Objectives

Objectives of the final assignments were to define a business problem, look for data in the web and, use Foursquare location data to compare different locations to figure out which neighborhood is suitable for starting a restaurant business. As prepared for the assignment, I go through the problem designing, data preparation and final analysis section step by step.

1. Introduction¶

1.1. Problem Statement

Chennai also known as Madras is the capital of the Indian state of Tamil Nadu. Located on the Coromandel Coast off the Bay of Bengal, it is the biggest cultural, economic and educational center of south India. According to the 2011 Indian census, it is the sixth-most populous city and fourth-most populous urban agglomeration in India. The city together with the adjoining regions constitutes the Chennai Metropolitan Area, which is the 36th-largest urban area by population in the world.

Chennai as the only South Asian city to feature in its 2015 "Top 10 food cities" list. Chennai was also named the ninth-best cosmopolitan city in the world by Lonely planet.

The south Indian city of Chennai is fast emerging as a destination for information technology outsourcing and has seen a growing number of IT parks being built here. Most of the upcoming complexes are being built along the **IT Corridor**.

- To find a suitable Area for starting a Restaurent near the IT HUBS of Chennai.
- This analysis will help to find suitable place for starting a new restaurent as the need for food is more among the office during lunch hours.
- This will help the new entrepreneurs who are in need of information regarding business ideas.

1.2. Import Necessary Libraries

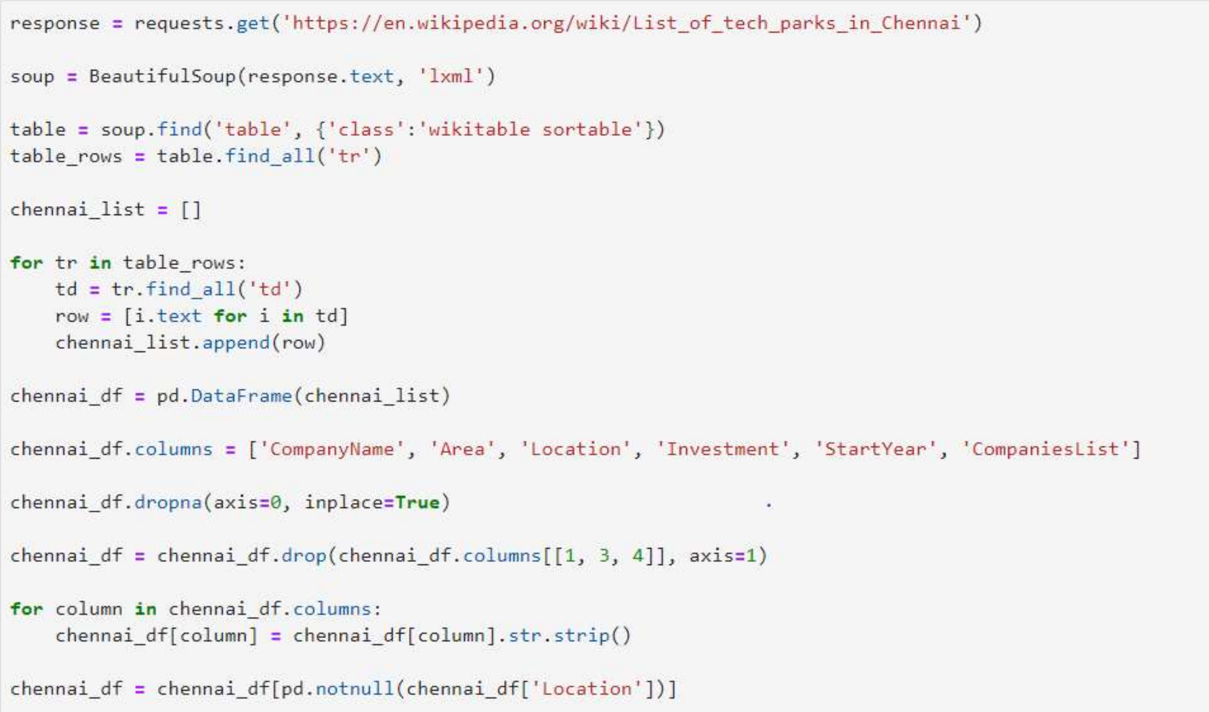
We used following packages in this assignments. **Geospy, BeautifulSoup, Foursquare, Matplotlib and Folium**.

