IBM DATA SCIENCE COURSE

APPLIED DATA SCIENCE CAPSTONE FINAL REPORT

Topic: Using K-mean Clustering to Support decision making for finding the best place for living and opening a coffee shop.

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I. INTRODUCTION

1.1 Background:

Ho Chi Minh City, Vietnam also commonly referred to as Saigon is the largest city of Vietnam. According to the 2019 census, Ho Chi Minh City has a population of over 8.9 million within city proper and over 21 million within the metropolitan area. Ho Chi Minh City is the economic and financial Centre of Vietnam, and plays an important role in the country's culture and scientific developments. Ho Chi Minh City is an emerging international tourist destination, with popular landmarks related to the remnants of its colonial past showcased through colonial architecture [wikipedia]. With the advantage of geography location as well as the development of economic and travelling, Ho Chi Minh city is one of the best place for foreigners for living and investments.

1.2 Problem

Tom is one of my best foreigner friend who wants to move to Ho Chi Minh City for living the retired life and also want to open a Café shop in Ho Chi Minh to earn the living cost. Because he just came to Vietnam several times, so he does not know much about Ho Chi Minh City life and environment. He knocks my door to ask about Ho Chi Minh City and help him to buy house which has the same convenient place around as his current house in his country. He also asked me to collect the data of existing coffee shop in Ho Chi Minh city which can help him to prevent opening the coffee shop at which has many coffee shop nearby to reduce the competition.

The business problem:

[1] Find the best place which has the same convenient place as his current house in his country to buy a house

[2] collect the data of existing coffee shop in Ho Chi Minh city which can help him to prevent opening the coffee shop at which has many coffee shop nearby.

II. DATA PREPROCESSING

2.1 Import necessary libraries

1. Importing necessary Libraries

In [1]:
```
import numpy as np # library to handle data in a vectorized manner

import pandas as pd # library for data analsysis
pd.set_option('display.max_columns', None)
pd.set_option('display.max_rows', None)

import json # library to handle JSON files

#!conda install -c conda-forge geopy --yes # uncomment this line if you haven't completed the Foursquare API lab
from geopy.geocoders import Nominatim # convert an address into latitude and longitude values

import requests # library to handle requests
from pandas.io.json import json_normalize # tranform JSON file into a pandas dataframe

# Matplotlib and associated plotting modules
import matplotlib.cm as cm
import matplotlib.colors as colors

# import k-means from clustering stage
from sklearn.cluster import KMeans

#!conda install -c conda-forge folium=0.5.0 --yes # uncomment this line if you haven't completed the Foursquare API lab
import folium # map rendering library
from geopy.geocoders import Nominatim # convert an address into latitude and longitude values
print('Libraries imported.')
```

```
Libraries imported.
```

2.2 Data Acquisition

The data is collected at an open source in Github which has the information of the ward and district of Ho Chi Minh City.

2. Download and Explore Dataset

In [3]:
```
df = pd.read_excel ('/content/drive/My Drive/ST/DS/[1] PROJECT/[3] IBM FINAL PROJECT/HoChiMinhCity.xlsx')
df.head()
```

Out[3]:

	Unnamed: 0	ward	district	area
0	9214	Phường Tân Định	Quận 1	Phường Tân Định, Quận 1
1	9215	Phường Đa Kao	Quận 1	Phường Đa Kao, Quận 1
2	9216	Phường Bến Nghé	Quận 1	Phường Bến Nghé, Quận 1
3	9217	Phường Bến Thành	Quận 1	Phường Bến Thành, Quận 1
4	9218	Phường Nguyễn Thái Bình	Quận 1	Phường Nguyễn Thái Bình, Quận 1

2.3 Adding The Latitude and Longitude by call Google Geocode API

In this section, I would like to use some supported code for data processing such as Adding the Latitude and Longitude by call Google Geocode API.

a. Find the geographical coordinate of Ho Chi Minh city

Find the geograpical coordinate of Ho Chi Minh city

In [2]:
```
address = 'Ho Chi Minh, VN'
geolocator = Nominatim(user_agent="HCM")
location = geolocator.geocode(address)
latitude = location.latitude
longitude = location.longitude
print('The geograpical coordinate of Ho Chi Minh are {}, {}.'.format(latitude, longitude))
HCMlat = latitude
HCMlong = longitude
```

```
The geograpical coordinate of Ho Chi Minh are 10.7758439, 106.7017555.
```

b. Find the geographical coordinate of each ward in Ho Chi Minh city

In [4]:
```
lat = []
lon = []
for i in range(len(df)) :
    s = df.iloc[i, 2] + ", Hồ Chí Minh"
    address = s
    geolocator = Nominatim(user_agent="HCM")
    location = geolocator.geocode(address)
    latitude = location.latitude
    longitude = location.longitude
    lat.append(latitude)
    lon.append(longitude)
df['Lat'] = lat
df['lon'] = lon
```

