The Battle of Neighbourhoods: Finding a Familiar Neighbourhood

1. Introduction

Human migration is the movement by people from one place to another with the intention of settling, permanently or temporarily in a new location. Early human migrants are usually a result of climate change. Though climate change is no longer severer in modern societies, there are still several causes impel migrants to move to another country. Globalization is one of the reasons people move to new places for better job opportunities

Migration is a huge event for most migrants. In addition to searching for new accommodation and a new job, migrates also need to overcome culture shocks during settle down. To have a smooth transfer in the new city, it is very desirable to move to a similar neighbourhood where the migrants lived before. For example, a coffee lover who usually needs a cup of coffee every morning from Starbucks will prefer a place with a cafe nearby. I would like to use the

Foursquare location data to analyse the neighbourhoods of eleven different cities across the world. These cities are the economic or political centre of the countries. I wish to find similar neighbourhoods among these cities and provide some useful information for people who are considering moving among these places.

2. Data

The neighborhood data of New York is provided here:
https://geo.nyu.edu/catalog/nyu_2451_34572
The neighborhoods of Toronto are extracted from here:
https://en.wikipedia.org/wiki/List_of_postal_codes_of_Canada:_M
The neighborhoods of Bangalore are extracted from:
https://www.indiatvnews.com/pincode/karnataka/bangalore/
The neighborhoods of Hyderabad are extracted from:
https://www.indiatvnews.com/pincode/telangana/hyderabad
The neighborhoods of Mumbai are extracted from:
https://www.indiatvnews.com/pincode/maharashtra/mumbai
The neighborhoods of Delhi are extracted from:
https://www.indiatvnews.com/pincode/delhi
The neighborhoods of Pune are extracted from:
https://www.indiatvnews.com/pincode/maharashtra/pune
The neighborhoods of Paris are extracted from:
https://www.data.gouv.fr/fr/datasets/r/e88c6fda-1d09-42a0-a069-606d3259114e
The neighborhoods of London are extracted from:
https://en.wikipedia.org/wiki/List_of_areas_of_London
The neighborhoods of Beijing are extracted from :
https://en.wikipedia.org/wiki/List_of_township-level_divisions_of_Beijing
The neighborhoods of Shanghai are extracted from:
https://en.wikipedia.org/wiki/List_of_townshiplevel_divisions_of_Shanghai

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3. Methodology

3.1 Data preparation

The New York data is available online with the neighbourhood name and location information (latitude and longitude). For Toronto, Bangalore, Hyderabad, Mumbai, Delhi, Pune, London, Beijing and Shanghai, only neighbourhood name is provided. Therefore, I used the **Nomination** library to obtain the location information by searching each neighbourhood name. A number of neighbourhoods are not found in **Nomination**, I didn't include these neighbourhoods in my analysis. For Paris, the data is available on two different links which I combined together to get all the required information for the analysis. For the data scraping from various websites, I used the **Beautifulsoup** package.
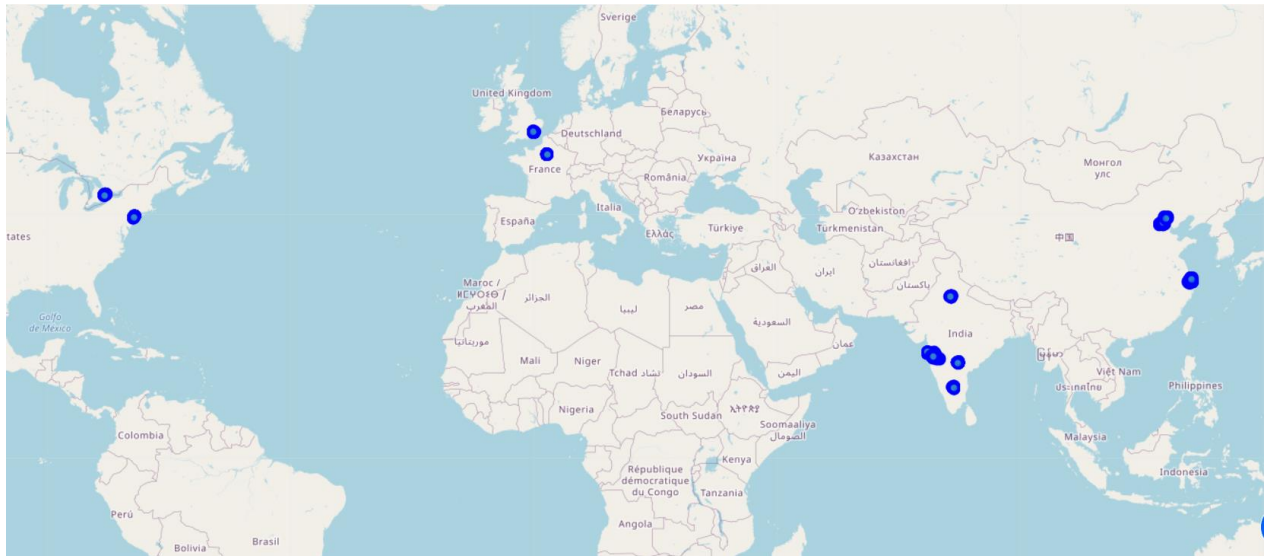

FIG. 1. Here is the visualization of all the eleven places that we are going to analyse this project to find the similarity among these places.
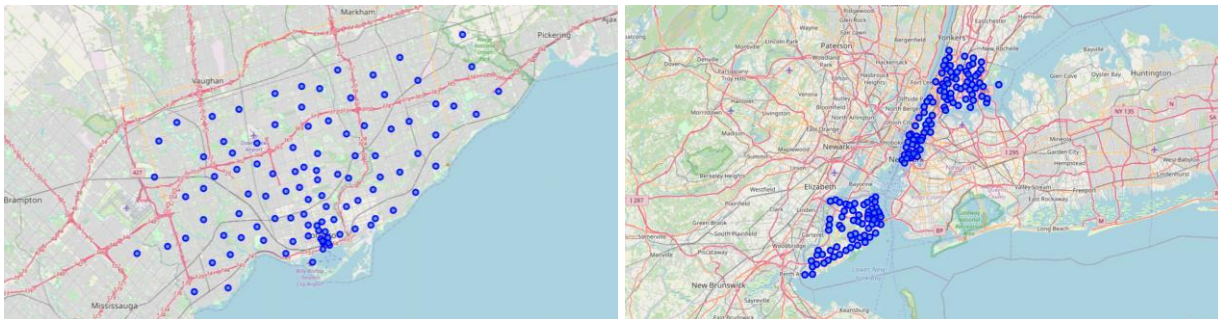

