

Capstone Project - The Battle of the Neighborhoods

A Full Report

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1.0 Introduction

1.1 Background

Toronto is the capital city of the Canadian province of Ontario. With a recorded population of approximately 2.7 million in 2016, it is the most populous city in Canada and the fourth most populous city in North America. The diverse population of Toronto reflects its current and historical role as an important destination for immigrants to Canada. More than 50 percent of residents belong to a visible minority population group, and over 200 distinct ethnic origins are represented among its inhabitants. Toronto is an international centre of business, finance, arts, and culture, and is recognized as one of the most multicultural and cosmopolitan cities in the world. Toronto covers an area of 630 square kilometres (243 sq mi), with a maximum north–south distance of 21 km (13 mi). It has a maximum east–west distance of 43 km (27 mi) and it has a 46-kilometre (29 mi) long waterfront shoreline, on the northwestern shore of Lake Ontario. Toronto encompasses a geographical area formerly administered by many separate municipalities. These municipalities have each developed a distinct history and identity over the years, and their names remain in common use among Torontonians. Former municipalities include East York, Etobicoke, Forest Hill, Mimico, North York, Parkdale, Scarborough, Swansea, Weston and York. Throughout the city there exist hundreds of small neighbourhoods and some larger neighbourhoods covering a few square kilometres.

Penang is a Malaysian state located on the northwest coast of Peninsular Malaysia, by the Malacca Strait. The state consists of Penang Island, Seberang Perai (a narrow strip of the Malay Peninsula) and a handful of smaller islets. Its capital city, George Town, is located at the northeastern tip of Penang Island. They are connected by Malaysia's two longest road bridges, the Penang Bridge and the Sultan Abdul Halim Muadzam Shah Bridge. Penang's population stood at nearly 1.767 million as of 2018, while its population density rose to 1,684/km² (4,360/sq mi). It has among the nation's highest population densities and is one of the country's most urbanised states. With a total land area of just 1,048 km² (405 sq mi), Penang is the second smallest state in Malaysia by land mass after Perlis. Penang, situated at the northwestern coastline of Peninsular Malaysia, lies between latitudes 5.59° and 5.12°N, and longitudes 100.17° and 100.56°E. The city of George Town includes the Bayan Lepas Free Industrial Zone, a high-tech manufacturing hub regarded as the "Silicon Valley of the East". The expansion of George Town has created suburbs to its

northwest, west and south. The northwestern suburbs are somewhat more affluent, given their seafront locations which attract tourists and expatriates. The southern suburbs, such as Jelutong, grew due to industrial activities. On the other hand, Air Itam and Paya Terubong emerged to the west of George Town as a result of agricultural plantations on the central hills of Penang Island. Since the 1970s, massive industrialisation around Bayan Lepas, which created the Bayan Lepas Free Industrial Zone, led to the rapid urbanisation of the southeastern corner of Penang Island as well. The western half of the island, where Balik Pulau forms the main population centre, remains sparsely-populated, although urbanisation has encroached into the area in recent years.

1.2 Problem Statement

As both selected locations as stated in clause 1.1 are regarded as top spots of tourism in the world due to the compactness and richness of culture and livelihood as practiced in the two locations, both reputations in the tourism field can be studied and compared. Hence, the following case study is conducted with the motive of **comparing the tourism characteristics of two major cities**, which are **Toronto, Ontario** and **Georgetown, Penang**. Such comparison study is prioritized to access the potentiality of both locations on tourism today and in the near future. The fields of comparison study includes food spots (restaurants, cafes etc.), galleries, museums and so much more. But, for this study, I will be using **restaurants, museums** and **galleries** for the comparison study.

1.3 Scope of Study

For the case of **Toronto, Ontario**, the area scope will be covering the **entire city**. And as for **Penang island**, the scope will only be covering the **North-East District of the island**, which covers approximately 10 sub-districts.

2.0 Data

The targeted datas of the two locations of interest, which are **Toronto, Ontario** and the **North-East District of the Penang island** selected for this study are listed as below, with the corresponding methods:

- The number of **restaurants** in **Toronto, Ontario** and the **North-East District of the Penang island**.
- The number of **museums** in **Toronto, Ontario** and the **North-East District of the Penang island**.
- The number of **galleries** in in **Toronto, Ontario** and the **North-East District of the Penang island**.

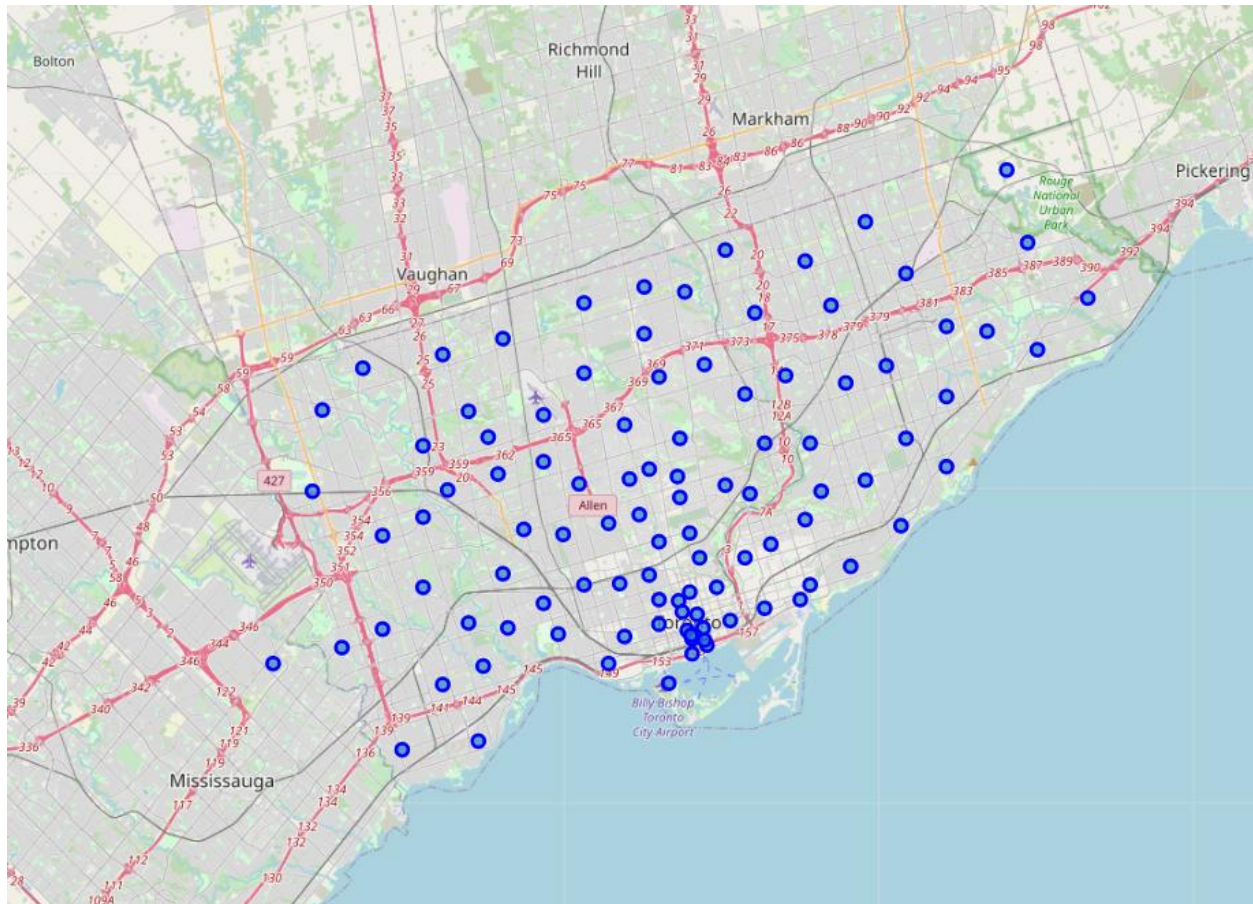
Firstly, the data sources that explain the postal codes and corresponding neighborhoods/ boroughs/ districts of the two locations of interest are extracted from 'https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M' (Toronto, Ontario) and 'https://en.wikipedia.org/wiki/Northeast_Penang_Island_District' (North-East District of the Penang island).