2.4 Use the Foursquare API to explore the neighborhoods

a. Define Foursquare Credentials and Version

In [7]:
```
CLIENT_ID = '4UFDWNUONKDOUURIIQVJDH2FJBOQKVS1YSFSUT4KKU1XKXDS' # your Foursquare ID
CLIENT_SECRET = '3UKE1TKWPRSD1LHPQ0CLFRZ0MS3C14KXOZ0QQGRO1NCH0EHA' # 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: 4UFDWNUONKDOUURIIQVJDH2FJBOQKVS1YSFSUT4KKU1XKXDS
CLIENT_SECRET:3UKE1TKWPRSD1LHPQ0CLFRZ0MS3C14KXOZ0QQGRO1NCH0EHA
```

b. Now, let's get the top 100 venues that are in Ho Chi Minh City within a radius of 500 meters.

In [8]:
```
# defining radius and limit of venues to get
radius=500
LIMIT=100
```

In [9]:
```
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={}'.forr
            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 = ['Neighborhood',
```

2.5 See the top 5 venues nearby HCM

In [13]:
```
# one hot encoding
HCM_onehot = pd.get_dummies(HCM_venues[['Venue Category']], prefix="", prefix_sep="")

# add neighborhood column back to dataframe
HCM_onehot['Neighborhood'] = HCM_venues['Neighborhood']

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

HCM_onehot.head()
```

```
----Phường 1, Quận 10----
                   venue  freq
0                  Café  0.44
1  Vietnamese Restaurant  0.22
2      Hotpot Restaurant  0.04
3              Bookstore  0.04
4                   Spa  0.04


----Phường 1, Quận 11----
                venue  freq
0               Café  0.75
1        Pizza Place  0.25
2  American Restaurant  0.00
3           Multiplex  0.00
4           Rock Club  0.00


----Phường 1, Quận 3----
```

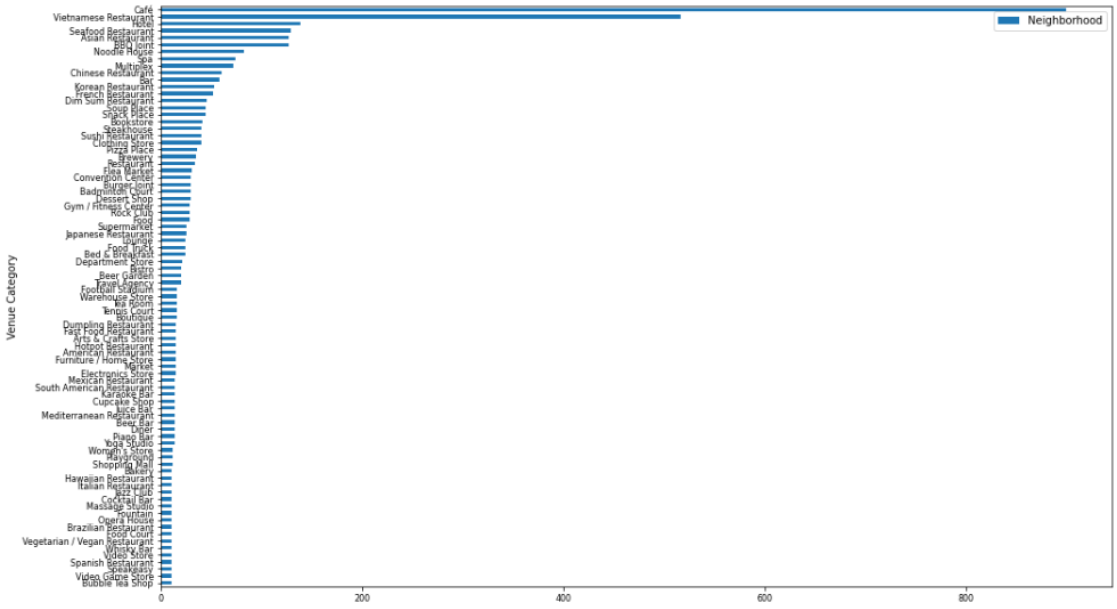
2.6 Exploratory Data Analysis: Find the most Venue Category in HoCHiMinh City

In [16]:
```
HCM_Plot = HCM_venues.groupby('Venue Category').count()
HCM_Plot.to_csv('X.csv')
HCM_Plot = pd.read_csv('X.csv')
HCM_Plot.head()
```