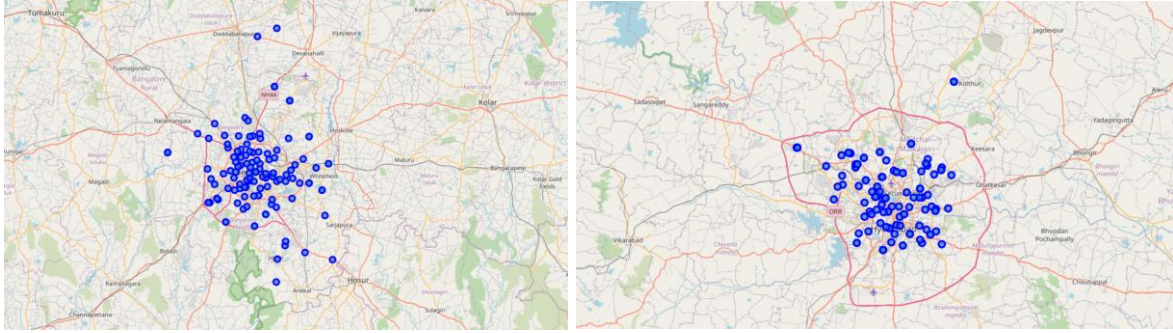
FIG. 2. Map of (a) Toronto, (b) New York
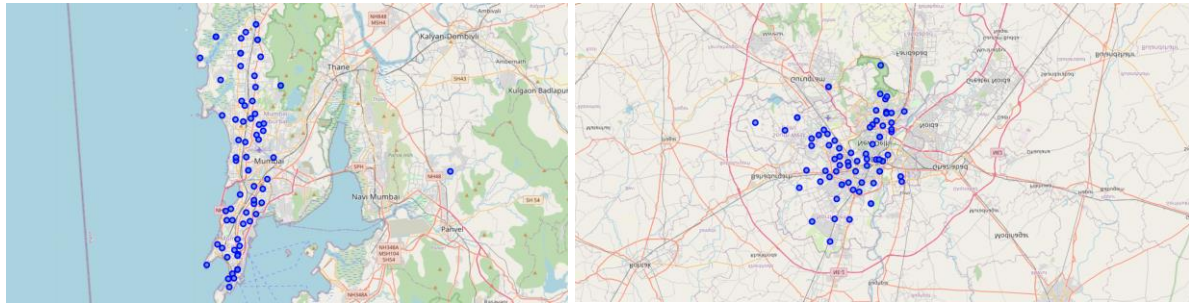
FIG. 3. Map of (a) Bengaluru, (b) Hyderabad

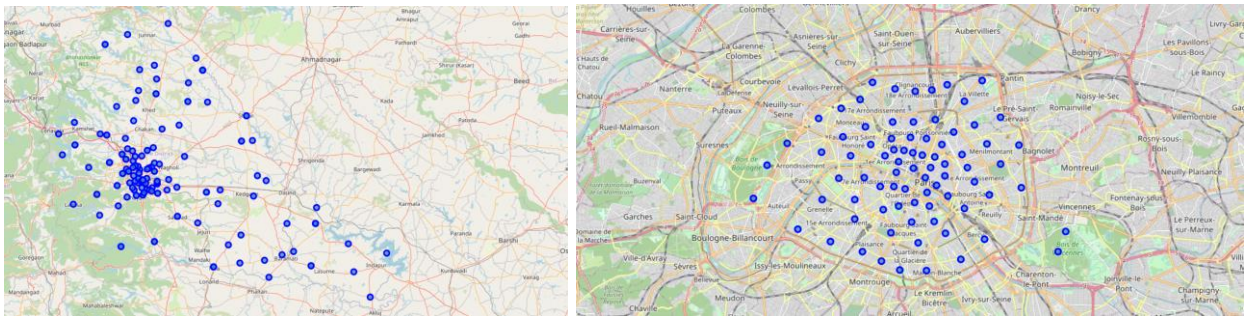FIG. 4. Map of (a) Mumbai, (b) Delhi
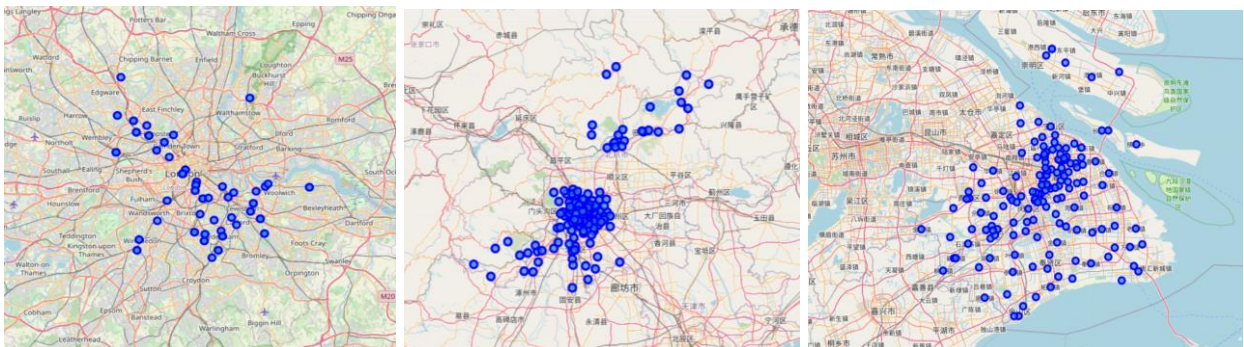

FIG. 5. Map of (a) Pune, (b) Paris

FIG. 6. Map of (a) London, (b) Beijing, (c) Shanghai

3.2 Data acquisition

I utilized the **Foursquare API** to explore the boroughs and segment them. It was used to search for nearby venues of each neighbourhood in radius of 500 meters for each borough from their given latitude and longitude information. Only the venues name and venues category (i.e. café, restaurant, school, etc.) are extracted. In the whole combined dataset of all the neighbourhood of eleven places, a total of 30520 relevant venues were found with their coordinates.