As follows, the geospatial datas of the corresponding postal codes, restaurants, museums and galleris of both locations are extracted as explained below:

- The coordinates of the postal codes based on the district/ borough/ neighbourhood of both locations are extracted via 'http://cocl.us/Geospatial_data' (Toronto, Ontario) and **GeoPy's Geocoder** (North-East District of the Penang island).
- The geospatial data, numbers and other detials of the restaurants, museums and galleries of both location of interest are extracted via **Foursquare API**.

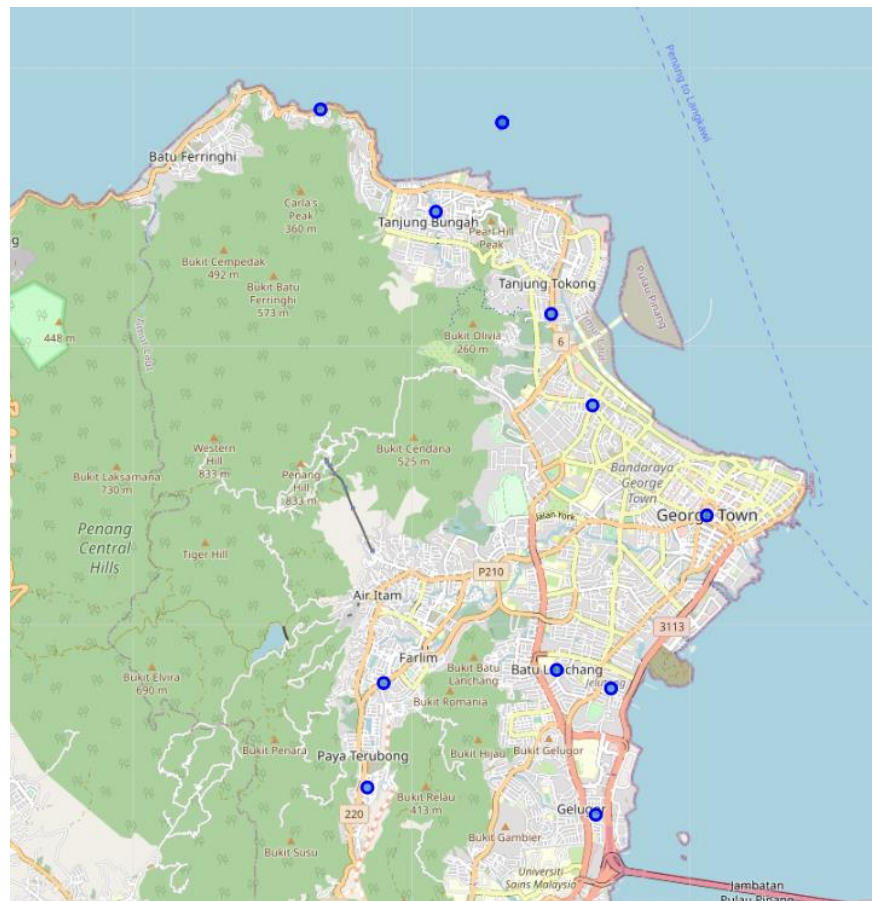
2.1 Geospatial Data of Toronto, Ontario

	Postal Code	Borough	Neighbourhood	Latitude	Longitude
0	M3A	North York	Parkwoods	43.753259	-79.329656
1	M4A	North York	Victoria Village	43.725882	-79.315572
2	M5A	Downtown Toronto	Regent Park, Harbourfront	43.654260	-79.360636
3	M6A	North York	Lawrence Manor, Lawrence Heights	43.718518	-79.464763
4	M7A	Downtown Toronto	Queen's Park, Ontario Provincial Government	43.662301	-79.389494
...
98	M8X	Etobicoke	The Kingsway, Montgomery Road, Old Mill North	43.653654	-79.506944
99	M4Y	Downtown Toronto	Church and Wellesley	43.665860	-79.383160
100	M7Y	East Toronto	Business reply mail Processing Centre, South C...	43.662744	-79.321558
101	M8Y	Etobicoke	Old Mill South, King's Mill Park, Sunnylea, Hu...	43.636258	-79.498509
102	M8Z	Etobicoke	Mimico NW, The Queensway West, South of Bloor,...	43.628841	-79.520999



2.2 Geospatial Data of North-West District of Penang Island, Malaysia

	District	Postal Code	Latitude	Longitude
0	Georgetown	10000	5.414568	100.329803
1	Batu Ferringhi	11100	5.478218	100.268761
2	Tanjung Bungah	11200	5.462163	100.286995
3	Tanjung Tokong	10470	5.446139	100.305254
4	Pulau Tikus	10250	5.431822	100.311768
5	Pulau Tikus	10350	5.476292	100.297370
6	Pulau Tikus	10400	5.476292	100.297370
7	Batu Lanchang	11600	5.390322	100.306109
8	Air Itam	11500	5.388131	100.278691
9	Paya Terubong	11060	5.371803	100.276162
10	Jelutong	11600	5.387346	100.314559
11	Gelugor	11700	5.367514	100.312132