Out[16]:

	Venue Category	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude
0	American Restaurant	15	15	15	15	15	15
1	Arts & Crafts Store	15	15	15	15	15	15
2	Asian Restaurant	127	127	127	127	127	127
3	BBQ Joint	127	127	127	127	127	127
4	Badminton Court	30	30	30	30	30	30

In [44]:
```
import matplotlib.pyplot as plt
HCM_Plot.sort_values('Neighborhood',inplace=True)
HCM_Plot.plot.barh(x='Venue Category', y='Neighborhood', fontsize = 8, figsize=(16, 10))
plt.savefig("HCM_Plot.png")
```



III. METHODOLOGY

3.1 Clustering the venue in HCM city

a. Creating the new dataframe and display the top 10 venues for each neighborhood

In [ ]:
```
num_top_venues = 10

indicators = ['st', 'nd', 'rd']

# create columns according to number of top venues
columns = ['Neighborhood']
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['Neighborhood'] = HCM_grouped['Neighborhood']

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

neighborhoods_venues_sorted.head()
```

Out[ ]:

	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	Phường 1, Quận 10	Café	Vietnamese Restaurant	Sushi Restaurant	Korean Restaurant	Dessert Shop	Multiplex	Spa	Bookstore	Steakhouse	Hotpot Restaurant
1	Phường 1, Quận 11	Café	Pizza Place	Yoga Studio	Fast Food Restaurant	Department Store	Dessert Shop	Dim Sum Restaurant	Diner	Dumpling Restaurant	Electronics Store
2	Phường 1, Quận 3	Café	Vietnamese Restaurant	BBQ Joint	French Restaurant	Asian Restaurant	Korean Restaurant	Seafood Restaurant	Rock Club	Bar	Noodle House
3	Phường 1, Quận 4	Seafood Restaurant	Snack Place	Vietnamese Restaurant	Japanese Restaurant	Furniture / Home Store	BBQ Joint	Fast Food Restaurant	Cupcake Shop	Department Store	Dessert Shop
4	Phường 1, Quận 5	Chinese Restaurant	Vietnamese Restaurant	Noodle House	Dim Sum Restaurant	Café	Dessert Shop	Brewery	Hotel	Asian Restaurant	BBQ Joint

b. Cluster Neighborhoods

Set k_clusters = 5, using Scikitlearn Library to solve Clustering problems

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

HCM_grouped_clustering = HCM_grouped.drop('Neighborhood', 1)

# run k-means clustering
kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(HCM_grouped_clustering)

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

Out[ ]:
```
array([1, 1, 2, 0, 2, 2, 2, 3, 4, 1], dtype=int32)
```

c. Let's create a new dataframe that includes the cluster as well as the top 10 venues for each neighborhood.

Let's create a new dataframe that includes the cluster as well as the top 10 venues for each neighborhood.

In [ ]:
```
# add clustering labels
neighborhoods_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)

HCM_merged = df

# merge toronto_grouped with toronto_data to add latitude/longitude for each neighborhood
HCM_merged = HCM_merged.join(neighborhoods_venues_sorted.set_index('Neighborhood'), on='area')

HCM_merged.head() # check the last columns!
```

d. Finally, let's visualize the resulting clusters

Finally, let's visualize the resulting clusters

In [ ]:
```
# create map
map_clusters = folium.Map(location=[HCMlat, HCMlong], 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(HCM_merged['Lat'], HCM_merged['lon'], HCM_merged['area'], HCM_merged['Cluster']):
    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
```

Out[ ]: Make this Notebook Trusted to load map: File -> Trust Notebook

e. Explore the Cafe shop in HCM City

Make the report which area has the most café shop in HCM city

Make a dataframe of Coffee shop of HCM city

In [ ]:
```
HCM_cafe = HCM_venues.loc[HCM_venues['Venue Category'] == 'Café']
```

Make the report which area has the most café shop in HCM city

In [ ]:
```
HCM_cf = HCM_cafe.groupby('Neighborhood').count()
HCM_cf.sort_values('Venue',inplace=True, ascending=False)
HCM_cf.to_csv('X.csv')
HCM_cf = pd.read_csv('X.csv')
HCM_cf = HCM_cf.drop(['Neighborhood Latitude', 'Neighborhood Longitude', 'Venue Latitude', 'Venue Longitude', 'Venue Category'], axis=1)
HCM_cf= HCM_cf.rename(columns={'Venue': 'Total'})
HCM_cf.head()
```

Out[ ]:

	Neighborhood	Total
0	Phường Đa Kao, Quận 1	16
1	Phường Cầu Ông Lãnh, Quận 1	16
2	Phường Bến Thành, Quận 1	16
3	Phường Cô Giang, Quận 1	16
4	Phường Cầu Kho, Quận 1	16