- **BeautifulSoup:** Beautiful Soup is a Python package for parsing HTML and XML documents. It creates a parse tree for parsed pages that can be used to extract data from HTML, which is useful for web scraping.
- **GeoSpy:** 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.
- **Foursquare:** The Foursquare is to help you discover and share information about businesses and attractions around you.
- **Folium:** Folium makes it easy to visualize data that’s been manipulated in Python on an interactive leaflet map.
- **Matplotlib:**Matplotlib is a plotting library for the Python programming language and its numerical mathematics extension NumPy. You can generate plots, histograms, power spectra, bar charts, errorcharts, scatterplots, etc.,

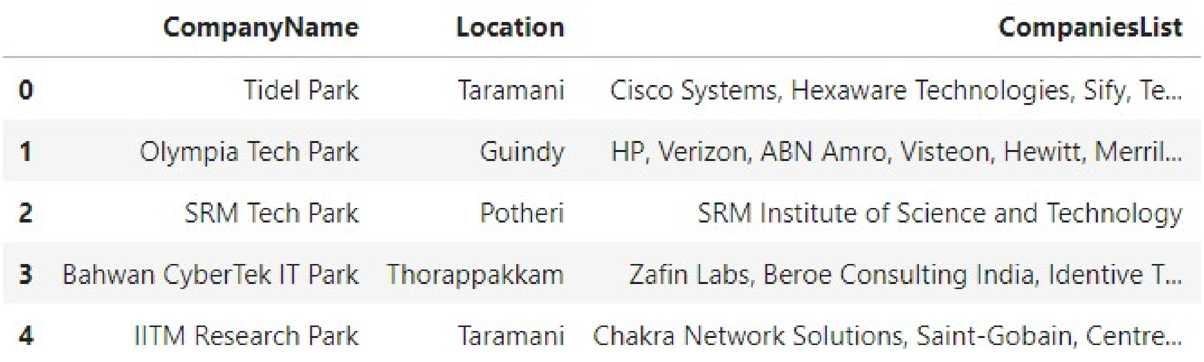
2. Data Preparation

The south Indian city of *Chennai* is fast emerging as a destination for information technology outsourcing and has seen a growing number of IT parks being built here. List of IT parks details are getting from https://en.wikipedia.org/wiki/List_of_tech_parks_in_Chennai.

The BeautifulSoup is used for parsing and extract data from HTML. The result is uploaded into GitHub for later reference.



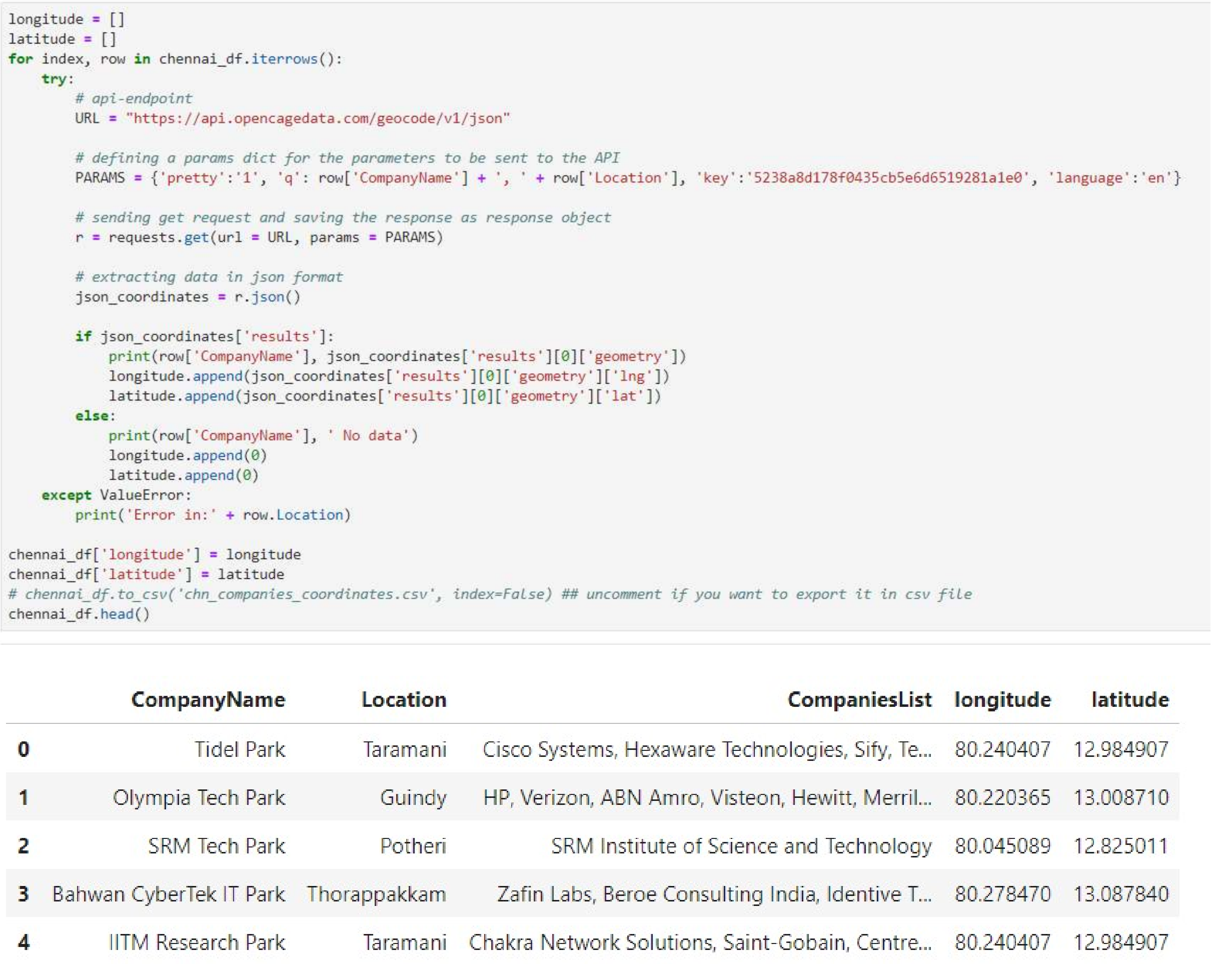
```
response = requests.get('https://en.wikipedia.org/wiki/List_of_tech_parks_in_Chennai')

soup = BeautifulSoup(response.text, 'lxml')

table = soup.find('table', {'class':'wikitable sortable'})
table_rows = table.find_all('tr')

chennai_list = []

for tr in table_rows:
    td = tr.find_all('td')
    row = [i.text for i in td]
    chennai_list.append(row)

chennai_df = pd.DataFrame(chennai_list)

chennai_df.columns = ['CompanyName', 'Area', 'Location', 'Investment', 'StartYear', 'CompaniesList']

chennai_df.dropna(axis=0, inplace=True)

chennai_df = chennai_df.drop(chennai_df.columns[[1, 3, 4]], axis=1)

for column in chennai_df.columns:
    chennai_df[column] = chennai_df[column].str.strip()

chennai_df = chennai_df[pd.notnull(chennai_df['Location'])]
```