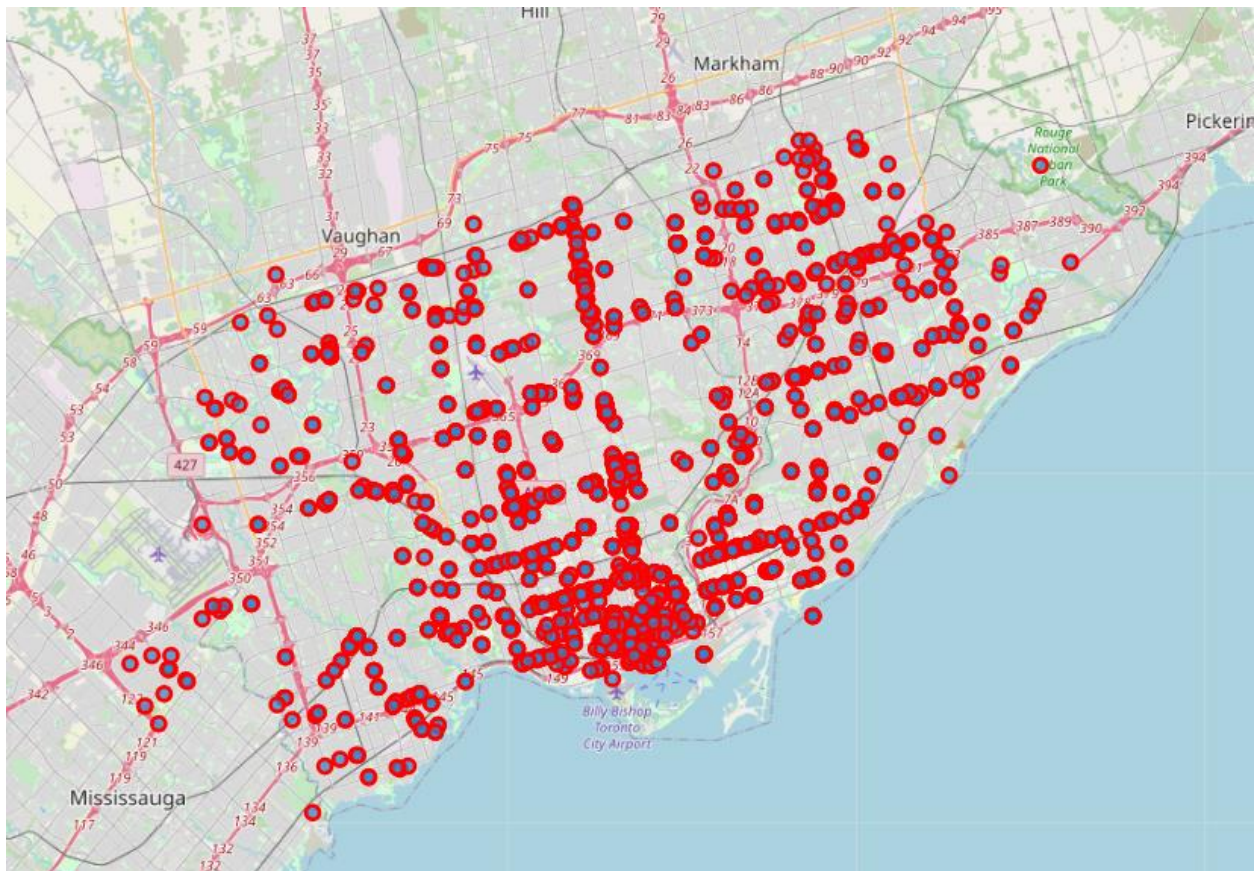


2.3 Geospatial Data of Restaurants, Galleries and Museums (Foursquare API)

2.3.1 To find statistical patterns of restaurants, galleries, and museums in the city of Tonto, Ontario

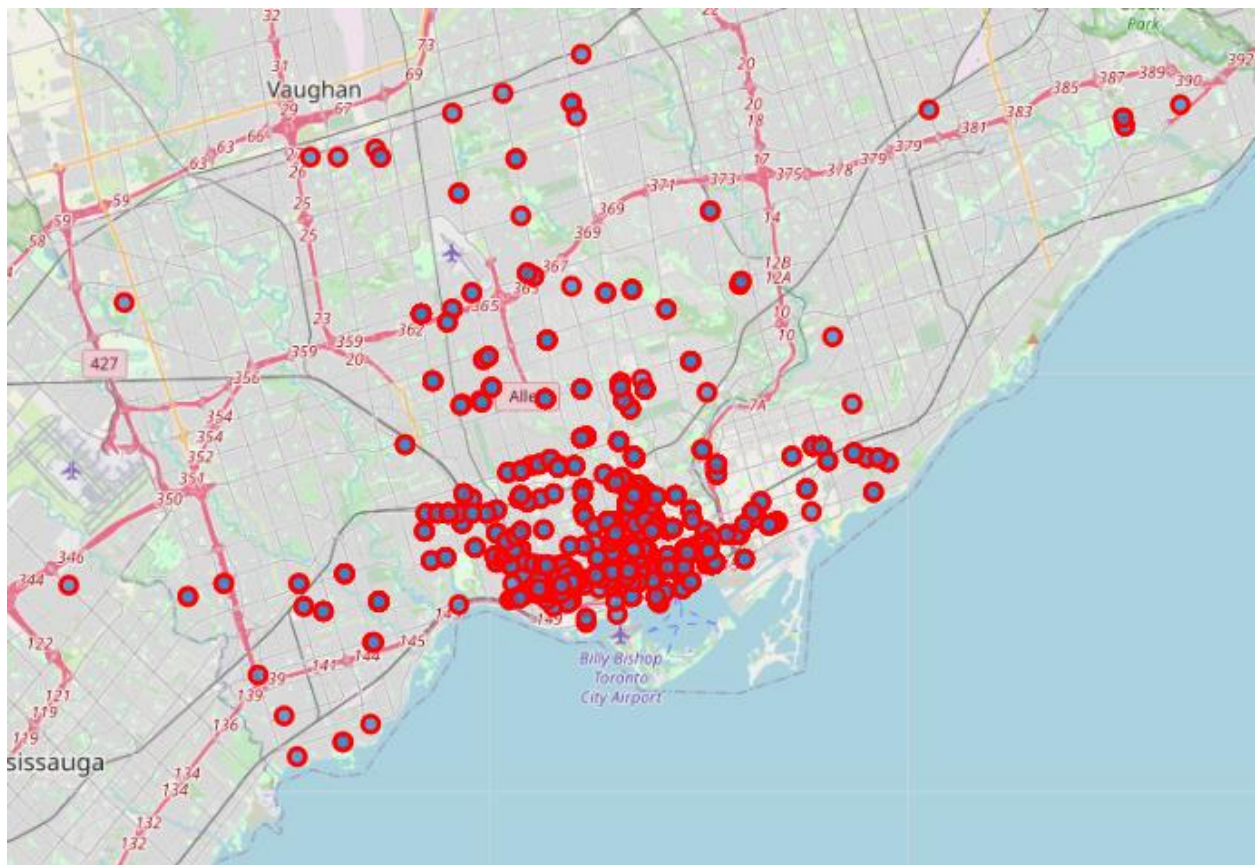
Restaurants

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude
1	North York	43.725882	-79.315572	The Curry & Roti Restaurant	43.742554	-79.308792
3	North York	43.718518	-79.464763	Hakka No.1 Restaurant	43.756800	-79.312850
4	Downtown Toronto	43.662301	-79.389494	The Mill Restaurant	43.740700	-79.322400
5	Etobicoke	43.667856	-79.532242	Valley Fields Family Restaurant	43.741452	-79.319633
6	Scarborough	43.806686	-79.194353	Karibu Restaurant	43.759216	-79.311051
...
3124	York	43.689026	-79.453512	Izba Schnitzel House	43.627567	-79.497410
3125	Scarborough	43.770992	-79.216917	I Love Sushi	43.648393	-79.529215
3126	East York	43.709060	-79.363452	Subway	43.636128	-79.540240
3127	Downtown Toronto	43.657952	-79.387383	Subway	43.648400	-79.528777
3128	Downtown Toronto	43.669542	-79.422564	IKEA Restaurant	43.618156	-79.534550