Creating the map which illustrate the existing Café shop in Ho Chi Minh City

Creating the map which illustrate the existing Café shop in Ho Chi Minh City

In [ ]:
```
# create map of Toronto using latitude and longitude values
map_HCM = folium.Map(location=[HCMlat, HCMlong], zoom_start=12)

# add markers to map
for Lat, lon, Neighborhood in zip(HCM_cafe['Venue Latitude'], HCM_cafe['Venue Longitude'], HCM_cafe['Neighborhood']):
    label = '{}'.format(Neighborhood)
    label = folium.Popup(label, parse_html=True)
    folium.CircleMarker(
        [Lat, lon],
        radius=5,
        popup="O Day Roi!",
        color='blue',
        fill=True,
        fill_color='#3186cc',
        fill_opacity=0.7,
        parse_html=False).add_to(map_HCM)

map_HCM
```

Out[ ]: Make this Notebook Trusted to load map: File -> Trust Notebook

IV. RESULTS

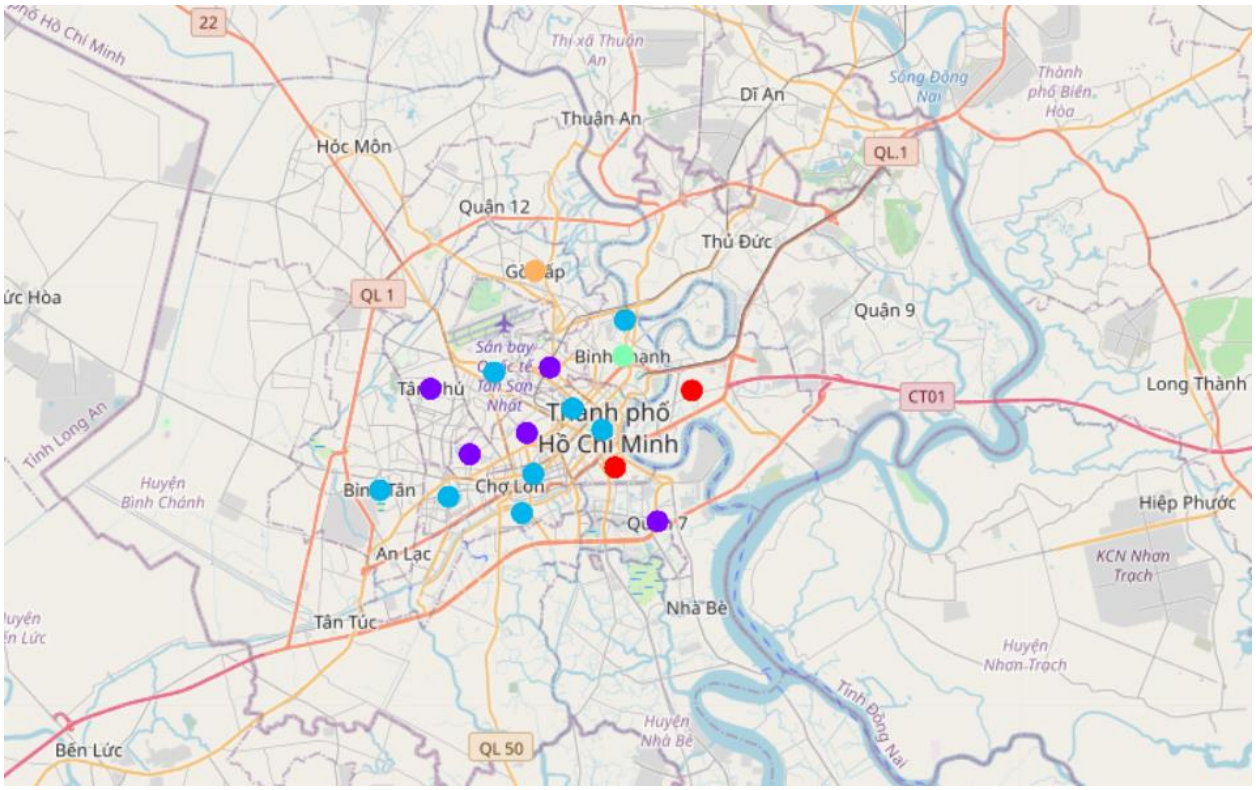
4.1 Top 10 venues for each neighborhood.