	CompanyName	Location	CompaniesList
0	Tidel Park	Taramani	Cisco Systems, Hexaware Technologies, Sify, Te...
1	Olympia Tech Park	Guindy	HP, Verizon, ABN Amro, Visteon, Hewitt, Merril...
2	SRM Tech Park	Potheri	SRM Institute of Science and Technology
3	Bahwan CyberTek IT Park	Thorappakkam	Zafin Labs, Beroe Consulting India, Identive T...
4	IITM Research Park	Taramani	Chakra Network Solutions, Saint-Gobain, Centre...

2.1 Getting Coordinates of Major Areas.

The OpenCage Geocoder (https://api.opencagedata.com/geocode/v1/json) is used to provide text to latitude and longitude via a RESTful API. The result is stored Github for further reference.



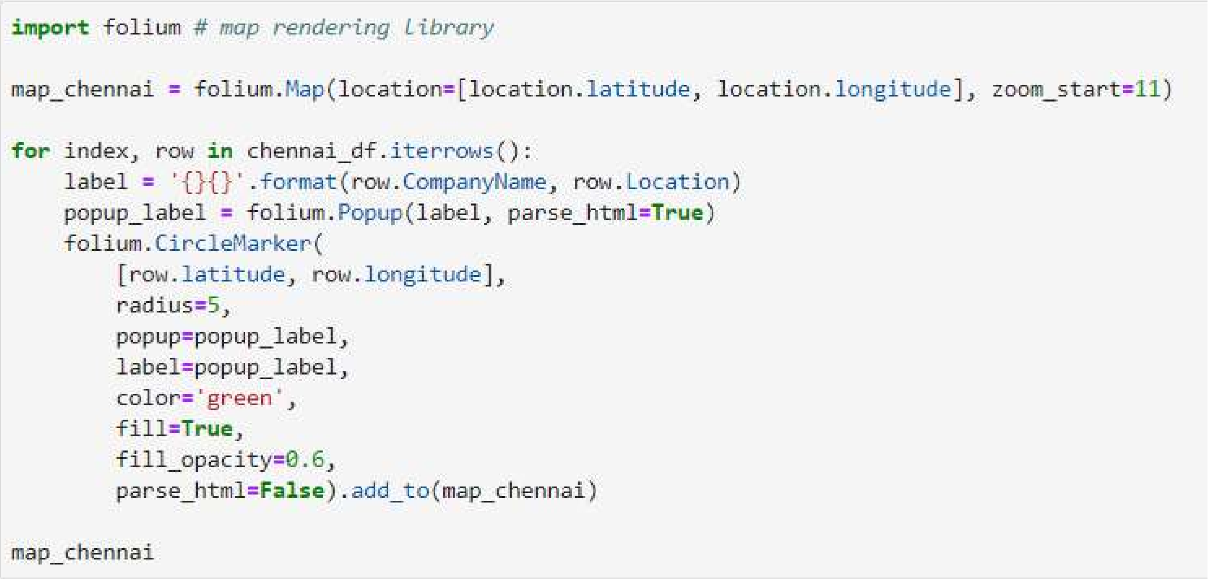
```python
longitude = []
latitude = []
for index, row in chennai_df.iterrows():
    try:
        # api-endpoint
        URL = "https://api.opencagedata.com/geocode/v1/json"

        # defining a params dict for the parameters to be sent to the API
        PARAMS = {'pretty':'1', 'q': row['CompanyName'] + ', ' + row['Location'], 'key':'5238a8d178f0435cb5e6d6519281a1e0', 'language':'en'}

        # sending get request and saving the response as response object
        r = requests.get(url = URL, params = PARAMS)

        # extracting data in json format
        json_coordinates = r.json()

        if json_coordinates['results']:
            print(row['CompanyName'], json_coordinates['results'][0]['geometry'])
            longitude.append(json_coordinates['results'][0]['geometry']['lng'])
            latitude.append(json_coordinates['results'][0]['geometry']['lat'])
        else:
            print(row['CompanyName'], ' No data')
            longitude.append(0)
            latitude.append(0)
    except ValueError:
        print('Error in:' + row.Location)

chennai_df['longitude'] = longitude
chennai_df['latitude'] = latitude
# chennai_df.to_csv('chn_companies_coordinates.csv', index=False) ## uncomment if you want to export it in csv file
chennai_df.head()
```