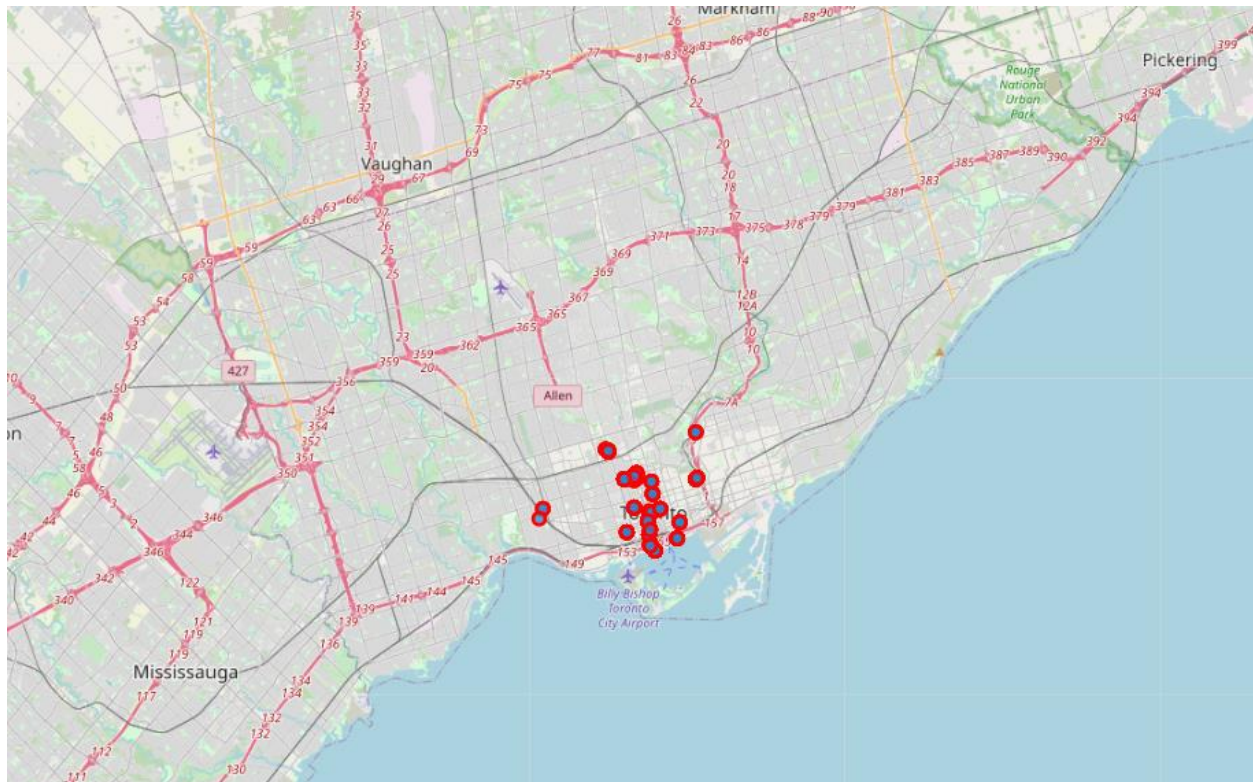
Galleries

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude
0	North York	43.753259	-79.329656	Sandra Ainsley Gallery	43.719044	-79.308892
2	North York	43.725882	-79.315572	Rouge gallery	43.659070	-79.349182
3	Downtown Toronto	43.654260	-79.360636	Botté Gallery	43.654110	-79.360976
4	North York	43.718518	-79.464763	Jane Roos Gallery	43.653962	-79.361090
5	Downtown Toronto	43.662301	-79.389494	Austin Gallery	43.648814	-79.378071
...
1696	North York	43.725882	-79.315572	Sweet Gallery	43.637314	-79.531125
1699	Downtown Toronto	43.662301	-79.389494	Chinese Food Gallery	43.643905	-79.533167
1700	Etobicoke	43.667856	-79.532242	Carl's Framing And Art Gallery	43.638756	-79.499944
1701	Scarborough	43.806686	-79.194353	The Artisan Cheese and Food Gallery	43.638785	-79.499953
1702	North York	43.745906	-79.352188	Privé Hair Gallery	43.646915	-79.513993



Museums

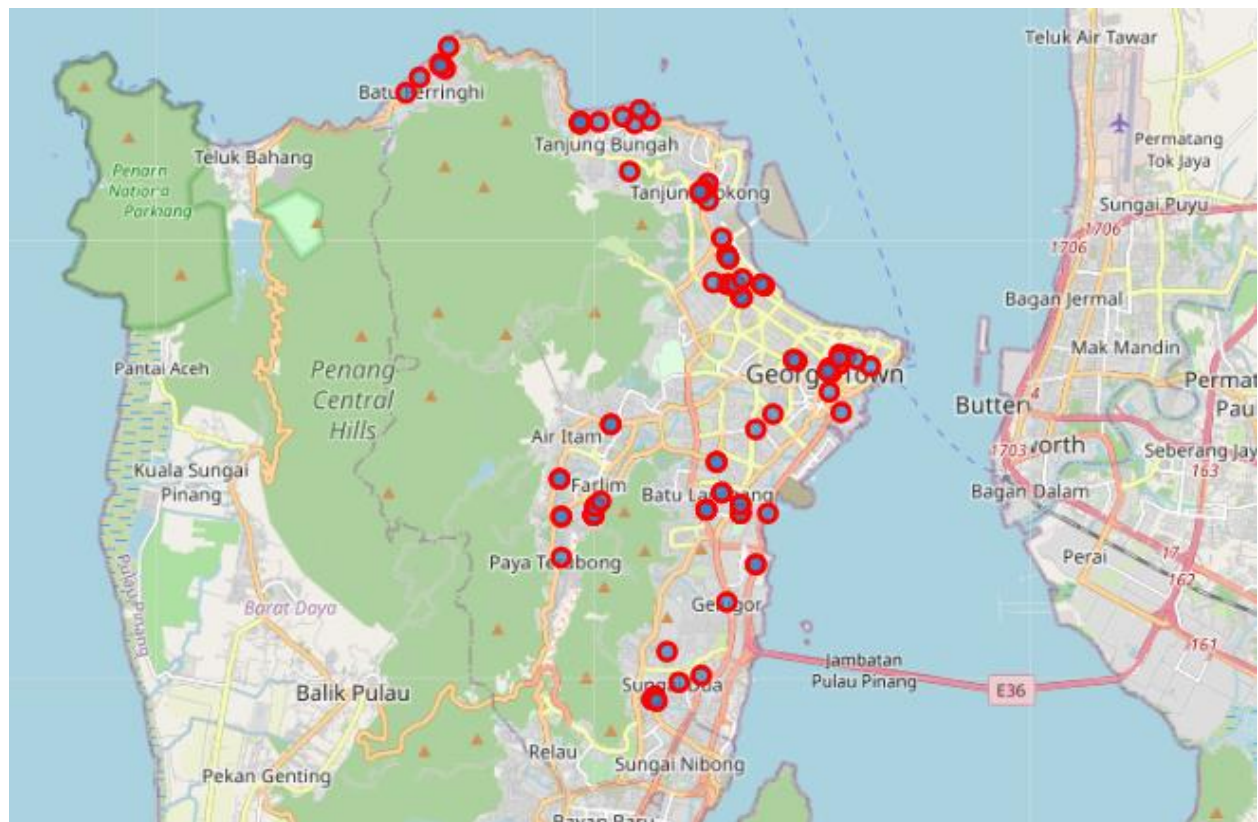
	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude
2	North York	43.753259	-79.329656	Museum Of Illusions	43.650219	-79.369451
3	North York	43.725882	-79.315572	Museum Of The End Of The World	43.654061	-79.385452
4	Downtown Toronto	43.654260	-79.360636	Riverdale Farm Museum	43.667602	-79.360132
5	North York	43.718518	-79.464763	Cabbagetown Regent Park Museum	43.667732	-79.359980
6	Downtown Toronto	43.662301	-79.389494	Friar's Music Museum	43.655662	-79.380426
...
501	Scarborough	43.770992	-79.216917	Campbell House Museum	43.650720	-79.387128
502	East York	43.709060	-79.363452	Riverdale Farm Museum	43.667602	-79.360132
503	Downtown Toronto	43.657952	-79.387383	Cabbagetown Regent Park Museum	43.667732	-79.359980
504	Downtown Toronto	43.669542	-79.422564	48Th Highlanders Museum	43.646890	-79.385760
505	Scarborough	43.773136	-79.239476	Toronto Railway Museum	43.640745	-79.385981