Let's create a new dataframe that includes the cluster as well as the top 10 venues for each neighborhood.

```
[ ] # add clustering labels
    neighborhoods_venues_sorted.insert(0, 'Cluster Labels', kmeans.labels_)

    HCM_merged = df

    # merge toronto_grouped with toronto_data to add latitude/longitude for each neighborhood
    HCM_merged = HCM_merged.join(neighborhoods_venues_sorted.set_index('Neighborhood'), on='area')

    HCM_merged.head() # check the last columns!
```

	Unnamed: 0	ward	district	area	Lat	lon	Cluster Labels	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	9214	Phường Tân Định	Quận 1	Phường Tân Định, Quận 1	10.77454	106.699184	2.0	Café	Vietnamese Restaurant	Hotel	Clothing Store	Spa	Asian Restaurant	Burger Joint	BBQ Joint	Multiplex	Bar
1	9215	Phường Đa Kao	Quận 1	Phường Đa Kao, Quận 1	10.77454	106.699184	2.0	Café	Vietnamese Restaurant	Hotel	Clothing Store	Spa	Asian Restaurant	Burger Joint	BBQ Joint	Multiplex	Bar
2	9216	Phường Bến Nghé	Quận 1	Phường Bến Nghé, Quận 1	10.77454	106.699184	2.0	Café	Vietnamese Restaurant	Hotel	Clothing Store	Spa	Asian Restaurant	Burger Joint	BBQ Joint	Multiplex	Bar
3	9217	Phường Bến Thành	Quận 1	Phường Bến Thành, Quận 1	10.77454	106.699184	2.0	Café	Vietnamese Restaurant	Hotel	Clothing Store	Spa	Asian Restaurant	Burger Joint	BBQ Joint	Multiplex	Bar
4	9218	Phường Nguyễn Thái Bình	Quận 1	Phường Nguyễn Thái Bình, Quận 1	10.77454	106.699184	2.0	Café	Vietnamese Restaurant	Hotel	Clothing Store	Spa	Asian Restaurant	Burger Joint	BBQ Joint	Multiplex	Bar

4.2 Visualization of the resulting clusters



Examine Cluster 1:

```
#Cluster_1
Cluster_1 = HCM_merged.loc[HCM_merged['Cluster'] == 0,HCM_merged.columns[[1] + list(range(3, HCM_merged.shape[1]))]]
Cluster_1.head()
```

	ward	area	Lat	lon	Cluster	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
123	Phường Thảo Điền	Phường Thảo Điền, Quận 2	10.791116	106.736729	0	Seafood Restaurant	Bookstore	Department Store	Flea Market	French Restaurant	Electronics Store	Cupcake Shop	Gym / Fitness Center	Dessert Shop	Dim Sum Restaurant
124	Phường An Phú	Phường An Phú, Quận 2	10.791116	106.736729	0	Seafood Restaurant	Bookstore	Department Store	Flea Market	French Restaurant	Electronics Store	Cupcake Shop	Gym / Fitness Center	Dessert Shop	Dim Sum Restaurant
125	Phường Bình An	Phường Bình An, Quận 2	10.791116	106.736729	0	Seafood Restaurant	Bookstore	Department Store	Flea Market	French Restaurant	Electronics Store	Cupcake Shop	Gym / Fitness Center	Dessert Shop	Dim Sum Restaurant
126	Phường Bình Trưng Đông	Phường Bình Trưng Đông, Quận 2	10.791116	106.736729	0	Seafood Restaurant	Bookstore	Department Store	Flea Market	French Restaurant	Electronics Store	Cupcake Shop	Gym / Fitness Center	Dessert Shop	Dim Sum Restaurant
127	Phường Bình Trưng Tây	Phường Bình Trưng Tây, Quận 2	10.791116	106.736729	0	Seafood Restaurant	Bookstore	Department Store	Flea Market	French Restaurant	Electronics Store	Cupcake Shop	Gym / Fitness Center	Dessert Shop	Dim Sum Restaurant

Examine Cluster 2:

```
#Cluster_2
Cluster_2 = HCM_merged.loc[HCM_merged['Cluster'] == 1,HCM_merged.columns[[1] + list(range(3, HCM_merged.shape[1]))]]
Cluster_2.head()
```