Here is a head of the list Venues name, category, latitude and longitude information from **Foursquare API**.

```
(30520, 7)
```

Out[55]:

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Parkwoods	43.753259	-79.329656	Brookbanks Park	43.751976	-79.332140	Park
1	Parkwoods	43.753259	-79.329656	TTC stop #8380	43.752672	-79.326351	Bus Stop
2	Parkwoods	43.753259	-79.329656	Variety Store	43.751974	-79.333114	Food & Drink Shop
3	Victoria Village	43.725882	-79.315572	Victoria Village Arena	43.723481	-79.315635	Hockey Arena
4	Victoria Village	43.725882	-79.315572	Portugril	43.725819	-79.312785	Portuguese Restaurant

After obtaining all the venues, the total number of venues in each category is counted for each neighbourhood and also the total number of unique venues that summed to 539 unique categories.

To further analyse, I also build a table with top 10 most frequent venue categories for each neighbourhood.

Out[62]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	9 DRD,Dukirkline,Vadgaon Sheri	Café	Indian Restaurant	Clothing Store	Fast Food Restaurant	Chinese Restaurant	South Indian Restaurant	Lounge	Asian Restaurant	Italian Restaurant	Pizza Place
1	A F Station Yelahanka,BSF Campus Yelahanka	ATM	Financial or Legal Service	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Event Space	Exhibit	Eye Doctor	Factory	Falafel Restaurant
2	A I Staff Colony,Santacruz P&t Colony	Indian Restaurant	Multiplex	Pizza Place	Bar	Chinese Restaurant	Fast Food Restaurant	Tea Room	Lounge	Sporting Goods Shop	Food Service
3	A.G.C.R.,Ajmeri Gate Extn.,Darya Ganj,Gandhi S...	Cricket Ground	Soccer Stadium	Road	History Museum	Zoo Exhibit	Factory	Farmers Market	Farm	Falafel Restaurant	Eye Doctor
4	A.Gs Office,Anandnagar Hyderabad,Bazarghat Hyd...	Café	Bakery	Market	Zoo Exhibit	Falafel Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor

3.3 Machine Learning Uses

For segmenting neighbourhood in the dataset of all the eleven places around the world based on their similarities with each other to find recommendation for a familiar neighbourhood for the person moving from one place to another, **clustering algorithm** will be used especially **K-mean method**. This method is used as unsupervised algorithm. It doesn't need previous recommendations to build a model. **K-mean method** is good for segmentation. It divides the data into clusters without any cluster-internal structures or label.

The number of clusters was decided to be 14, after checking the **Elbow Method** and **Silhouette Coefficients.**

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3.4 Data Analysis

I used python **Folium** library to visualize geographic details of all these places and its boroughs and I created a map of these places with boroughs superimposed on top. I used latitude and longitude values to get the visuals.

To analyse the data of the different categories of the venues of various neighbourhood, one hot encoding was done.

Out[50]:

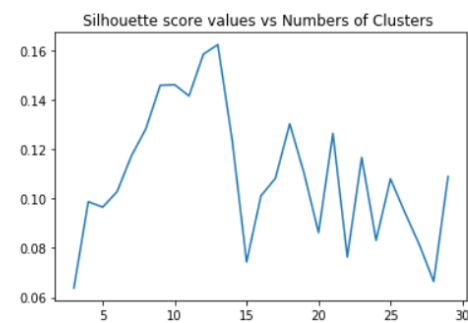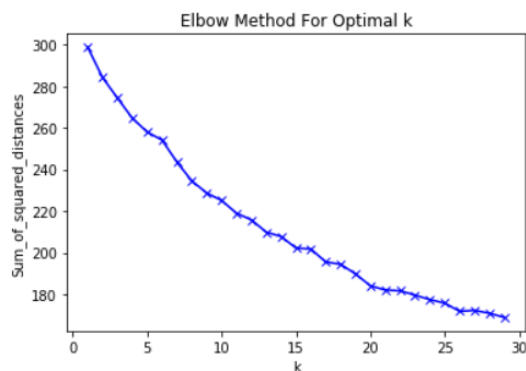|	Neighborhood	ATM	Accessories Store	Adult Boutique	Afghan Restaurant	African Restaurant	Airport	Airport Food Court	Airport Gate	Airport Lounge	...	Wine Bar	Wine Shop	Wings Joint	Women's Store	Xinjiang Restaurant	Yoga Studio	Yunnan Restaurant	Zhejiang Restaurant	Zoo	Zoo Exhibit
0	Parkwoods	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	0
1	Parkwoods	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	0
2	Victoria Village	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	0
3	Victoria Village	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	0
4	Victoria Village	0	0	0	0	0	0	0	0	0	...	0	0	0	0	0	0	0	0	0	0

5 rows × 543 columns

Next, I grouped the rows by neighbourhood and by taking the mean of the frequency of occurrence of each category.

Out[60]:

	Neighborhood	ATM	Accessories Store	Adult Boutique	Afghan Restaurant	African Restaurant	Airport	Airport Food Court	Airport Lounge	Airport Service	...	Wine Bar	Wine Shop	Wings Joint	Women's Store	Xinjiang Restaurant	Yoga Studio	Yunnan Restaurant	Zhejiang Restaurant
0	9 DRD,Dukirkline,Vadgaon Sheri	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.0	...	0.000000	0.000000	0.0	0.0	0.0	0.0	0.000000	0.0
1	A F Station Yelahanka,BSF Campus Yelahanka	1.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.0	...	0.000000	0.000000	0.0	0.0	0.0	0.0	0.000000	0.0
2	A I Staff Colony,Santacruz P&t Colony	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.0	...	0.000000	0.000000	0.0	0.0	0.0	0.0	0.000000	0.0
3	A.G.C.R.,Ajmeri Gate Extn.,Darya Ganj,Gandhi S...	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.0	...	0.000000	0.000000	0.0	0.0	0.0	0.0	0.000000	0.0
4	A Gs Office,Anandnagar Hyderabad,Bazarghat Hyd...	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.0	...	0.000000	0.000000	0.0	0.0	0.0	0.0	0.000000	0.0
5	A.Gs. Staff Quarters,Yousufguda	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.0	...	0.000000	0.000000	0.0	0.0	0.0	0.0	0.000000	0.0
6	A.R. Shala,Deccan Gymkhana,Film Institute	0.0	0.0	0.0	0.0	0.000000	0.0	0.0	0.0	0.0	...	0.000000	0.000000	0.0	0.0	0.0	0.0	0.000000	0.0

According to our problem statement, it is clear that this analysis required **unsupervised learning** and it has unlabelled dataset, thus it would likely to be required to be clustered. Therefore, to segment the neighbourhood in the dataset of all the eleven places around the world based on their similarities with each other to find recommendation for a familiar neighbourhood for the person moving from one place to another, **clustering algorithm** will be used especially **K-mean method**. This method is used as an **unsupervised algorithm**. It doesn't need previous recommendations to build a model. **K-mean method** is good for segmentation. It divides the data into clusters without any cluster-internal structures or label.

