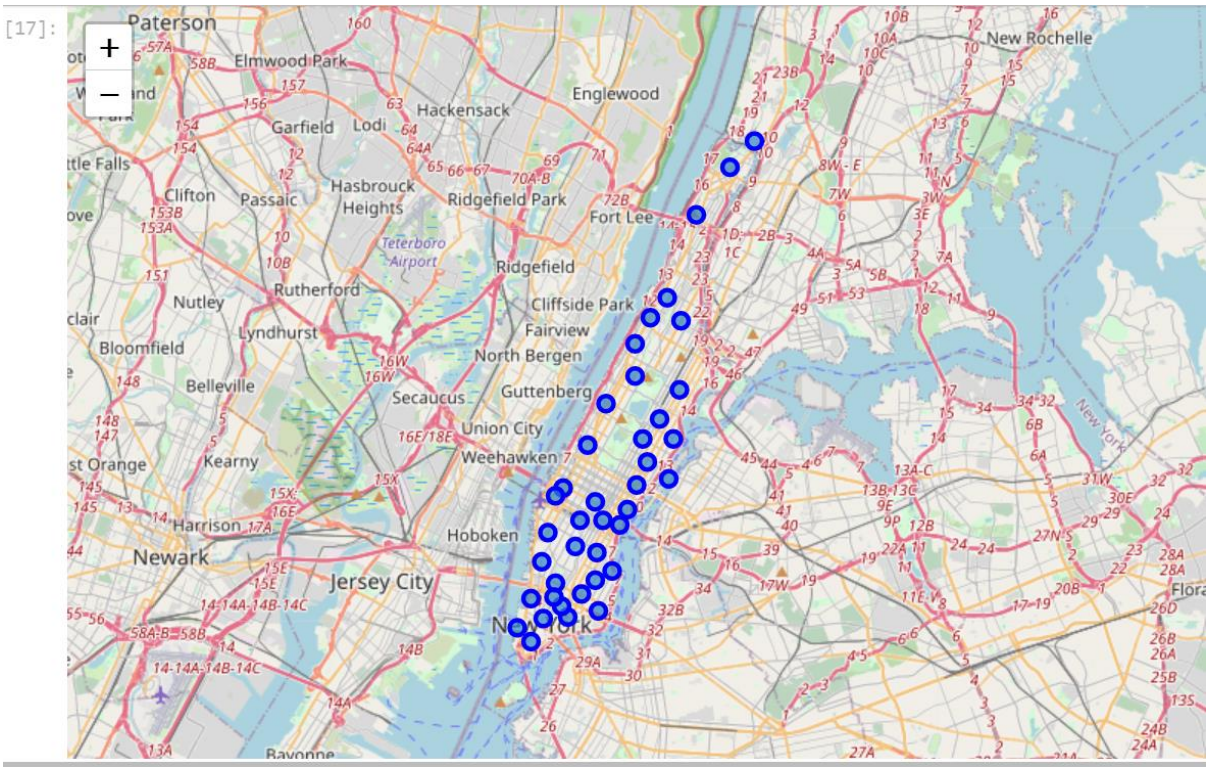
[17]:

```
# create map of Manhattan using latitude and longitude values
map_manhattan = folium.Map(location=[latitude_Manhattan, longitude_Manhattan], zoom_start=11)

# add markers to map
for lat, lng, label in zip(manhattan_data['Latitude'], manhattan_data['Longitude'], manhattan_data['Neighborhood']
    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_manhattan)

map_manhattan
```

[17]:



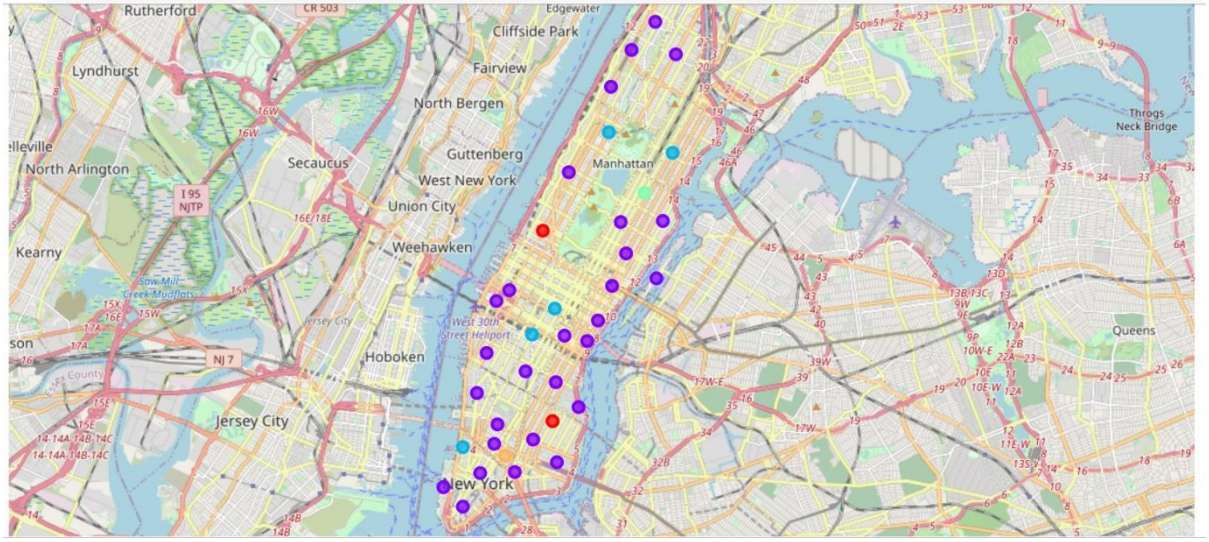
7.4 Manhattan After Clustering

```
[67]: # create map
map_clusters = folium.Map(location=[latitude_Manhattan, longitude_Manhattan], 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(manhattan_merged['Latitude'], manhattan_merged['Longitude'], manhattan_merged['Neighborhood'], manhattan_merged['Clust
    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
```



8. ANALYSIS

Analyze both Downtown Toronto and Manhattan, New York neighborhoods with one-hot encoding, which gives a value '1' if a venue category is present and '0' if there is no venue category. With the help of this technique, we will calculate the mean of each neighborhood's frequency of occurrence. The top venues will show the foot traffic.

9. Report

9.1 Results

- Downtown Toronto and Manhattan, New York both the places have venues that tourists would be attracted to explore.
- The neighborhoods are similar to venues like Theaters, opera houses, food places, clubs, museums, parks, etc.
- The only dissimilarity is that their unique historical places and monuments.

9.2 Observations

The following are the places that attract tourists

- Downtown Toronto has Historical places and Airport facilities, a harbor, a Sculpture garden, and ferry services.

- Manhattan has monument or landmark venues, Nightlife, Climbing gym, and Museums.

After the analysis, we recommend Downtown Toronto will be a tourist's priority to visit. This is because the airport facility is available in Downtown Toronto which saves time but also saves money.

9.3 Conclusion

Downtown Toronto and Manhattan neighborhoods have similar venues. These neighborhoods are unique in their way. Hence, we suggest if money is a concern, a person should travel to Downtown Toronto.