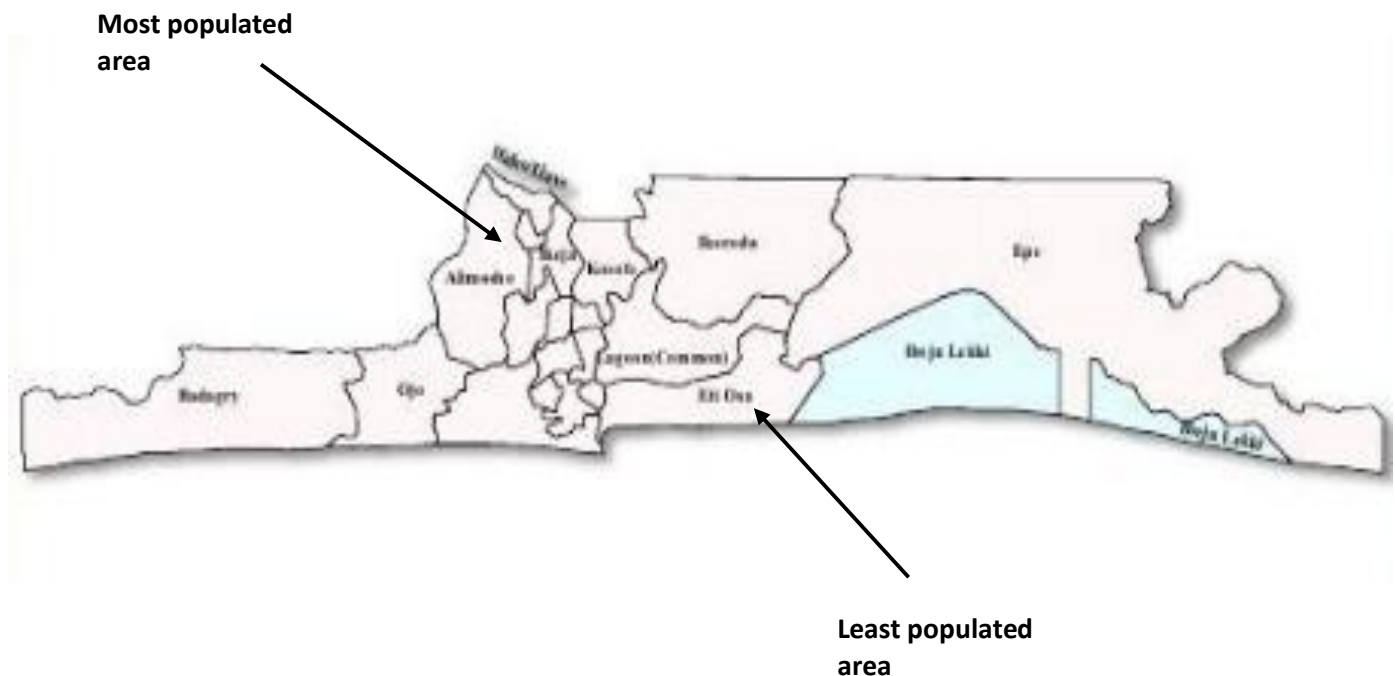# INTRODUCTION/BUSINESS PROBLEM

Lagos state is located in the southwestern geopolitical zone of Nigeria. It is the most economically important state of the country and the nation's largest urban area. It is a major financial center and would be the fifth largest economy in Africa, if it were a country.

It has the highest population density of Nigeria's states and as at 2016, more than 12 million people are living in Lagos State. It is a city with high population and population density which is very viable for business opportunities.

Mr. Brown is an investor looking to invest in the food business in Lagos State, and he is looking a location to start his business. My Job as a Data Scientist is to solve Mr. Brown's Location problem by getting a location with high Population Density, Economic Strength as well as few numbers of restaurants.

This will solve the demand/supply problem of the area, as well as give Mr. Brown a good location to start his restaurant business. Furthermore, there are actual significant locations in Lagos that are very important to his restaurant business in terms of the Population of the area i.e. Local Government area and the Economy Viability of the area but there is need to be specific and be definite about the particular location.

Map of Lagos State showing all the Local Government Areas

Most populated area

Least populated area

Victoria Island (VI) is an affluent area that encompasses a former island of Lagos State neighboring Lagos Island, Ikoyi and the Lekki Peninsula by the Lagos Lagoon. It is the main business and financial center of Lagos State. The town and island lie within the boundaries of the Eti-Osa Local Government Area (LGA).