	CompanyName	Location	CompaniesList	longitude	latitude
0	Tidel Park	Taramani	Cisco Systems, Hexaware Technologies, Sify, Te...	80.240407	12.984907
1	Olympia Tech Park	Guindy	HP, Verizon, ABN Amro, Visteon, Hewitt, Merril...	80.220365	13.008710
2	SRM Tech Park	Potheri	SRM Institute of Science and Technology	80.045089	12.825011
3	Bahwan CyberTek IT Park	Thorappakkam	Zafin Labs, Beroe Consulting India, Identive T...	80.278470	13.087840
4	IITM Research Park	Taramani	Chakra Network Solutions, Saint-Gobain, Centre...	80.240407	12.984907

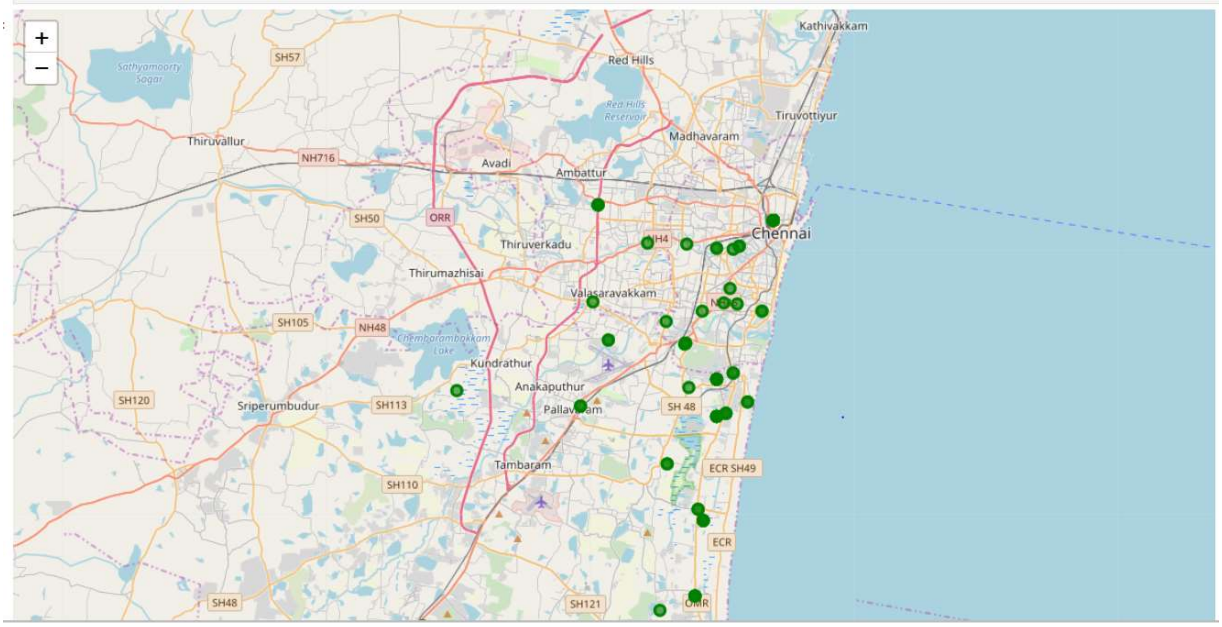
3. Data Visualization

Data visualization is viewed by many disciplines as a modern equivalent of visual communication. It involves the creation and study of the visual representation of data. To communicate information clearly and efficiently, data visualization uses statistical graphics, plots, information graphics and other tools.

Folium makes it easy to visualize data that's been manipulated in Python on an interactive leaflet map. It enables both the binding of data to a map for choropleth visualizations as well as passing rich vector/raster/HTML visualizations as markers on the map.