The number of clusters was decided to be **13**, after checking the (a)**Elbow Method** and (b)**Silhouette Coefficients** as seen in the figures given below.

Optimal number of components is: 13

4. Results

4.1 Total number of neighbourhoods in each cluster

Let's look at the total number of neighbourhoods in each cluster to make sure they are properly clustered.

Cluster Number	0	1	2	3	4	5	6	7	8	9	10	11	12
Total number of neighbourhoods	12	836	13	17	18	8	33	4	66	67	124	33	9

Table.1 Total number of neighbourhoods in each cluster.

4.2 Map visualization of the clusters

4.2.1 Cluster City Maps

Here is the visualization of all the places that we are analysing after the clustering was done.
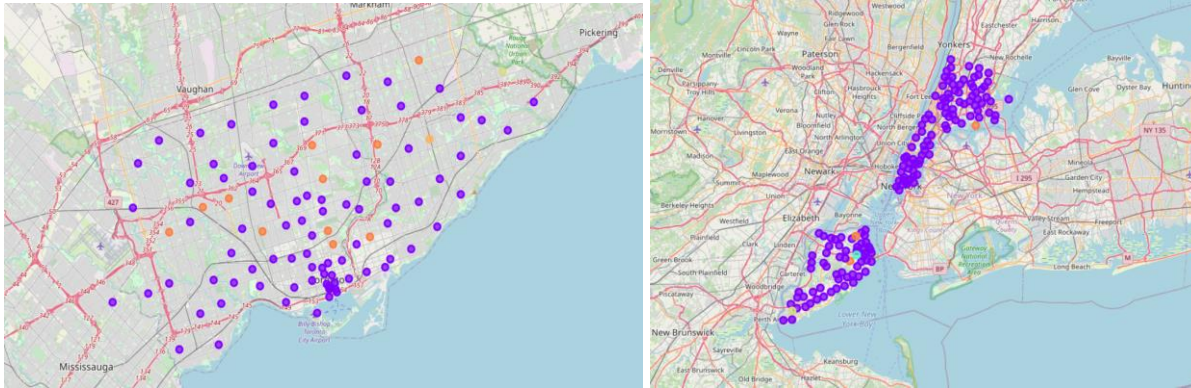

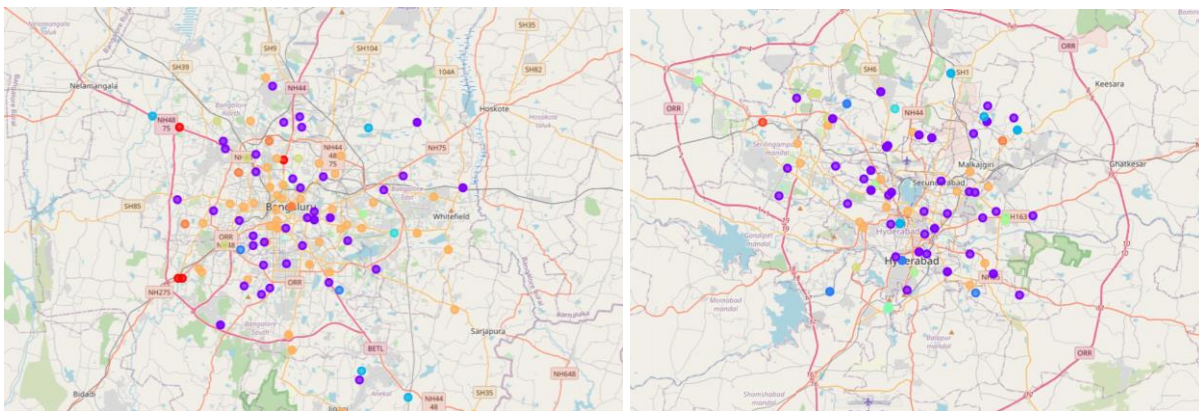FIG. 7. Map of (a) Toronto, (b) New York
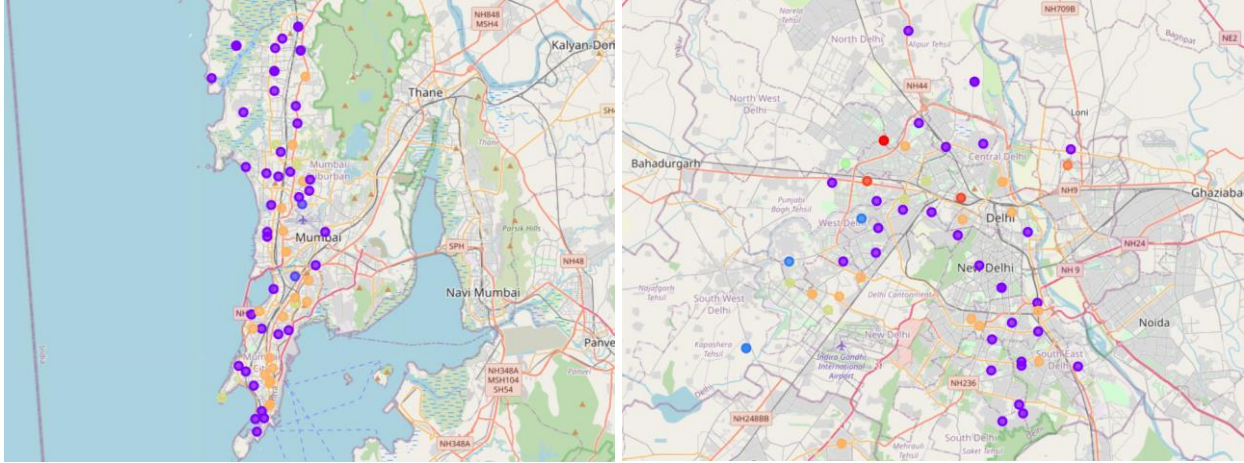