Alimosho is a Local Government Area in Lagos State. It is the largest and most populated local government area in Lagos, with 1,817,200 inhabitants, however, the Lagos State Government disputes the official figures and claims a population within the Local Government Area of more than 2 million residents. It has now been subdivided between several Local Community Development Areas (LCDA).

DATA DESCRIPTION

To consider the problem, the following data was utilized:

1. I found the population data of all the Local Government Areas in Lagos State via https://www.citypopulation.de/php/nigeria-admin.php?adm1id=NGA025

2. I used the Foursquare API to get restaurants business names located in Lagos State.

METHODOLOGY

The Methodology section describes the main components of my analysis system.
The Methodology section comprises three stages:

1. Collecting the Inspection Data
2. Exploring and Understanding the Data
3. Data Visualization

1. COLLECT INSPECTION DATA

The Restaurant Data was collected utilizing the Foursquare API and the Lagos State's population data from a website

This is the Restaurant Data

```
']: venues = results['response']['venues']

    dataframe = json_normalize(venues)
    dataframe.head()

    /home/jupyterlab/conda/envs/python/lib/python3.6/site-packages/ipykernel_launcher.py:3: FutureWarning: pandas.io.json.json_normalize is deprecated, use pandas.json_normaliz
    e instead
      This is separate from the ipykernel package so we can avoid doing imports until
```

	id	name	categories	referralId	hasPerk	location.address	location.lat	location.lng	location.labeledLatLngs	location.distance	location.cc	location.city
0	507444a1e4b0740da8b54064	MacBells Bar & Restaurant	[{'id': '4bf58dd8d48988d116941735', 'name': 'B...	v-1587502982	False	22 Yaya Abatan Street	6.453056	3.395833	[{'label': 'display', 'lat': 6.4530556, 'lng':...	288	NG	Ogba
1	4dade258f7b17488f4862317	Jevenik Restaurant	[{'id': '4bf58dd8d48988d1c8941735', 'name': 'A...	v-1587502982	False	14 Agoro Odiyan St	6.429070	3.419177	[{'label': 'display', 'lat': 6.429070138952921,...	4001	NG	Victoria Island
2	51ef0365e4b05e2658f4b565	Milano Restaurant	[{'id': '4bf58dd8d48988d110941735', 'name': 'I...	v-1587502982	False	52, Kofo Abayomi Street	6.434910	3.422778	[{'label': 'display', 'lat': 6.434910348217528,...	3877	NG	Victoria Island
3	52829c4a11d20800b639f33e	Soho Restaurant	[{'id': '4bf58dd8d48988d142941735', 'name': 'A...	v-1587502982	False	Plot 52 Kofo Abayomi Street, Victoria Island L...	6.435061	3.422925	[{'label': 'display', 'lat': 6.435060545319184,...	3881	NG	Victoria Island
4	4d4ef59b8af6721ecab41588	Ikoyi Club 44 Restaurant	[{'id': '4bf58dd8d48988d1c8941735', 'name': 'A...	v-1587502982	False	6 Ikoyi Club 1938 Road	6.451735	3.428198	[{'label': 'display', 'lat': 6.451735415348105,...	3781	NG	Lagos

This is Lagos State's population data

```
.7]: second_table = pd.read_csv("second_capstone_table.csv")
     second_table.head(10)
```

.7]:	restaurant local government	population of local government
0	Agege	635900
1	Eti-Osa	390800
2	Eti-Osa	390800
3	Eti-Osa	390800
4	Eti-Osa	390800
5	Eti-Osa	390800
6	Eti-Osa	390800
7	Eti-Osa	390800
8	Eti-Osa	390800
9	Apapa	307100

2. EXPLORING AND UNDERSTANDING DATA

Firstly, there is the foursquare data, this include all the trendy restaurants in Lagos State, this data was cleaned and unwanted columns were dropped. The data includes the name of the restaurant, the kind of restaurant it is, i.e. categories, the address which includes which particular part of the state the restaurant is located and the longitude and latitude of the restaurant.