2.3.2 To find statistical patterns of restaurants, galleries and museums in the North-West District of Penang, Malaysia

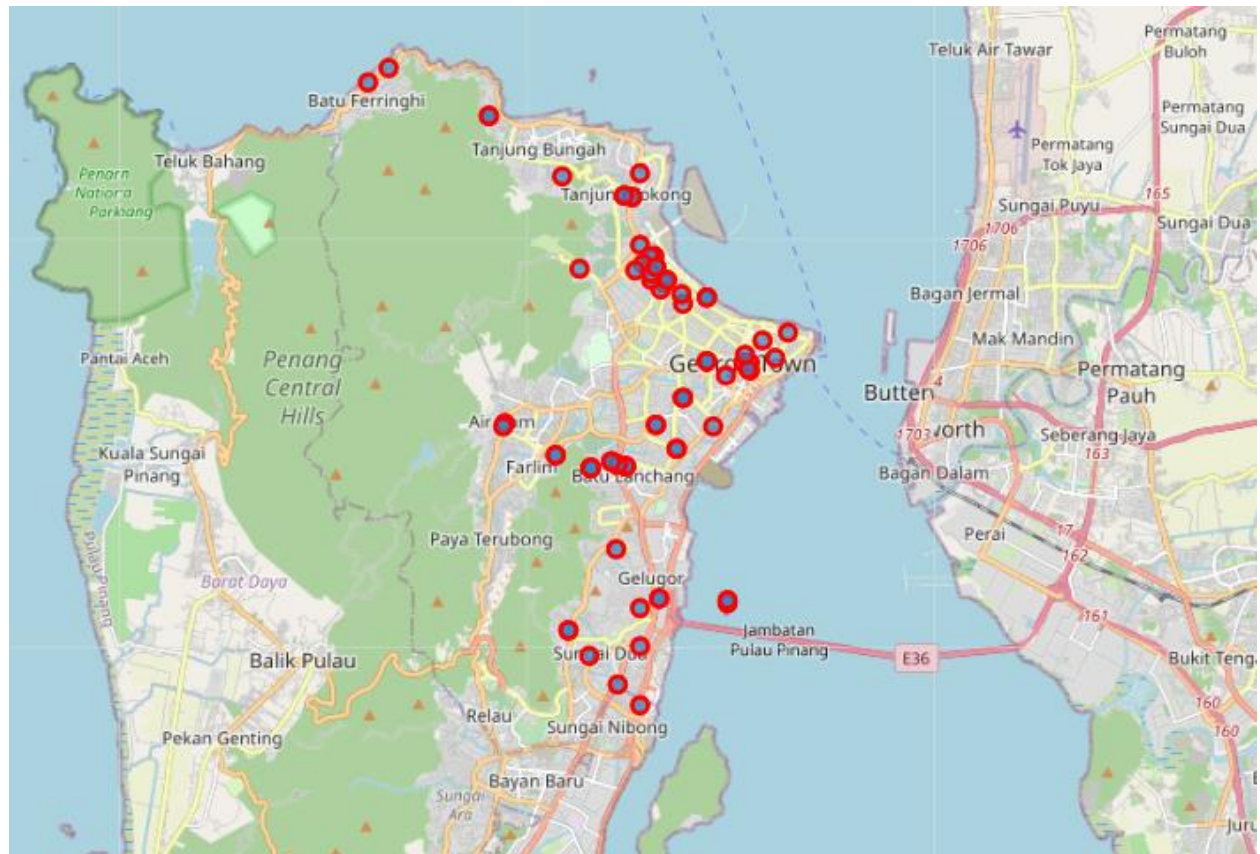
Restaurants

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude
0	Georgetown	5.414568	100.329803	Hameediyah Restaurant	5.418519	100.332556
1	Batu Ferringhi	5.478218	100.268761	Kimberly Restaurant (汕头街权记鸭粥螺汁专卖店) (Restoran K...	5.416286	100.332799
2	Tanjung Bungah	5.462163	100.286995	Kapitan Restaurant	5.416220	100.338714
3	Tanjung Tokong	5.446139	100.305254	Tho Yuen Restaurant (桃园茶楼)	5.417972	100.333898
4	Pulau Tikus	5.431822	100.311768	Wong Chau Jun Restaurant (王昭君小食馆)	5.417003	100.324029
...
139	Batu Lanchang	5.390322	100.306109	Sam Restaurant USM Sungai Dua	5.354118	100.304684
140	Air Itam	5.388131	100.278691	Chu Yoke Weng Restaurant 猪肉羹麵麵麵专卖店	5.349966	100.295551
141	Paya Terubong	5.371803	100.276162	Xin Chen Restaurant 新城小馆	5.349009	100.295975
142	Jelutong	5.387346	100.314559	Restaurant Jawi Food Corner	5.359087	100.297967
143	Gelugor	5.367514	100.312132	Hameediyah Restaurant	5.388421	100.312766