	ward	area	Lat	lon	Cluster	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
97	Phường Tân Sơn Nhì	Phường Tân Sơn Nhì, Quận Tân Phú	10.79164	106.627302	1	Café	Vietnamese Restaurant	BBQ Joint	Yoga Studio	Flea Market	Department Store	Dessert Shop	Dim Sum Restaurant	Diner	Dumpling Restaurant
98	Phường Tây Thạnh	Phường Tây Thạnh, Quận Tân Phú	10.79164	106.627302	1	Café	Vietnamese Restaurant	BBQ Joint	Yoga Studio	Flea Market	Department Store	Dessert Shop	Dim Sum Restaurant	Diner	Dumpling Restaurant
99	Phường Sơn Kỳ	Phường Sơn Kỳ, Quận Tân Phú	10.79164	106.627302	1	Café	Vietnamese Restaurant	BBQ Joint	Yoga Studio	Flea Market	Department Store	Dessert Shop	Dim Sum Restaurant	Diner	Dumpling Restaurant
100	Phường Tân Quý	Phường Tân Quý, Quận Tân Phú	10.79164	106.627302	1	Café	Vietnamese Restaurant	BBQ Joint	Yoga Studio	Flea Market	Department Store	Dessert Shop	Dim Sum Restaurant	Diner	Dumpling Restaurant
101	Phường Tân Thành	Phường Tân Thành, Quận Tân Phú	10.79164	106.627302	1	Café	Vietnamese Restaurant	BBQ Joint	Yoga Studio	Flea Market	Department Store	Dessert Shop	Dim Sum Restaurant	Diner	Dumpling Restaurant

Examine Cluster 3:

```
#Cluster_3
Cluster_3 = HCM_merged.loc[HCM_merged['Cluster'] == 2,HCM_merged.columns[[1] + list(range(3, HCM_merged.shape[1]))]]
Cluster_3.head()
```

	ward	area	Lat	lon	Cluster	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	Phường Tân Định	Phường Tân Định, Quận 1	10.77454	106.699184	2	Café	Vietnamese Restaurant	Hotel	Clothing Store	Spa	Asian Restaurant	Burger Joint	BBQ Joint	Multiplex	Bar
1	Phường Đa Kao	Phường Đa Kao, Quận 1	10.77454	106.699184	2	Café	Vietnamese Restaurant	Hotel	Clothing Store	Spa	Asian Restaurant	Burger Joint	BBQ Joint	Multiplex	Bar
2	Phường Bến Nghé	Phường Bến Nghé, Quận 1	10.77454	106.699184	2	Café	Vietnamese Restaurant	Hotel	Clothing Store	Spa	Asian Restaurant	Burger Joint	BBQ Joint	Multiplex	Bar
3	Phường Bến Thành	Phường Bến Thành, Quận 1	10.77454	106.699184	2	Café	Vietnamese Restaurant	Hotel	Clothing Store	Spa	Asian Restaurant	Burger Joint	BBQ Joint	Multiplex	Bar
4	Phường Nguyễn Thái Bình	Phường Nguyễn Thái Bình, Quận 1	10.77454	106.699184	2	Café	Vietnamese Restaurant	Hotel	Clothing Store	Spa	Asian Restaurant	Burger Joint	BBQ Joint	Multiplex	Bar

Examine Cluster 4:

```
#Cluster_4
Cluster_4 = HCM_merged.loc[HCM_merged['Cluster'] == 3,HCM_merged.columns[[1] + list(range(3, HCM_merged.shape[1]))]]
Cluster_4.head()
```

	ward	area	Lat	lon	Cluster	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
62	Phường 13	Phường 13, Quận Bình Thạnh	10.804659	106.707848	3	Soup Place	Travel Agency	Yoga Studio	Electronics Store	Convention Center	Cupcake Shop	Department Store	Dessert Shop	Dim Sum Restaurant	Diner
63	Phường 11	Phường 11, Quận Bình Thạnh	10.804659	106.707848	3	Soup Place	Travel Agency	Yoga Studio	Electronics Store	Convention Center	Cupcake Shop	Department Store	Dessert Shop	Dim Sum Restaurant	Diner
64	Phường 27	Phường 27, Quận Bình Thạnh	10.804659	106.707848	3	Soup Place	Travel Agency	Yoga Studio	Electronics Store	Convention Center	Cupcake Shop	Department Store	Dessert Shop	Dim Sum Restaurant	Diner
65	Phường 26	Phường 26, Quận Bình Thạnh	10.804659	106.707848	3	Soup Place	Travel Agency	Yoga Studio	Electronics Store	Convention Center	Cupcake Shop	Department Store	Dessert Shop	Dim Sum Restaurant	Diner
66	Phường 12	Phường 12, Quận Bình Thạnh	10.804659	106.707848	3	Soup Place	Travel Agency	Yoga Studio	Electronics Store	Convention Center	Cupcake Shop	Department Store	Dessert Shop	Dim Sum Restaurant	Diner

```
#Cluster 5
```