FIG. 8. Map of (a) Bengaluru, (b) Hyderabad

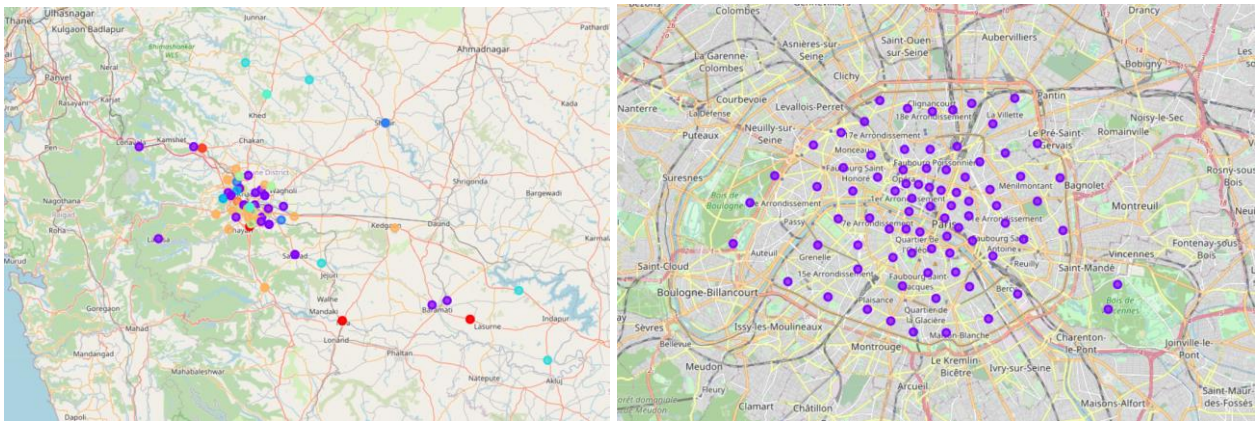FIG. 9. Map of (a) Mumbai, (b) Delhi
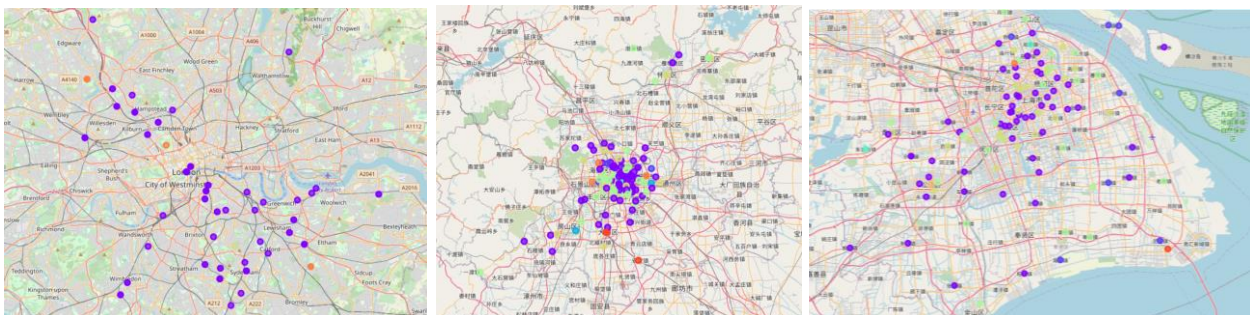

FIG. 10. Map of (a) Pune, (b) Paris

FIG. 11. Map of (a) London, (b) Beijing, (c) Shanghai

4.3.2 Individual Cluster Maps

Now let us visualize each cluster indivisually on a world map for their footprint and discuss their details which can be inferred from their indivisual clustering tables.
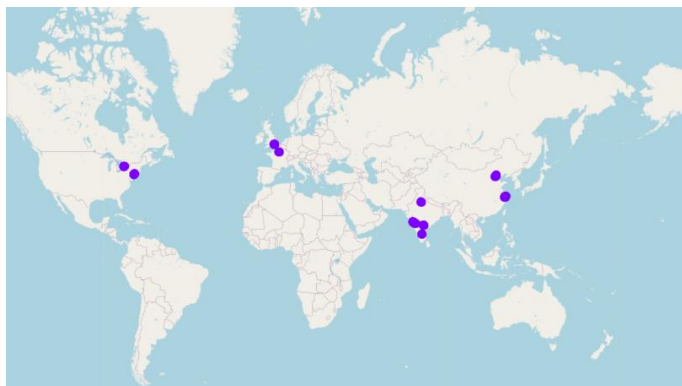
a) **Cluster 0**

From the table and the map, we can clearly see that this cluster is a local cluster of India. From the table we can infer that these are places situated outside the city as we can see that the top venues include zoo exhibit, factory, farms, farmer market which usually are situated in the outskirts of a city. There are some restaurants which might be there for tourists visiting zoo exhibit.

Cluster 0

Out[96]:

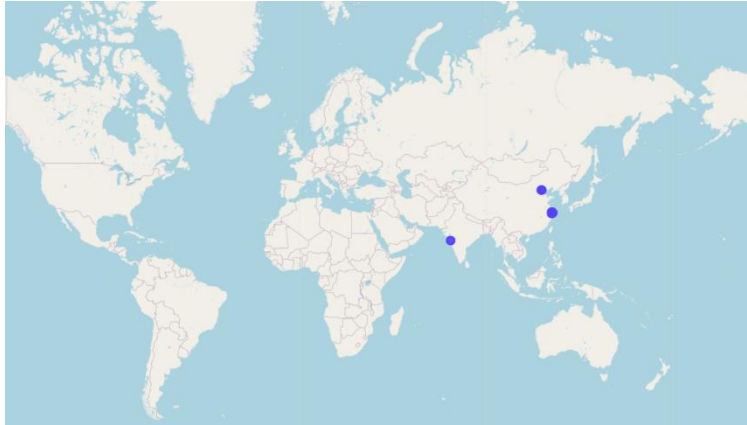|	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
262	Anandnagar Bangalore,H.A. Farm,Hebbal Kempapura	Bus Station	Vegetarian / Vegan Restaurant	Hotel	Indian Restaurant	Factory	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant
324	Chudenapura	Bus Station	Indian Restaurant	Zoo Exhibit	Falafel Restaurant	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Factory
337	Kumbalagodu,Kumbalgodu Gollahalli,Ramohalli	Bus Station	Zoo Exhibit	Falafel Restaurant	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Factory	Financial or Legal Service
343	Bagalgunte,Chikkabidarkal,Nagasandra Bangalore...	Bus Station	Restaurant	Zoo Exhibit	Film Studio	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory
624	Ambegaon BK	Bus Station	Lake	Farm	Zoo Exhibit	Falafel Restaurant	Field	Fast Food Restaurant	Farmers Market	Factory	Film Studio

b) **Cluster 1**

Here from the table and the map, we can infer that this is a universal cluster. From the table we can see that these are places situated in the middle of the cities. There are pizza places, cafes, coffee shops, various type of stores, art galleries, theatre, parks, pubs, gym, restaurants etc. So, this cluster provides places to move into the hustle and bustle of the centre of a city.