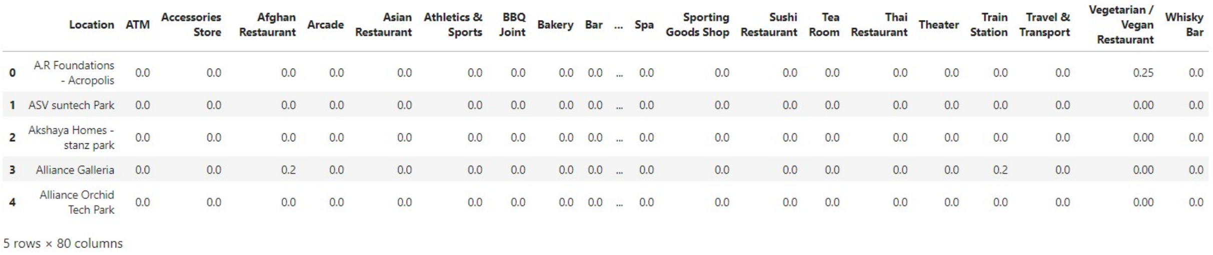


```
import folium # map rendering library

map_chennai = folium.Map(location=[location.latitude, location.longitude], zoom_start=11)

for index, row in chennai_df.iterrows():
    label = '{}{}'.format(row.CompanyName, row.Location)
    popup_label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [row.latitude, row.longitude],
        radius=5,
        popup=popup_label,
        label=popup_label,
        color='green',
        fill=True,
        fill_opacity=0.6,
        parse_html=False).add_to(map_chennai)

map_chennai
```



4. Data Analysis

We are going to focuses on processing and performing statistical analysis on existing data sets. We will concentrate on creating methods to capture, process, and organize data to uncover actionable insights for current problems, and establishing the best way to present this data. We are going to use ***FourSquare*** to explore a list of venues near the current location, optionally matching a search term. We used latitude and longitude of each location to find venues.

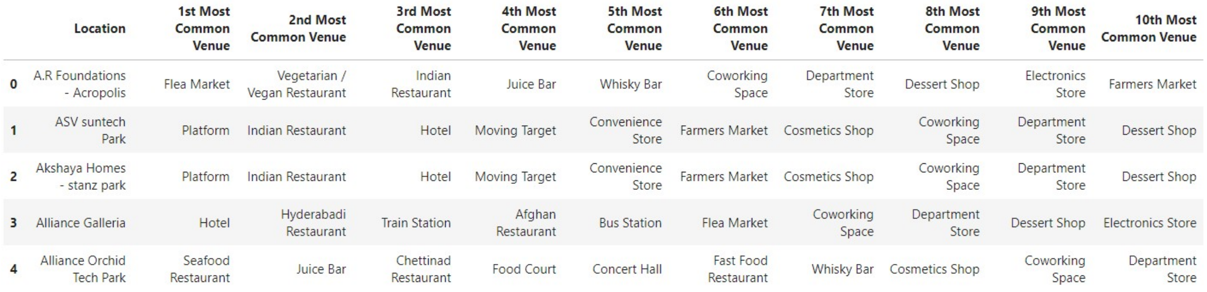


	Location	ATM	Accessories Store	Afghan Restaurant	Arcade	Asian Restaurant	Athletics & Sports	BBQ Joint	Bakery	Bar	...	Spa	Sporting Goods Shop	Sushi Restaurant	Tea Room	Thai Restaurant	Theater	Train Station	Travel & Transport	Vegetarian / Vegan Restaurant	Whisky Bar
0	A.R Foundations - Acropolis	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.25	0.0
1	ASV suntech Park	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.0
2	Akshaya Homes - stanz park	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.0
3	Alliance Galleria	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.00	0.0
4	Alliance Orchid Tech Park	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	...	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0.0

5 rows × 80 columns

4.1 Grouping Results

Next, let's group rows by Location and by taking the mean of the frequency of occurrence of each category. Now let's create the new dataframe and display the top 10 venues for each neighborhood.



	Location	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	A.R Foundations - Acropolis	Flea Market	Vegetarian / Vegan Restaurant	Indian Restaurant	Juice Bar	Whisky Bar	Coworking Space	Department Store	Dessert Shop	Electronics Store	Farmers Market
1	ASV suntech Park	Platform	Indian Restaurant	Hotel	Moving Target	Convenience Store	Farmers Market	Cosmetics Shop	Coworking Space	Department Store	Dessert Shop
2	Akshaya Homes - stanz park	Platform	Indian Restaurant	Hotel	Moving Target	Convenience Store	Farmers Market	Cosmetics Shop	Coworking Space	Department Store	Dessert Shop
3	Alliance Galleria	Hotel	Hyderabadi Restaurant	Train Station	Afghan Restaurant	Bus Station	Flea Market	Coworking Space	Department Store	Dessert Shop	Electronics Store
4	Alliance Orchid Tech Park	Seafood Restaurant	Juice Bar	Chettinad Restaurant	Food Court	Concert Hall	Fast Food Restaurant	Whisky Bar	Cosmetics Shop	Coworking Space	Department Store