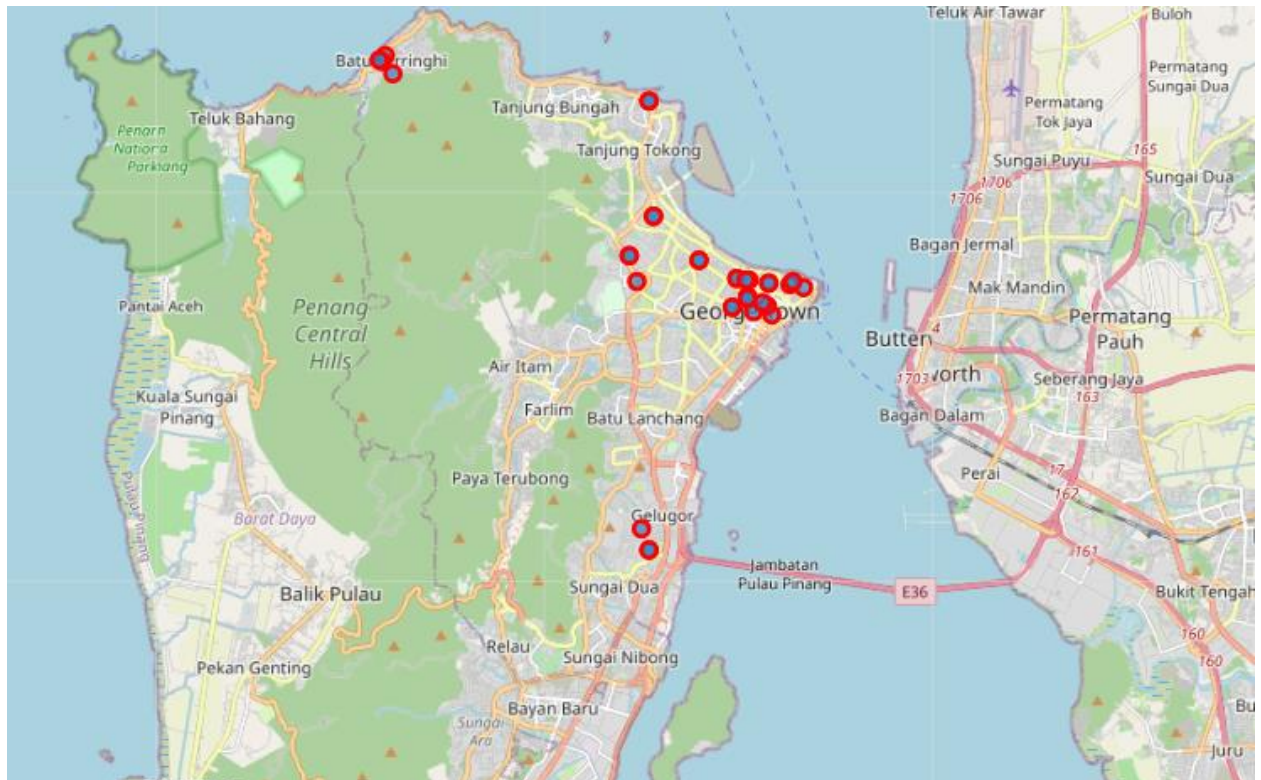
Galleries

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude
0	Georgetown	5.414568	100.329803	Tomnic Gallery	5.412844	100.331163
1	Batu Ferringhi	5.478218	100.268761	Food Gallery (食代广场)	5.411952	100.326028
2	Tanjung Bungah	5.462163	100.286995	Tongkat Ali King Gallery	5.414604	100.329768
3	Tanjung Tokong	5.446139	100.305254	World Buddhist Stamps Gallery	5.414942	100.322103
4	Pulau Tikus	5.431822	100.311768	Penang State Museum & Art Gallery	5.421268	100.339404
...
98	Pulau Tikus	5.476292	100.297370	Gallery Seasons	5.363263	100.326333
101	Air Itam	5.388131	100.278691	Simon Photo Gallery	5.363947	100.326462
102	Paya Terubong	5.371803	100.276162	Artist Gallery	5.351796	100.296652
103	Jelutong	5.387346	100.314559	Ratu Bridal Gallery	5.345742	100.302931
104	Gelugor	5.367514	100.312132	Flower Gallery	5.341197	100.307451



Museums

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude
0	Georgetown	5.414568	100.329803	Ghost Museum	5.413839	100.334855
1	Batu Ferringhi	5.478218	100.268761	Penang State Museum (King Edward VII Memorial ...	5.415391	100.325809
2	Tanjung Bungah	5.462163	100.286995	Asia Comic Cultural Museum 亚洲漫画文化馆	5.414315	100.330464
3	Tanjung Tokong	5.446139	100.305254	Asia Camera Museum	5.417695	100.329340
4	Pulau Tikus	5.431822	100.311768	Glass Museum Penang	5.417439	100.329198
5	Pulau Tikus	5.476292	100.297370	Chocolate and Coffee Museum	5.420958	100.334064
6	Pulau Tikus	5.476292	100.297370	Penang Museum (Muzium Negeri Pulau Pinang)	5.420487	100.338849
7	Batu Lanchang	5.390322	100.306109	Penang 3D Trick Art Museum	5.419707	100.341765
8	Air Itam	5.388131	100.278691	Zheng He Museum Restaurant	5.421893	100.326934
9	Paya Terubong	5.371803	100.276162	Upside Down Museum	5.415840	100.333542
10	Jelutong	5.387346	100.314559	Dark Mansion - 3D Glow In The Dark Museum	5.416511	100.332506
11	Gelugor	5.367514	100.312132	Penang State Museum & Art Gallery	5.421268	100.339404
13	Batu Ferringhi	5.478218	100.268761	War Museum	5.467955	100.248903
14	Tanjung Bungah	5.462163	100.286995	Museum	5.472174	100.247184
15	Tanjung Tokong	5.446139	100.305254	Art Museum	5.470603	100.246324
16	Pulau Tikus	5.431822	100.311768	History museum	5.470999	100.245914
18	Batu Ferringhi	5.478218	100.268761	Upside Down Museum	5.461876	100.306840
23	Tanjung Tokong	5.446139	100.305254	Upside Down Museum	5.435780	100.308031
24	Pulau Tikus	5.431822	100.311768	Upside Down Museum	5.461876	100.306840



3.0 Methodology

In **Section 2.0**, the relevant data comprises of the number of restaurants, galleries and museums in both location of interest (**Toronto, Ontario & North-West District of Penang, Malaysia**) are collected using the search query function available in **Foursquare API**, with the respective baseline input search queries of 'Restaurant', 'Gallery' and 'Museum' and radius settings of **2000m** for Toronto, Ontario and **2500m** for North-West District of Penang, Malaysia. The radius settings are selected based on the distribution of districts or borough in both location of interests. For example, since there is significantly higher number of distinctive postal codes and boroughs in Toronto, Ontario, than the districts and postal codes on North-West District of Penang, Malaysia, the radius of search for Toronto, Ontario is set to be lower than that of Penang, Malaysia.

In this following section, the data gathered from the previous section will be used to do **exploratory data analysis**, we will be looking into the data comparisons of both locations via **data visualization** as explained below:

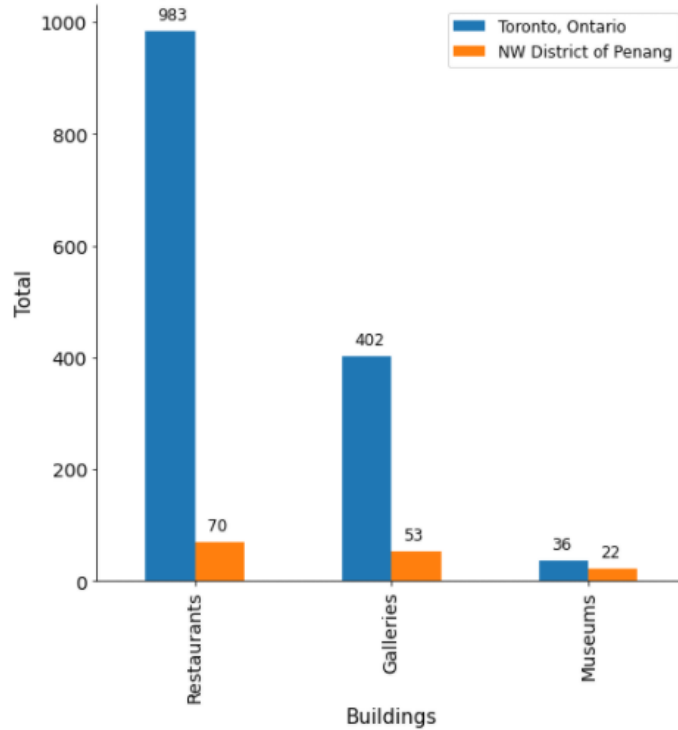
- Total Number of Restaurants, Museums and Galleries in both location.
- Distribution of Restaurants, Museums and Galleries in both location according to districts / boroughs.
- Total Number of Restaurants, Museums and Galleries per district / borough in both location.

Then, the potentiality study of both locations on tourism will be accessed based on the analyzed data.