Cluster 1

Out[97]:

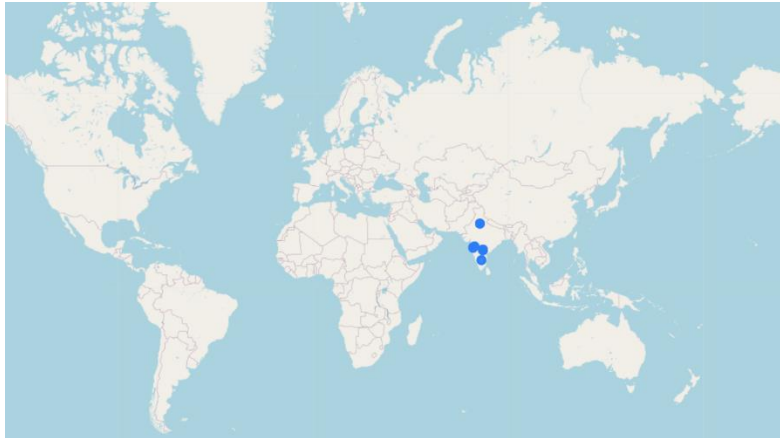|	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
1	Victoria Village	Pizza Place	Hockey Arena	Coffee Shop	Portuguese Restaurant	Zoo Exhibit	Factory	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant
2	Regent Park, Harbourfront	Coffee Shop	Bakery	Park	Pub	Breakfast Spot	Theater	Café	Restaurant	Mexican Restaurant	Performing Arts Venue
3	Lawrence Manor, Lawrence Heights	Clothing Store	Accessories Store	Furniture / Home Store	Event Space	Miscellaneous Shop	Vietnamese Restaurant	Boutique	Coffee Shop	Zoo Exhibit	Farmers Market
4	Queen's Park, Ontario Provincial Government	Coffee Shop	Diner	Bank	Art Gallery	Hobby Shop	College Auditorium	Park	Sandwich Place	Bar	Theater
7	Don Mills	Gym	Japanese Restaurant	Beer Store	Coffee Shop	Asian Restaurant	Restaurant	Italian Restaurant	Discount Store	Chinese Restaurant	Sporting Goods Shop

c) Cluster 2

From the map and the table, we can see that this is a cluster that belong only to Indian and Chinese cities. From the table, it seems to include places near highways on the outskirts of a city. This is because it has hotels as well as farms, farmers market and factories which generally are situated outside city. There are some restaurant options for the people staying in the hotels.

Cluster 2

Out[98]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
523	Airport Mumbai,International Airport,Sahar P &...	Hotel	Café	Gym	Falafel Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Factory	Film Studio
579	Dharavi Road,Dharavi	Hotel	Factory	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Eye Doctor	EV Charging Station
1132	Yanghang	Hotel	Big Box Store	Coffee Shop	Financial or Legal Service	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant
1136	Haiwan	Hotel	Factory	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Eye Doctor	EV Charging Station
1155	Shihua	Hotel	Factory	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Eye Doctor	EV Charging Station

d) Cluster 3

From the map and the table, this cluster also seems clearly to be a local cluster of Indian cities. Places in these are most probably situated inside the cities as there are ATMs, legal services, restaurants, eye doctors which usually are essential services inside a city. Its not very clear though because there are also factories in these clusters, so maybe these are small factories allowed within city limits.

Cluster 3

Out[99]:

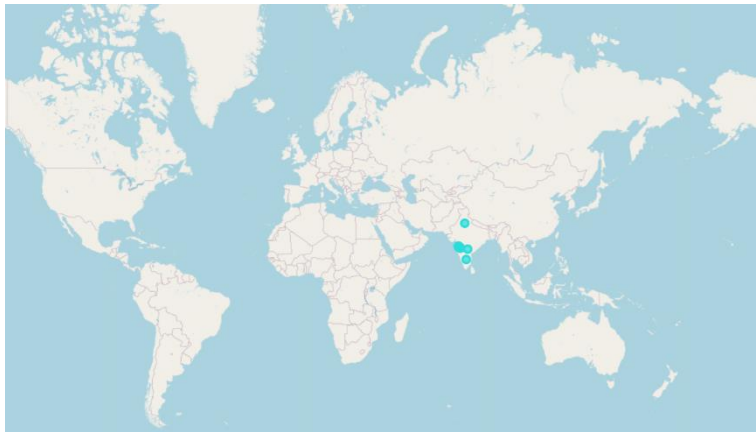|	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
258	A F Station Yelahanka,BSF Campus Yelahanka	ATM	Financial or Legal Service	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Event Space	Exhibit	Eye Doctor	Factory	Falafel Restaurant
306	Banashankari III Stage,Girinagar Bangalore,Kat...	ATM	Mountain	Ice Cream Shop	Factory	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant
406	Ibrahim Bagh Lines	ATM	Financial or Legal Service	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Event Space	Exhibit	Eye Doctor	Factory	Falafel Restaurant
421	Bahadurpura	ATM	Financial or Legal Service	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Event Space	Exhibit	Eye Doctor	Factory	Falafel Restaurant
422	Hussainialam,Kishanbagh,Tadbun	ATM	Financial or Legal Service	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Event Space	Exhibit	Eye Doctor	Factory	Falafel Restaurant

e) Cluster 4

This cluster also seems to be a local cluster of Indian and Chinese cities as seen in the map and the table. These places seem to be inside city boundaries and also located probably in the centre of the city as there are various restaurants, cafes, exhibits, eye doctors, market and stores.

Cluster 4

Out[100]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
279	Doddagubbi,Dr. Shivarama Karanth Nagar,Kothanur	Café	Karnataka Restaurant	Falafel Restaurant	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Factory	Financial or Legal Service
321	Chandapura	Café	Financial or Legal Service	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Event Space	Exhibit	Eye Doctor	Factory	Falafel Restaurant
330	Electronics City,Wipro Limited	Fruit & Vegetable Store	Café	Electronics Store	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Event Space	Exhibit	Film Studio	Factory
383	Dasanapura,Madanayakanahalli	Café	Financial or Legal Service	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Event Space	Exhibit	Eye Doctor	Factory	Falafel Restaurant
385	A.Gs Office,Anandnagar Hyderabad,Bazarghat Hyd...	Café	Bakery	Market	Zoo Exhibit	Falafel Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Eye Doctor

f) Cluster 5

From the table and the map, we can clearly see that this cluster is a local cluster of India. From the table we can infer that these are places situated outside the city as we can see that the top venues include zoo exhibit, factory, farms, farmer market which usually are situated in the outskirts of a city. There are some restaurants which might be there for tourists visiting zoo exhibit.