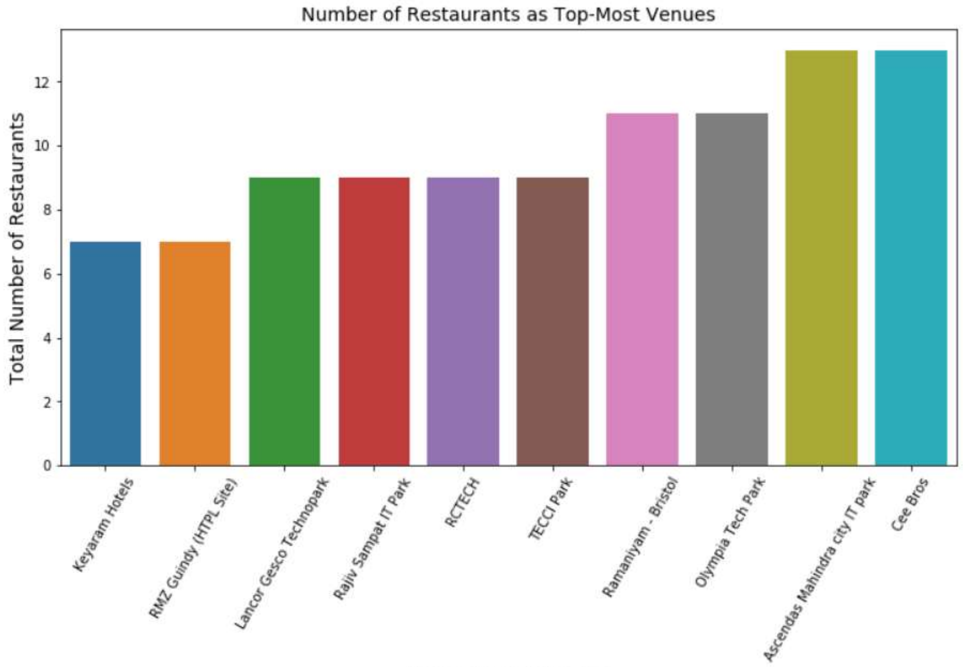
4.2 Matplot Library to Analysis Locations

We can use **Matplot** lib to analysis and visualize results. Matplotlib is used to create 2D graphs and plots by using scripts. It has a module named pyplot which makes things easy for plotting by providing feature to control line styles, font properties, formatting axes etc.

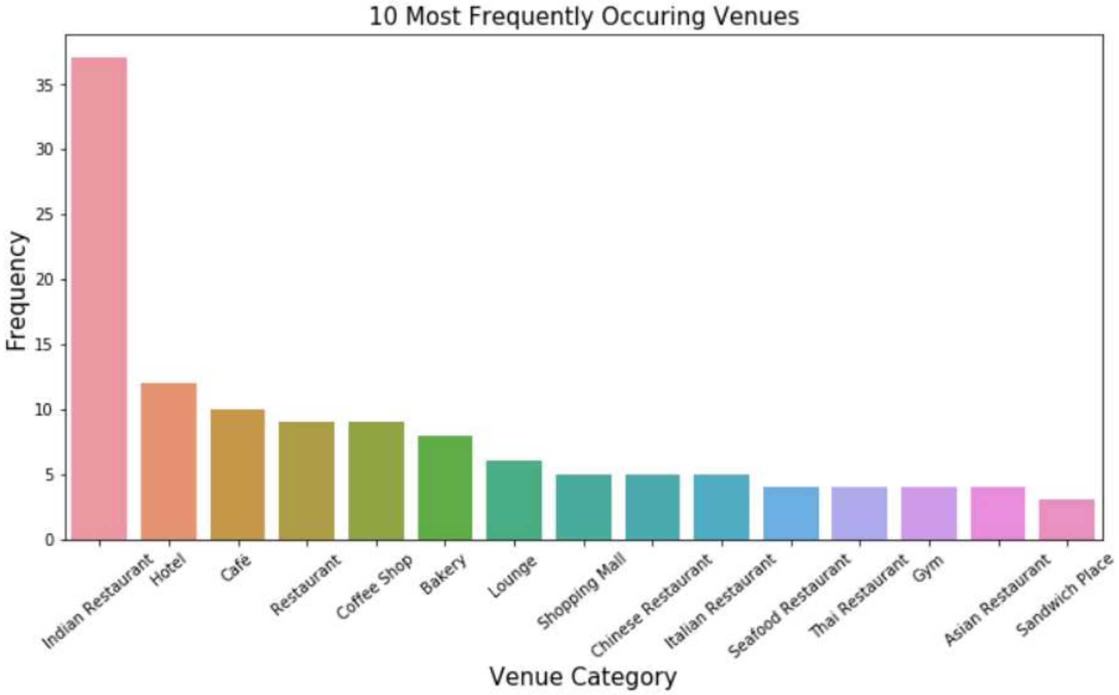
We can use Matplot library to analysis following:

- Shortlisted top 10 location with most happening places
- There are eighty unique venue categories and Indian Restaurant top the charts as we can see in the plot below.

```
In [12]:
```