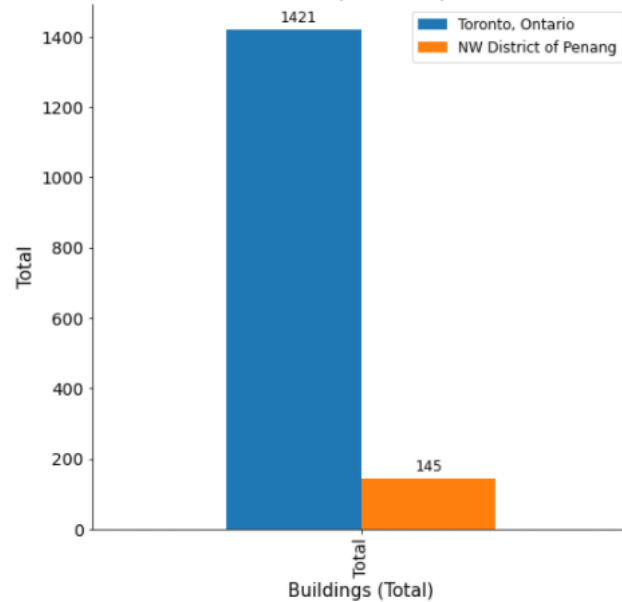
4.0 Analysis

4.1 Study on the total number of Restaurants, Galleries and Museums in both Location

Total Number of Restaurants, Galleries and Museums in Toronto and NW District of Penang, Malaysia



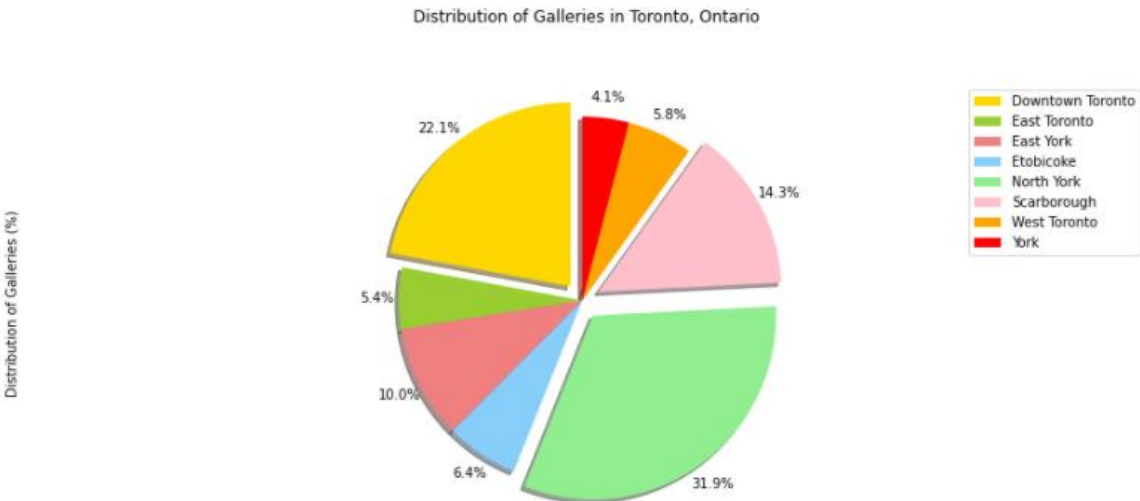
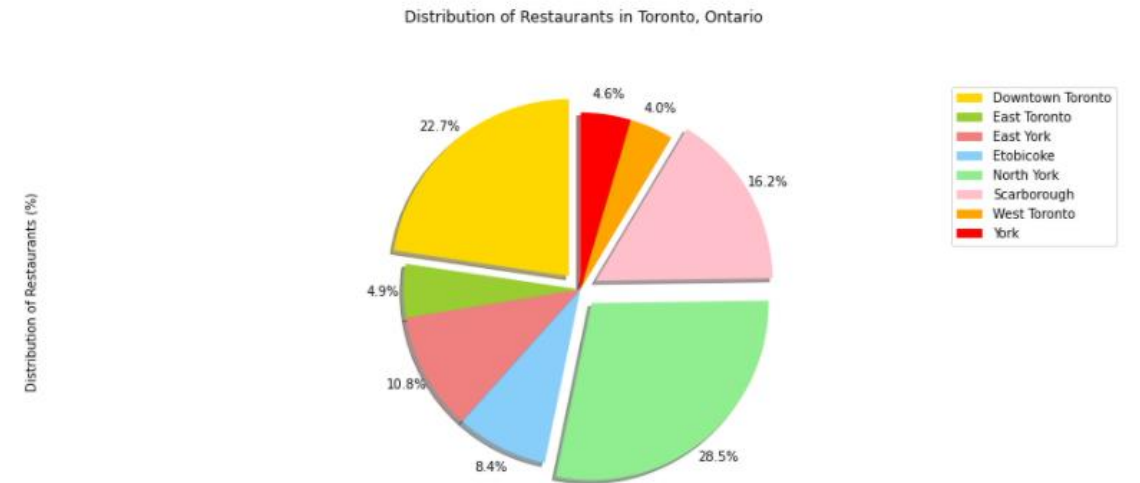
Total Number of Restaurants, Galleries and Museums (combined) in Toronto and NW District of Penang, Malaysia



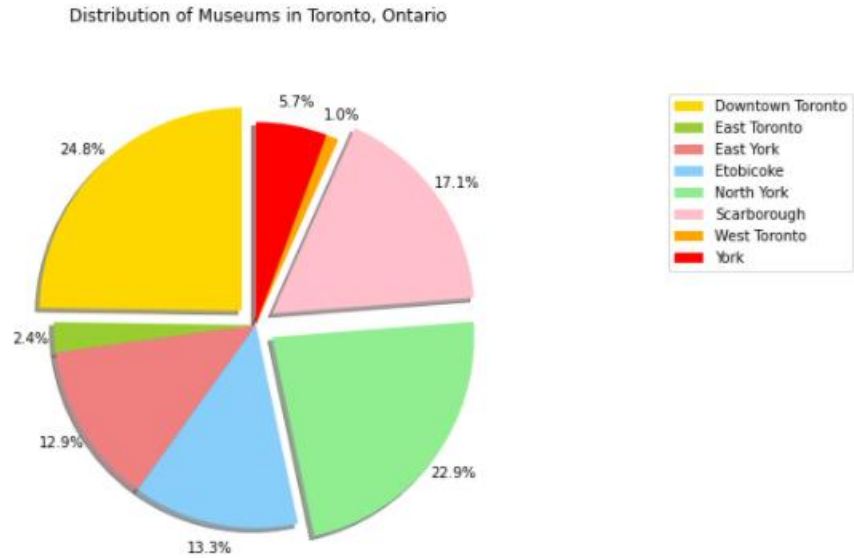
4.2 Study on the Distributions of Restaurants, Galleries and Museums in both Location (District/ Borough)

4.2.1 Toronto, Ontario

Neighborhood	Distribution of Restaurants (%)	Distribution of Galleries (%)	Distribution of Museums (%)
Downtown Toronto	22.7	22.1	24.8
East Toronto	4.9	5.4	2.4
East York	10.8	10.0	12.9
Etobicoke	8.4	6.4	13.3
North York	28.5	31.9	22.9
Scarborough	16.2	14.3	17.1
West Toronto	4.0	5.8	1.0
York	4.6	4.1	5.7