Cluster 5

Out[101]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
319	Carmelram	Mobile Phone Shop	Zoo Exhibit	Falafel Restaurant	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Factory	Financial or Legal Service
492	HMT Township	Mobile Phone Shop	Zoo Exhibit	Falafel Restaurant	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Factory	Financial or Legal Service
658	Agoti,Dalaj,Loni Deokar,Nhavi,Palasdeo	Mobile Phone Shop	Zoo Exhibit	Falafel Restaurant	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Factory	Financial or Legal Service
681	Amondi,Ghodegaon Pune,Girawali,Pimpalgaon Tarf...	Mobile Phone Shop	Zoo Exhibit	Falafel Restaurant	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Factory	Financial or Legal Service
689	Avasari BK,Lakhangaon,Nirgudsar,Pargaon Tarfe ...	Mobile Phone Shop	Zoo Exhibit	Falafel Restaurant	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Factory	Financial or Legal Service

g) Cluster 6

Here from the table and the map, we can infer that this is a universal cluster. From the table we can see that these are places situated around some historical sites. There are burrito places, restaurants, multiplex, theatre bakery, etc which indicates that these are mostly tourist places.

Cluster 6

Out[102]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
233	Emerson Hill	Historic Site	Construction & Landscaping	Food	Eye Doctor	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory	Zoo Exhibit
597	C M E	Historic Site	Burrito Place	Multiplex	Bakery	Indian Restaurant	Motorcycle Shop	Theater	Factory	Fast Food Restaurant	Farmers Market
598	Chikhali	Historic Site	Burrito Place	Multiplex	Bakery	Indian Restaurant	Motorcycle Shop	Theater	Factory	Fast Food Restaurant	Farmers Market
599	Rupeenagar,Talwade	Historic Site	Burrito Place	Multiplex	Bakery	Indian Restaurant	Motorcycle Shop	Theater	Factory	Fast Food Restaurant	Farmers Market
608	Infotech Park Hinjawadi	Historic Site	Burrito Place	Multiplex	Bakery	Indian Restaurant	Motorcycle Shop	Theater	Factory	Fast Food Restaurant	Farmers Market

h) Cluster 7

This clearly is an outlier cluster only including places of Hyderabad, India. It has only 4 neighbourhood assigned to it. It is mostly situated outside the city as it has zoo exhibit, factories and farms.

Cluster 7

Out[103]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
427	Crp Camp Hyderabad,Keshogiri	Stationery Store	Zoo Exhibit	Eye Doctor	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory	Exhibit
428	Mamidipalli	Stationery Store	Zoo Exhibit	Eye Doctor	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory	Exhibit
443	Kismathpur	Stationery Store	Zoo Exhibit	Eye Doctor	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory	Exhibit
444	Rajendranagar K.V.Rangareddy	Stationery Store	Zoo Exhibit	Eye Doctor	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory	Exhibit

i) Cluster 8

Here from the table and the map, we can infer that this is a universal cluster. From the table we can see that these includes places which are situated around some public event areas like music venues, zoo exhibits and have various resturants and also farms. So mostly these are tourist places and are situated on the outskirts.

Cluster 8

Out[104]:

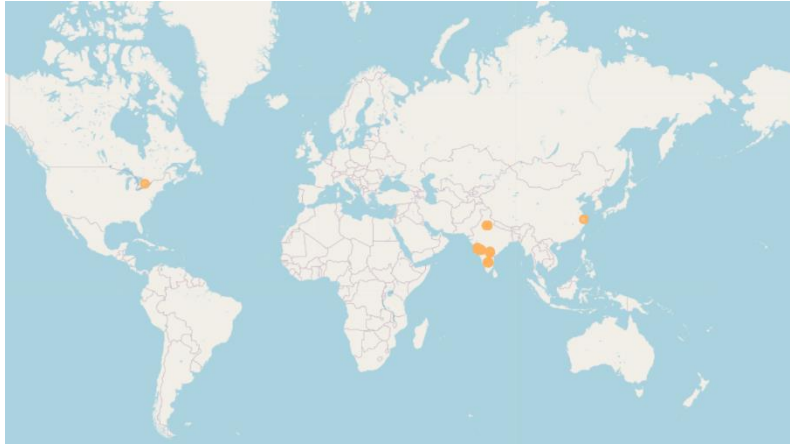|	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
39	Bayview Village	Chinese Restaurant	Bank	Café	Japanese Restaurant	Zoo Exhibit	Falafel Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm
295	Jeevanbhimanagar,New Thippasandra	Pizza Place	Restaurant	Chinese Restaurant	Bakery	Food Truck	Field	Electronics Store	French Restaurant	Empanada Restaurant	English Restaurant
389	AP Police Academy PO	Music Venue	Zoo Exhibit	Factory	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Eye Doctor
390	Hydershahkote	Music Venue	Zoo Exhibit	Factory	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Eye Doctor
412	Raj Bhawan Hyderabad	Music Venue	Zoo Exhibit	Factory	Filipino Restaurant	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Eye Doctor

j) Cluster 9

Here from the table and the map, we can infer that this is a universal cluster. From the table we can see that these are places situated in the middle of the cities. There are restaurants, bbq joint, resorts, stores, fast food restaurants, bank, coffee shops, etc. So, this cluster provides places to move into the hustle and bustle of the centre of a city.