Examine Cluster 5:

```
#Cluster_5
Cluster_5 = HCM_merged.loc[HCM_merged['Cluster'] == 4,HCM_merged.columns[[1] + list(range(3, HCM_merged.shape[1]))]]
Cluster_5.head()
```

	ward	area	Lat	lon	Cluster	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
46	Phường 15	Phường 15, Quận Gò Vấp	10.84015	106.671083	4	Warehouse Store	Boutique	Tea Room	Yoga Studio	Fast Food Restaurant	Cupcake Shop	Department Store	Dessert Shop	Dim Sum Restaurant	Diner
47	Phường 13	Phường 13, Quận Gò Vấp	10.84015	106.671083	4	Warehouse Store	Boutique	Tea Room	Yoga Studio	Fast Food Restaurant	Cupcake Shop	Department Store	Dessert Shop	Dim Sum Restaurant	Diner
48	Phường 17	Phường 17, Quận Gò Vấp	10.84015	106.671083	4	Warehouse Store	Boutique	Tea Room	Yoga Studio	Fast Food Restaurant	Cupcake Shop	Department Store	Dessert Shop	Dim Sum Restaurant	Diner
49	Phường 6	Phường 6, Quận Gò Vấp	10.84015	106.671083	4	Warehouse Store	Boutique	Tea Room	Yoga Studio	Fast Food Restaurant	Cupcake Shop	Department Store	Dessert Shop	Dim Sum Restaurant	Diner
50	Phường 16	Phường 16, Quận Gò Vấp	10.84015	106.671083	4	Warehouse Store	Boutique	Tea Room	Yoga Studio	Fast Food Restaurant	Cupcake Shop	Department Store	Dessert Shop	Dim Sum Restaurant	Diner

4.3 Explore the Cafe shop in HCM City

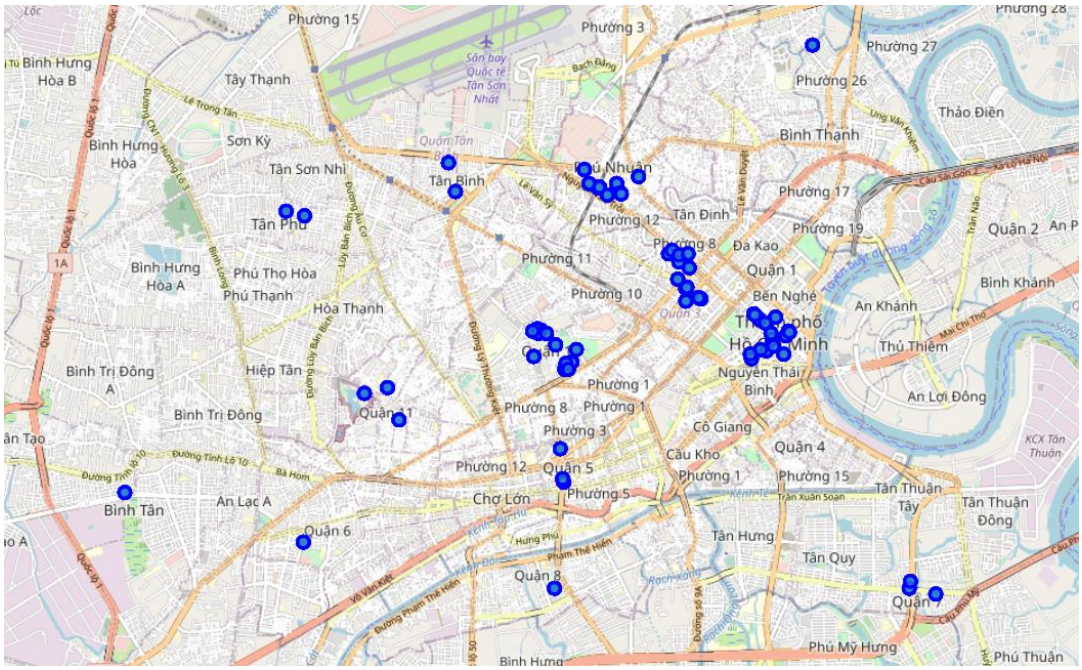
a. Make the report which area has the most café shop in HCM city