The Restaurant data after cleaning

```
columns = ['address','labeledLatLngs', 'distance', 'cc', 'crossStreet', 'postalCode', 'id','neighborhood']
dataframe_filtered.drop(columns, inplace=True, axis=1)
dataframe_filtered.head(10)
```

	name	categories	lat	lng	city	state	country	formattedAddress
0	MacBells Bar & Restaurant	Bar	6.453056	3.395833	Ogba	Lagos	Nigeria	[22 Yaya Abatan Street, Ogba, Lagos, Nigeria]
1	Jevenik Restaurant	African Restaurant	6.429070	3.419177	Victoria Island	Lagos	Nigeria	[14 Agoro Odiyan St (Agoro Odiyan St.), Victor...
2	Milano Restaurant	Italian Restaurant	6.434910	3.422778	Victoria Island	Lagos	Nigeria	[52, Kofo Abayomi Street, Victoria Island 1000...
3	Soho Restaurant	Asian Restaurant	6.435061	3.422925	Victoria Island	Lagos	Nigeria	[Plot 52 Kofo Abayomi Street, Victoria Island ...
4	Ikoyi Club 44 Restaurant	African Restaurant	6.451735	3.428198	Lagos	Lagos	Nigeria	[6 Ikoyi Club 1938 Road (Eti Osa), Lagos, Lago...
5	Bogobiri Restaurant	None	6.441018	3.426033	Ikoyi	Lagos	Nigeria	[Maitama Sule, Awolowo, Ikoyi, Lagos, Nigeria]
6	Restaurant - Black Diamond	Restaurant	6.438603	3.439766	Lagos	Lagos	Nigeria	[25, Ozumba Mbadiwe St. (Victoria Island), Lag...
7	Double 4 Restaurant	None	6.449767	3.409165	Lagos	Lagos	Nigeria	[44 Awolowo Road (Ikoyi), Lagos, Lagos, Nigeria]
8	Oriental Garden Restaurant	Chinese Restaurant	6.436089	3.444142	Victoria Island	Lagos	Nigeria	[3rd Floor, Oriental Hotel (Ozumba Mbadiwe St...
9	COTECNA Restaurant	African Restaurant	6.439836	3.388853	Lagos	Lagos	Nigeria	[Apapa Quays (Apapa Wharf), Lagos, Lagos, Nige...

```
dataframe_filtered.rename(columns={'formattedAddress':'Address'}, inplace=True)
```

Secondly, the Lagos State's Population Data, this consists the population of every local government area in Lagos State as long as the name of each Local Government.

Both data was concatenated to form the new restaurant data which includes each restaurant details, as well as the details of the local government the restaurant is located

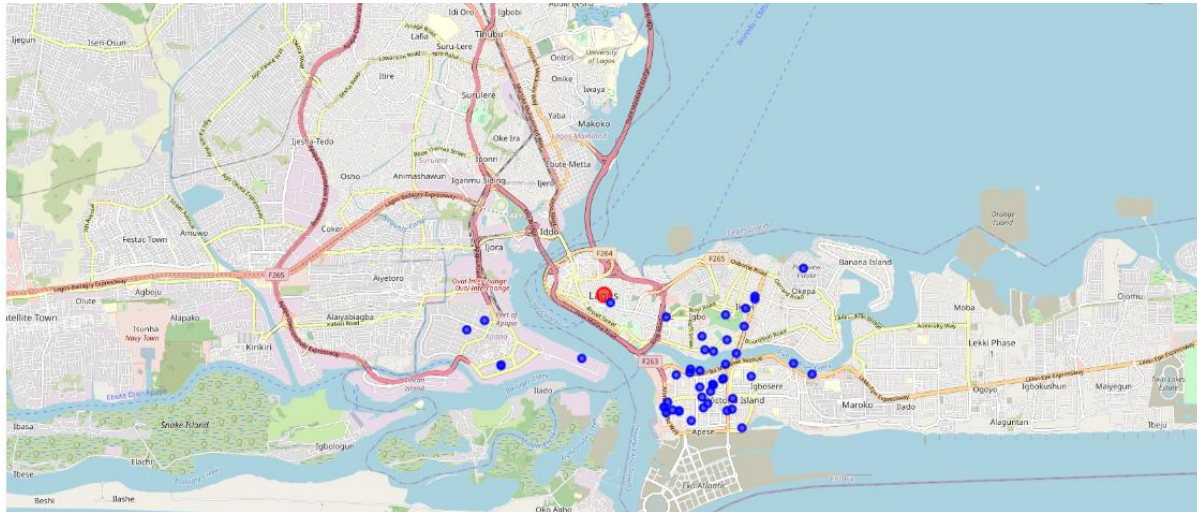*The new restaurant data after concatenating*

```
[18]: lagos_rest = pd.concat([dataframe_filtered.reset_index(drop=True), second_table.reset_index(drop=True)], axis=1)
      lagos_rest.head()
```