Cluster 9

Out[105]:

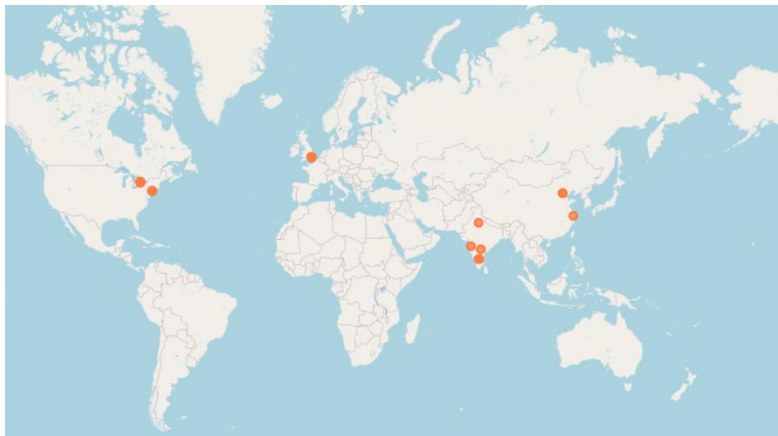|	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
6	Malvern, Rouge	Fast Food Restaurant	Zoo Exhibit	Financial or Legal Service	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Event Space	Exhibit	Eye Doctor	Factory
252	Richmond Valley	Fast Food Restaurant	Train Station	Smoothie Shop	Mexican Restaurant	Bank	Coffee Shop	Sandwich Place	Convenience Store	Construction & Landscaping	Food
299	P&T Col. Kavalbyrasandra,R T Nagar	Park	Resort	Electronics Store	Fast Food Restaurant	Bus Station	Field	Farmers Market	Farm	Falafel Restaurant	Zoo Exhibit
338	Nayandahalli	ATM	Road	Electronics Store	Fast Food Restaurant	Toll Plaza	Accessories Store	Fountain	Food Truck	Empanada Restaurant	English Restaurant
354	Jalahalli West	BBQ Joint	Fast Food Restaurant	Factory	Filipino Restaurant	Field	Farmers Market	Farm	Falafel Restaurant	Eye Doctor	Eastern European Restaurant

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k) Cluster 10

Here from the table and the map, we can infer that this is a universal cluster. From the table we can see that these are places situated in the middle of the cities. There are restaurants, snack place, playground, stores, fast food restaurants, doctors, gym, etc. So, this cluster provides places to move into the hustle and bustle of the centre of a city.

Cluster 10

Out[106]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
65	Dorset Park, Wexford Heights, Scarborough Town...	Indian Restaurant	Thrift / Vintage Store	Brewery	Chinese Restaurant	Light Rail Station	Vietnamese Restaurant	Pet Store	Zoo Exhibit	Factory	Farmers Market
263	Arabic College,Venkateshapura	Indian Restaurant	Clothing Store	Pool Hall	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory	Eye Doctor	Zoo Exhibit
264	Attur,CRPF Campus Yelahanka,Jakkur,Rajanakunte...	Snack Place	Indian Restaurant	Playground	Pharmacy	Athletics & Sports	Zoo Exhibit	Farmers Market	Farm	Falafel Restaurant	Factory
267	Banaswadi,Horamavu,Jalavayuvihar,Kalyananagar	Fast Food Restaurant	Indian Restaurant	Electronics Store	Gastropub	Steakhouse	Café	Indian Chinese Restaurant	Jewelry Store	Mediterranean Restaurant	Farmers Market
274	C.V.Raman Nagar	Indian Restaurant	Gym	Food Truck	Asian Restaurant	Trail	Restaurant	Zoo Exhibit	Farmers Market	Farm	Falafel Restaurant

l) Cluster 11

Here from the table and the map, we can infer that this is a universal cluster. From the table we can see that these are places situated in the middle of the cities. There are restaurants, park, bars, event space, stores, fast food restaurants, field, doctors, etc. So, this cluster provides places to move into the hustle and bustle of the centre of a city.

Cluster 11

Out[107]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Parkwoods	Park	Bus Stop	Food & Drink Shop	Empanada Restaurant	English Restaurant	Ethiopian Restaurant	Event Space	Exhibit	Filipino Restaurant	Eye Doctor
21	Caledonia-Fairbanks	Park	Bar	Women's Store	Convenience Store	Eye Doctor	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant
35	East Toronto, Broadview North (Old East York)	Intersection	Park	Convenience Store	Eye Doctor	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory	Event Space
49	North Park, Maple Leaf Park, Upwood Park	Park	Bakery	Trail	Construction & Landscaping	Eye Doctor	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory
61	Lawrence Park	Park	Swim School	Bus Line	Factory	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Eye Doctor

m) Cluster 12

From the table and the map, we can clearly see that this cluster is a local cluster of Indian and Chinese cities. From the table we can infer that these are places situated outside the city as we can see that the top venues include zoo exhibit, factory, farms, farmer market which usually are situated in the outskirts of a city. There are some restaurants which might be there for tourists visiting zoo exhibit.

Cluster 12

Out[108]:

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
483	Chandanagar	Train Station	ATM	Eye Doctor	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory	Exhibit
670	Ambale,Ambi,Induri,Umbre Navlakh,Varale	Train Station	Indian Restaurant	Bus Station	Zoo Exhibit	Eye Doctor	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory
671	Talegaon G H,Vishnupuri	Train Station	Indian Restaurant	Bus Station	Zoo Exhibit	Eye Doctor	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory
784	C.C.I.,Delhi University,Gulabi Bagh,Kamla Naga...	Train Station	Health & Beauty Service	Zoo Exhibit	Eye Doctor	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory	Event Space
802	New Multan Nagar,Shakur Basti Depot	Train Station	Zoo Exhibit	Eye Doctor	Field	Fast Food Restaurant	Farmers Market	Farm	Falafel Restaurant	Factory	Exhibit

Therefore, by observation of each cluster carefully, we can see that
- cluster 0, 3, 5 and 7 are local clusters of Indian cities.
- cluster 2, 4, 6 and 12 are clusters common among Indian and Chinese cities.
- cluster 6 is full of Historic Site, Multiplex, Theatre, Restaurant and other food shops so basically looks like a tourist place.
- rest all clusters, 1, 6, 8, 9, 10 and 11 are universal.

5. Conclusion

Therefore, from the analysis, we can conclude that if someone wants to move locally within India, then they can get help from the local clusters 0, 3, 5 and 7. Or if someone wants to move between Indian and Chinese cities, then they can get help from the clusters 2, 4, 6 and 12. And finally, for moving across countries one can find guidance from the other universal clusters that are 1, 6, 8, 9, 10 and 11.

We can also see that the clusters are also assigned based upon its location like within city limits, on the outskirts of city or exactly in the middle of the hustle and bustle of a city life. Therefore, for those who are looking for a good residential area to settle down or for those who have a job in the city centre and don't want to spend much time on transportation or for those who wants to settle down on the outskirts of a city life for a quite and peaceful life, everyone can take help from these analysis and the assigned the clusters to find an optimum place for themselves.

The following analysis also convince that despite the distinct cultural and geographical location differences of all these cities, there are several similar neighbourhoods among them. Therefore, I hope that this could provide some insight for the people who are considering moving among these countries.

Thank you for reading!