Make the report which area has the most café shop in HCM city

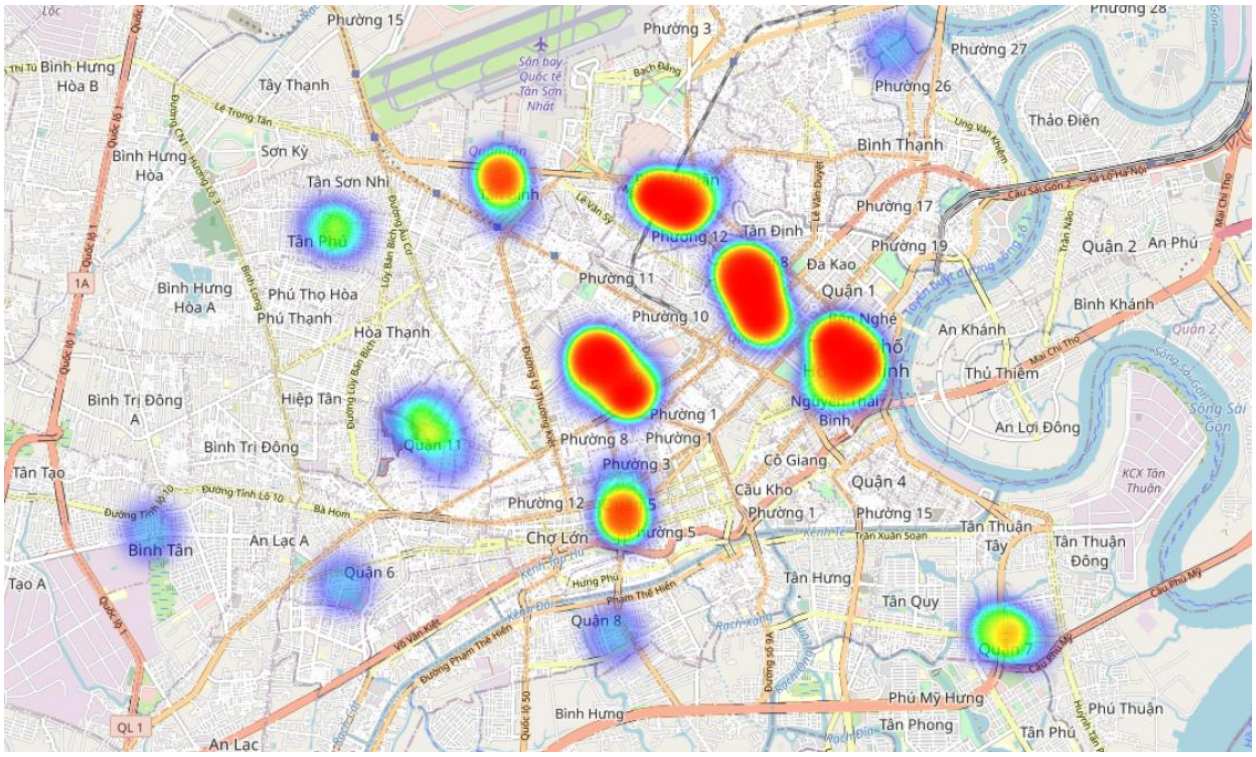
```
HCM_cf = HCM_cafe.groupby('Neighborhood').count()
HCM_cf.sort_values('Venue',inplace=True, ascending=False)
HCM_cf.to_csv('X.csv')
HCM_cf = pd.read_csv('X.csv')
HCM_cf = HCM_cf.drop(['Neighborhood Latitude', 'Neighborhood Longitude', 'Venue Latitude', 'Venue Longitude', 'Venue Category'], axis=1)
HCM_cf= HCM_cf.rename(columns={'Venue': 'Total'})
HCM_cf.head()
```

	Neighborhood	Total
0	Phường Đa Kao, Quận 1	16
1	Phường Cầu Ông Lãnh, Quận 1	16
2	Phường Bến Thành, Quận 1	16
3	Phường Cô Giang, Quận 1	16
4	Phường Cầu Kho, Quận 1	16

b. The map which illustrate the existing Café shop in Ho Chi Minh City



c. Creating the heat map of Café shop



This is some valuable information that Tom can make references for choosing the best place for living and opening the Café shop.

V. CONCLUSION

In this Project, I already helped Tom to solve his problems such as using K-mean Clustering to find some similar place as his current house for Tom to buy a new house in Ho Chi Minh City. I also used the EDA to explore which is the most venue in Ho Chi Minh city. I tried to find the best place for Tom to open the Coffee Shop in Ho Chi Minh City. The results are valuable references for Tom to consider. I hope that based on found insights, Tom will make a bestter decision in the near future.

REFERENCE:

[1] Capstone Project - The Battle of Neighborhoods

https://dev.to/chijade/capstone-project-the-battle-of-neighborhoods-4ha3

[2] Capstone Project — Battle of Neighborhoods in Dong Da District, Ha Noi

https://medium.com/@nguynvnc_45259/capstone-project-battle-of-neighborhoods-in-dong-da-district-ha-noi-66892ec0c9d1

[3] Battle of Neighborhoods in Ho Chi Minh City

https://medium.com/@thanhttrn/battle-of-neighborhoods-in-hochiminh-city-ae85173e61