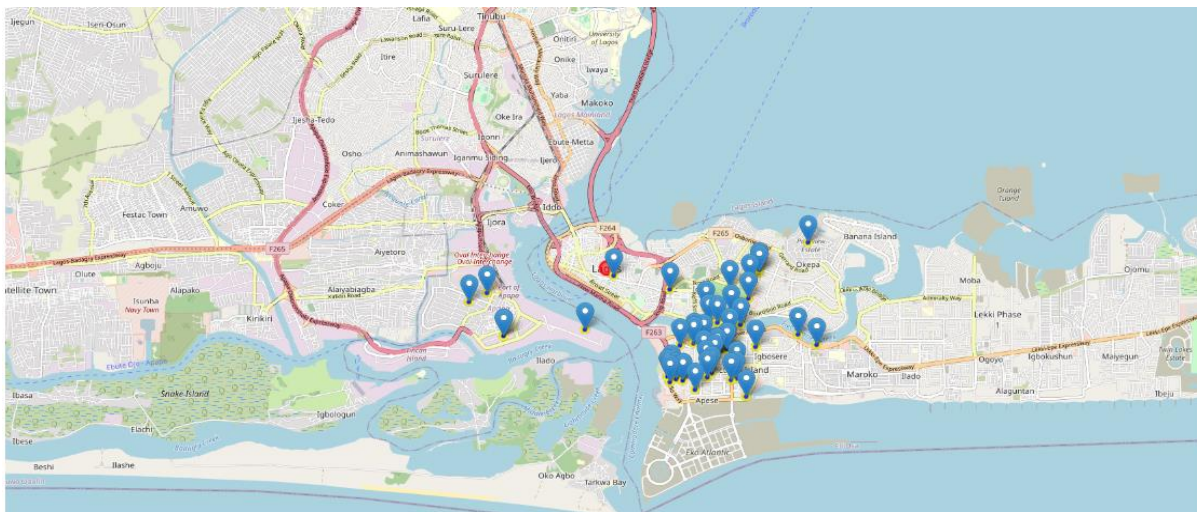| [18]:		name	categories	lat	lng	city	state	country	Address	restaurant local government	population of local government
	0	MacBells Bar & Restaurant	Bar	6.453056	3.395833	Ogba	Lagos	Nigeria	[22 Yaya Abatan Street, Ogba, Lagos, Nigeria]	Agege	635900
	1	Jevenik Restaurant	African Restaurant	6.429070	3.419177	Victoria Island	Lagos	Nigeria	[14 Agoro Odiyan St (Agoro Odiyan St.), Victor...	Eti-Osa	390800
	2	Milano Restaurant	Italian Restaurant	6.434910	3.422778	Victoria Island	Lagos	Nigeria	[52, Kofo Abayomi Street, Victoria Island 1000...	Eti-Osa	390800
	3	Soho Restaurant	Asian Restaurant	6.435061	3.422925	Victoria Island	Lagos	Nigeria	[Plot 52 Kofo Abayomi Street, Victoria Island ...	Eti-Osa	390800
	4	Ikoyi Club 44 Restaurant	African Restaurant	6.451735	3.428198	Lagos	Lagos	Nigeria	[6 Ikoyi Club 1938 Road (Eti Osa), Lagos, Lago...	Eti-Osa	390800