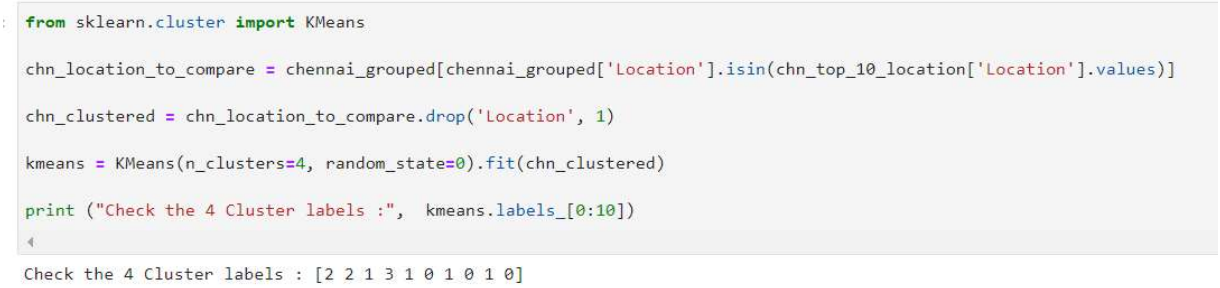
There are eighty unique venue categories and Indian Restaurants top the charts as we can see in the plot below



4.3. Clustering Locations

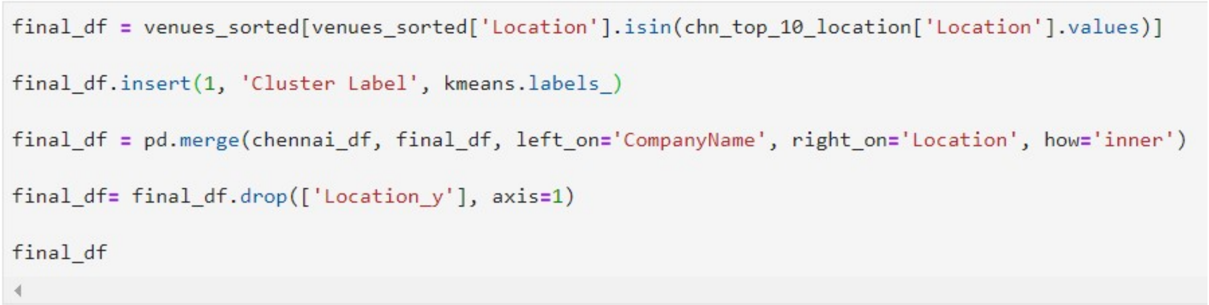
We have a data set of locations and venues. The task is to categorize those items into groups. To achieve this, we will use the **kMeans** algorithm; an unsupervised learning algorithm.

kMean algorithm used to categorize the items into k groups of similarity. To calculate that similarity, we will use the euclidean distance as measurement. We categorized the location into ***four*** clusters.

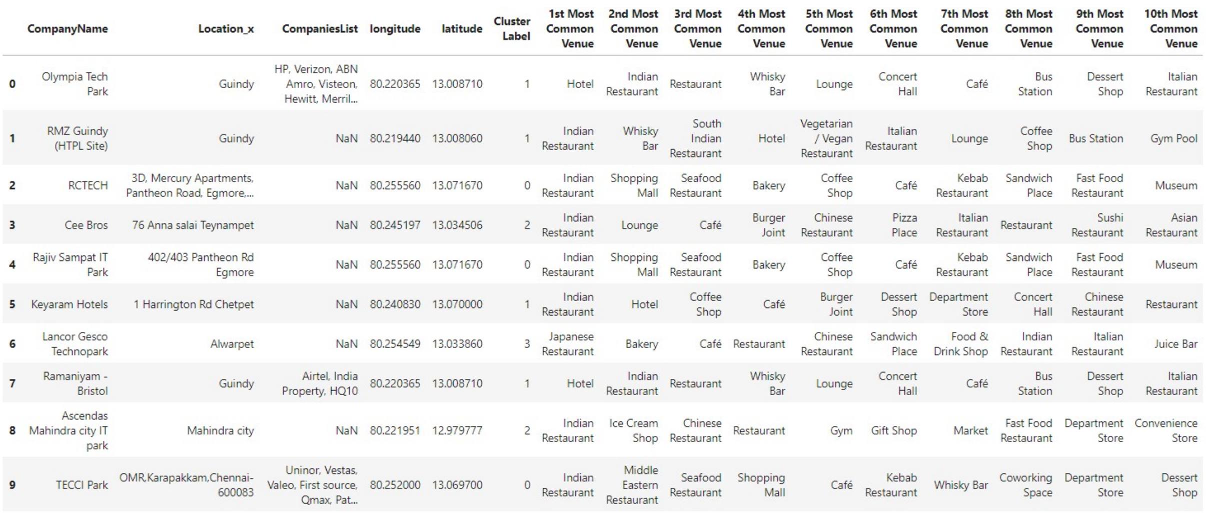


```
from sklearn.cluster import KMeans

chn_location_to_compare = chennai_grouped[chennai_grouped['Location'].isin(chn_top_10_location['Location'].values)]

chn_clustered = chn_location_to_compare.drop('Location', 1)

kmeans = KMeans(n_clusters=4, random_state=0).fit(chn_clustered)

print ("Check the 4 Cluster labels :",  kmeans.labels_[0:10])
```

```
Check the 4 Cluster labels : [2 2 1 3 1 0 1 0 1 0]
```



```
final_df = venues_sorted[venues_sorted['Location'].isin(chn_top_10_location['Location'].values)]

final_df.insert(1, 'Cluster Label', kmeans.labels_)

final_df = pd.merge(chennai_df, final_df, left_on='CompanyName', right_on='Location', how='inner')

final_df= final_df.drop(['Location_y'], axis=1)

final_df
```