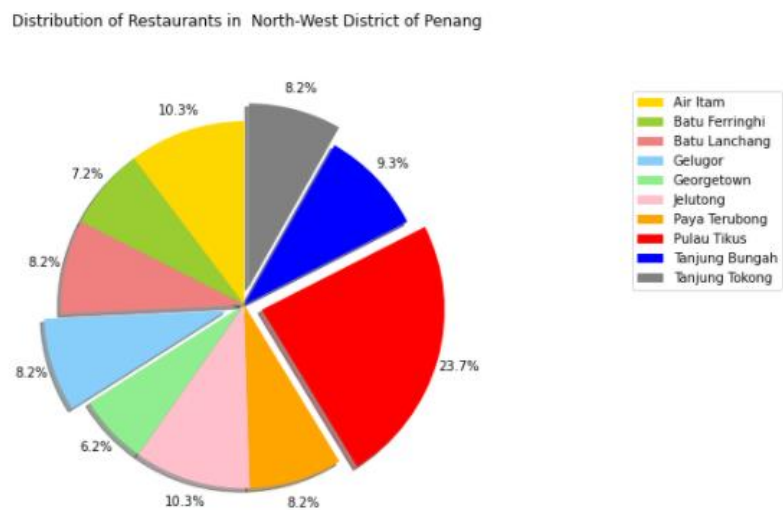
Distribution of Museums (%)



4.2.2 North-West District of Penang, Malaysia

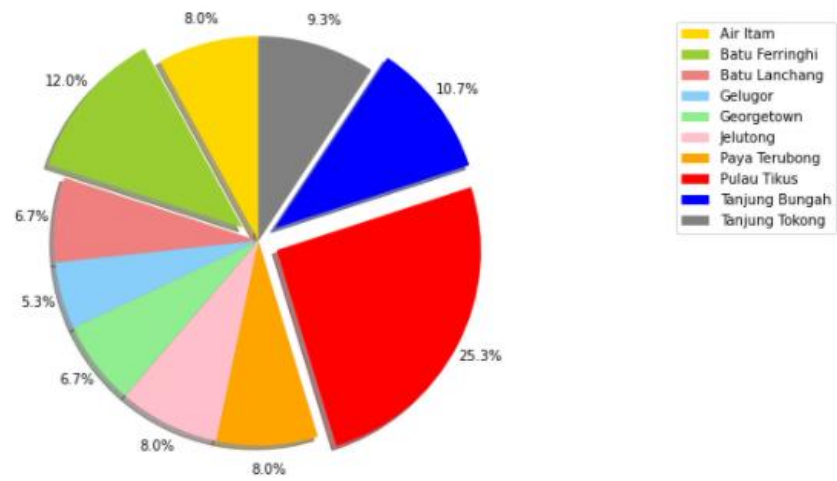
Neighborhood	Distribution of Restaurants (%)	Distribution of Galleries (%)	Distribution of Museums (%)
Air Itam	10.3	8.0	5.7
Batu Ferringhi	7.2	12.0	14.3
Batu Lanchang	8.2	6.7	8.6
Gelugor	8.2	5.3	5.7
Georgetown	6.2	6.7	2.9
Jelutong	10.3	8.0	5.7
Paya Terubong	8.2	8.0	5.7
Pulau Tikus	23.7	25.3	28.6
Tanjung Bungah	9.3	10.7	11.4
Tanjung Tokong	8.2	9.3	11.4

Distribution of Restaurants (%)



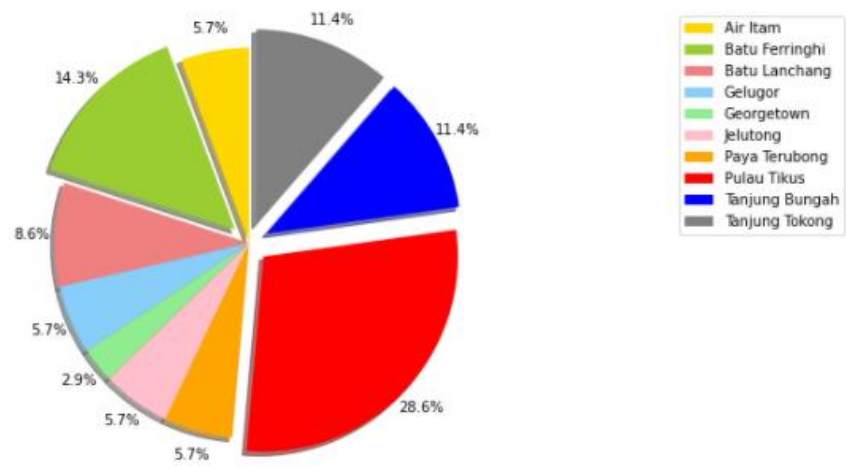
Distribution of Galleries (%)

Distribution of Galleries in North-West District of Penang



Distribution of Museums (%)

Distribution of Museums in North-West District of Penang



4.3 Study on the Total Number of Restaurants, Galleries and Museums in both Location (District/ Borough)

4.3.1 Toronto, Ontario

	Total Number of Restaurants	Total Number of Galleries	Total Number of Museums
Neighborhood			
Downtown Toronto	221	82	9
East Toronto	42	23	3
East York	95	36	3
Etobicoke	87	24	4
North York	297	147	9
Scarborough	157	55	5
West Toronto	40	20	1
York	44	15	2

4.3.2 North-West District of Penang, Malaysia

	Total Number of Restaurants	Total Number of Galleries	Total Number of Museums
Neighborhood			
Air Itam	10	5	2
Batu Ferringhi	5	4	3
Batu Lanchang	5	3	2
Gelugor	6	4	2
Georgetown	3	5	1
Jelutong	8	5	1
Paya Terubong	7	5	1
Pulau Tikus	15	14	5
Tanjung Bungah	6	4	3
Tanjung Tokong	5	4	2

5.0 Results and Discussion

The analyzed data obtained via exploratory data analysis in **section 4.0 to 4.3** has given us the findings that the total numbers of restaurants, galleries and museums in Toronto, Ontario significantly outweighs North-West district of Penang Island, Malaysia, as visualized via bar charts in **section 4.1**.

By accessing the total number and distributions of restaurants, galleries and museums of both location of interest in **section 4.2 and 4.3**, we can see that the data trends of each distinctive boroughs/ districts for restaurants, galleries and museums are distinctive for Toronto, Ontario, but equally distributed for North-West district of Penang Island, Malaysia. The boroughs of **Downtown Toronto, North York and Scarborough** are the top 3 boroughs with high numbers of restaurants, galleries and museums. Whereas, the notable districts with fairly similar distributions and total numbers of restaurants, galleries and museums are **Air Itam, Batu Ferringhi, Pulau Tikus, Tanjung Bungah and Tanjung Tokong**. Hence, these boroughs/ districts in both location of interest with higher numbers of restaurants, galleries and museums could be regarded as the respective tourist spots.

However, such findings might not be a reliable source of results due to the following areas of concern during study:

- Number of boroughs/ districts of both locations included in the case study scope (Toronto > Penang).
- Scale differences in terms of registered entities (i.e. restaurants, galleries and museums) in Foursquare API in both locations.
- The accuracy of geospatial data extracted from GeoPy's Geocoder and Foursquare API.
- The limitations of query ability in Foursquare API due to vast amount of possibilities in terms of data query

6.0 Conclusion

From our findings, it has come to a conclusion where **Toronto, Ontario** has significantly higher number of restaurants, galleries and museums than that of the **North-West district of Penang Island, Malaysia** based on the study scope. Therefore, we can say that **Toronto, Ontario** has a higher potentiality than **North-West district of Penang Island, Malaysia** as city with higher welcoming rate in tourism. However, such findings could differ due to factors such as cultural reception, demography differences in terms of races, culture and economy in different continents etc.

-END OF REPORT-