3. DATA VISUALIZATION

The Folium map of Lagos State was generated with the each restaurant address pinpoint by the blue dot on the restaurant on the map. This map is clustered with markers to show where most restaurant is located and a choropleth map was also generated to show the population of each local government a restaurant is located in the maps below
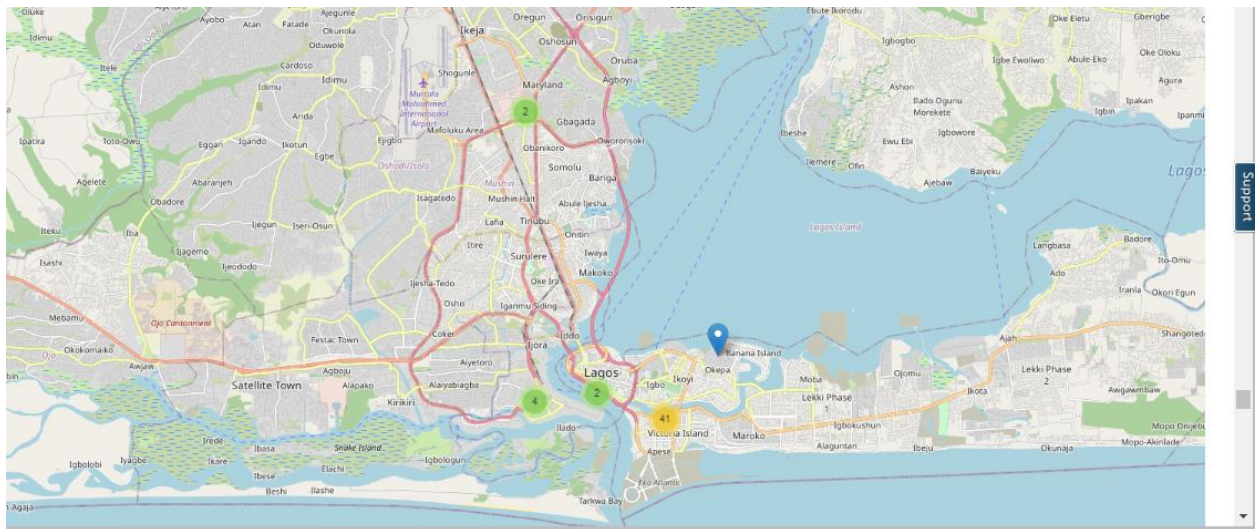
The Folium Map of Lagos State showing all the restaurants (the blue dots)
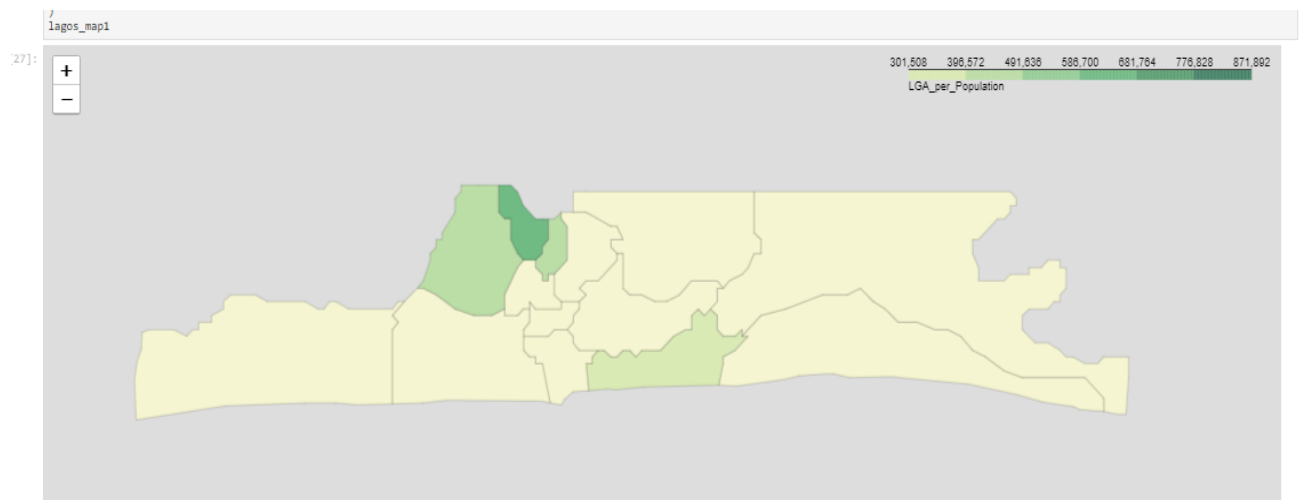

The folium map with markers

The markers in clusters

The Choropleth map of Lagos state Population by Local Government

RESULT AND DISCUSSION

From the folium map, it is observed that most of the restaurants are clustered in the South East region (Eti-Osa Local Government Areas) and much scanty in the North West region (Alimosho, Ikeja and Agege Local Government Area) of the map.

This is to show that the most of the restaurant activities prominently in Victoria Island under Eti-Osa Local Government, Victoria Island. As earlier stated, Victoria Island is the financial center of the state but it doesn't do so well in population. Victoria Island is one of the most exclusive and expensive areas to reside in Lagos and is known for its beach resorts, boutiques and nightlife.

As there is already enough restaurant in this area, Mr. Brown is advised to open a new restaurant in Alimosho, Ikeja and Agege. Alimosho seems to be the best location considering the fact that it is the largest and most populated local government area in Lagos State, with 1,817,200 inhabitants, however, the Lagos State Government disputes the official figures and claims a population within the Local Government Area of more than 2 million residents.

It is mainly residential compare to Victoria Island and is very viable for a restaurant business.

CONCLUSION

Lagos state is a very important location for investors. Alimosho, Agege and Ikeja are appropriate for the food industry. Aside the population density, it is filled with culture and a rich ambience.