	CompanyName	Location_x	CompaniesList	longitude	latitude	Cluster Label	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	Olympia Tech Park	Guindy	HP, Verizon, ABN Amro, Visteon, Hewitt, Merril...	80.220365	13.008710	1	Hotel	Indian Restaurant	Restaurant	Whisky Bar	Lounge	Concert Hall	Café	Bus Station	Dessert Shop	Italian Restaurant
1	RMZ Guindy (HTPL Site)	Guindy	NaN	80.219440	13.008060	1	Indian Restaurant	Whisky Bar	South Indian Restaurant	Hotel	Vegetarian / Vegan Restaurant	Italian Restaurant	Lounge	Coffee Shop	Bus Station	Gym Pool
2	RCTECH	3D, Mercury Apartments, Pantheon Road, Egmore,...	NaN	80.255560	13.071670	0	Indian Restaurant	Shopping Mall	Seafood Restaurant	Bakery	Coffee Shop	Café	Kebab Restaurant	Sandwich Place	Fast Food Restaurant	Museum
3	Cee Bros	76 Anna salai Teynampet	NaN	80.245197	13.034506	2	Indian Restaurant	Lounge	Café	Burger Joint	Chinese Restaurant	Pizza Place	Italian Restaurant	Restaurant	Sushi Restaurant	Asian Restaurant
4	Rajiv Sampat IT Park	402/403 Pantheon Rd Egmore	NaN	80.255560	13.071670	0	Indian Restaurant	Shopping Mall	Seafood Restaurant	Bakery	Coffee Shop	Café	Kebab Restaurant	Sandwich Place	Fast Food Restaurant	Museum
5	Keyaram Hotels	1 Harrington Rd Chetpet	NaN	80.240830	13.070000	1	Indian Restaurant	Hotel	Coffee Shop	Café	Burger Joint	Dessert Shop	Department Store	Concert Hall	Chinese Restaurant	Restaurant
6	Lancor Gesco Technopark	Alwarpet	NaN	80.254549	13.033860	3	Japanese Restaurant	Bakery	Café	Restaurant	Chinese Restaurant	Sandwich Place	Food & Drink Shop	Indian Restaurant	Italian Restaurant	Juice Bar
7	Ramaniyam - Bristol	Guindy	Airtel, India Property, HQ10	80.220365	13.008710	1	Hotel	Indian Restaurant	Restaurant	Whisky Bar	Lounge	Concert Hall	Café	Bus Station	Dessert Shop	Italian Restaurant
8	Ascendas Mahindra city IT park	Mahindra city	NaN	80.221951	12.979777	2	Indian Restaurant	Ice Cream Shop	Chinese Restaurant	Restaurant	Gym	Gift Shop	Market	Fast Food Restaurant	Department Store	Convenience Store
9	TECCI Park	OMR,Karapakkam,Chennai-600083	Uninor, Vestas, Valeo, First source, Qmax, Pat...	80.252000	13.069700	0	Indian Restaurant	Middle Eastern Restaurant	Seafood Restaurant	Shopping Mall	Café	Kebab Restaurant	Whisky Bar	Coworking Space	Department Store	Dessert Shop

5. Result and Discussion

The Data exploration mostly concentrated to analysis of Restaurants near IT HUBS. The below list summaries our findings.

- Indian Restaurants, Coffee Shop and Bakeries are commonly found near all the IT HUBS of Chennai.
- We observed that Ramaniyam - Bristol, Olympia Tech Park, Ascendas Mahindra City IP Park and CEE Bros were surrounded by more number of restaurants.
- Keyaram Hotels, RMZ Guindy were surrounded by least number of restaurants.
- My analysis is based on only Top 10 IT HUBS in Chennai that we categorized the location into 4 Clusters in that we consider Lancor Gesco IT Technopark is in separate Cluster.

6. Conclusion

I've made use of some frequently used Python libraries to scrap web-data, use Foursquare API to explore the Major IT HUBS in Chennai the results of segmentation of Location using Folium Map.

Finally, since my analysis were mostly concentrated on the possibilities of opening a restaurants targeting the huge pool of office workers, and also as a resident of the city. Especially cafe, bars, pubs as most frequent venues around all the IT HUBS. As per my analysis i have concluded that Loncor Gesco IT Technopark in Alwarpet is the place in seperate cluster. Hopefully, this kind of analysis will provide you initial guidance to take more real-life challenges using data-science.

7. Document Links:

CSV Files

https://github.com/srinivasanbragadeesan/prjdatascience/blob/master/chennai_companies.csv

https://github.com/srinivasanbragadeesan/prjdatascience/blob/master/chn_companies_coordinates.csv

Jupyter Notebook

https://github.com/srinivasanbragadeesan/prjdatascience/blob/master/Chennai-IT-Parks-Restaurant.ipynb