Opening a new Shopping Mall In Singapore

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Singapore

Background

- Background: this project is based on a hypothetical scenario. I chose Singapore as the study object for this project. Singapore,famously known as the "the red dot" on the world map, is one of the most important financial and transport hubs in Asia. Due to its geographical advantages, Singapore welcomes tourists from all around the world. Each year, Singapore attracts a lot of foreign investment as a result of its location, skilled workforce, low tax rates, and advanced infrastructure.

- Singapore has a decent amount of shopping malls, because Singaporeans of all ages like to go to shopping malls for different purposes, some for shopping, some for dining out, some for watching movies... Not only the locals love going to shopping mall, but also the millions of tourists who visit Singapore each year.

Business Problem

- Suppose a shopping mall chain is willing to open a new shopping mall outlet in Singapore to expand their business in South East Asia, however, the stakeholders are not familiar with Singapore. They want to know which location would be the best to suit their needs.

Target Audience

- The stakeholders who want to invest in the shopping mall.

- Tourists who visit Singapore. Singapore attracted approximately 19.1 million visitors in 2019 with receipts at S$27.1 billion, according to preliminary figures by the Singapore Tourism Board. The top three countries where the tourists are from are China, India and Indonesia.

- Local Singaporean residents. As of June 2019, Singapore's population stood at 5.70 million.

Data acquisition and Cleaning

- 2019 Singapore Planning area (Neighborhoods) dataset downloaded from data.gov.sg

- Venues of each planning areas dataset with the help of Foursquare API

- Clean the dataset and remove all irrelevant columns, and only keep four useful features, including neighborhood, region, and its latitude and longitude values.

# Visualize neighborhoods in Singapore on Map
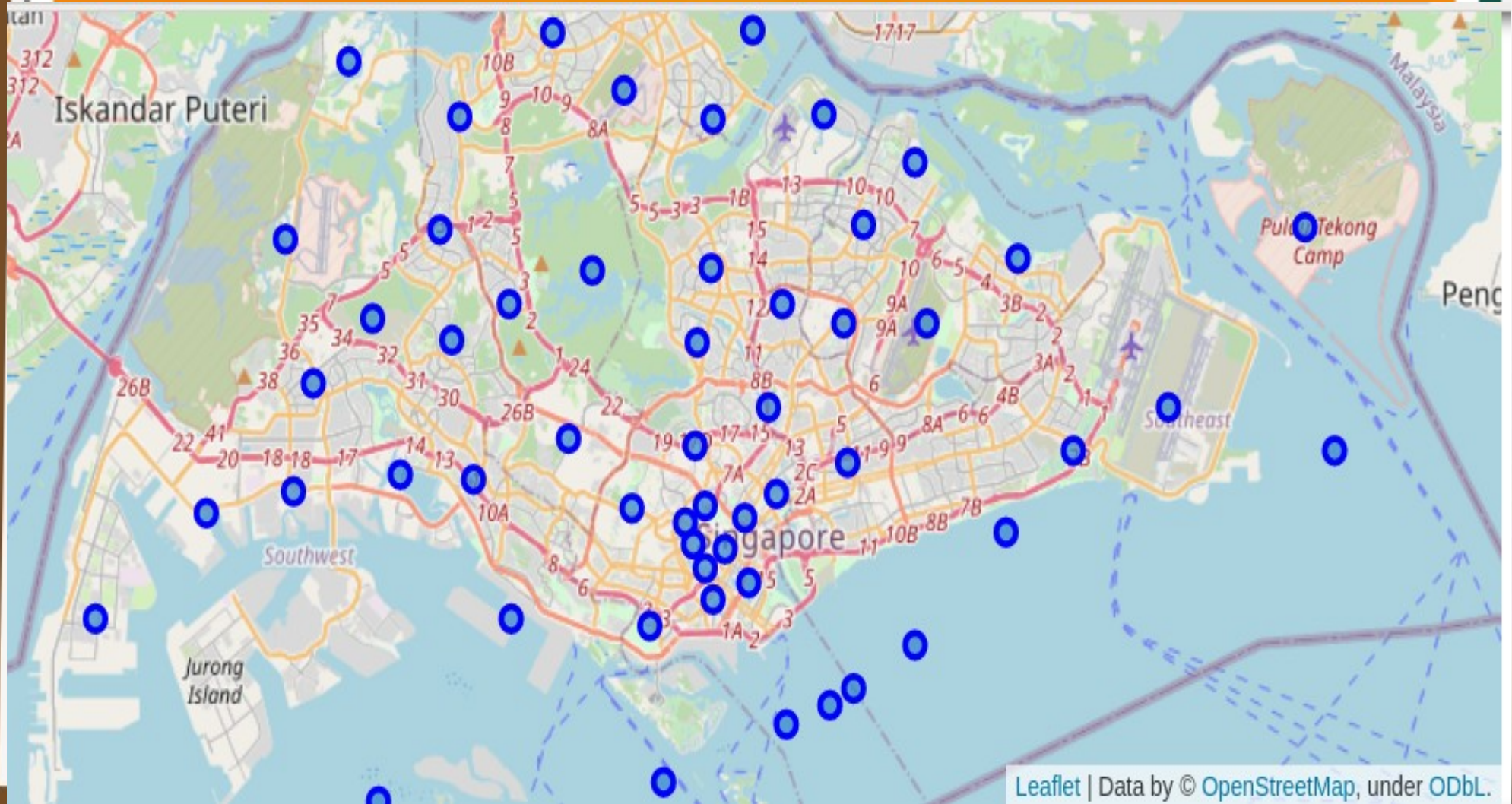
The most frequently occurring venues

- By using Foursquare API, we found out the top 20 popular venue categories and visualize them by using seaborn and matplotlib libraries. Shopping mall is ranked as 11th most frequent one.

20 Most Frequently Occuring Venues in Singapore
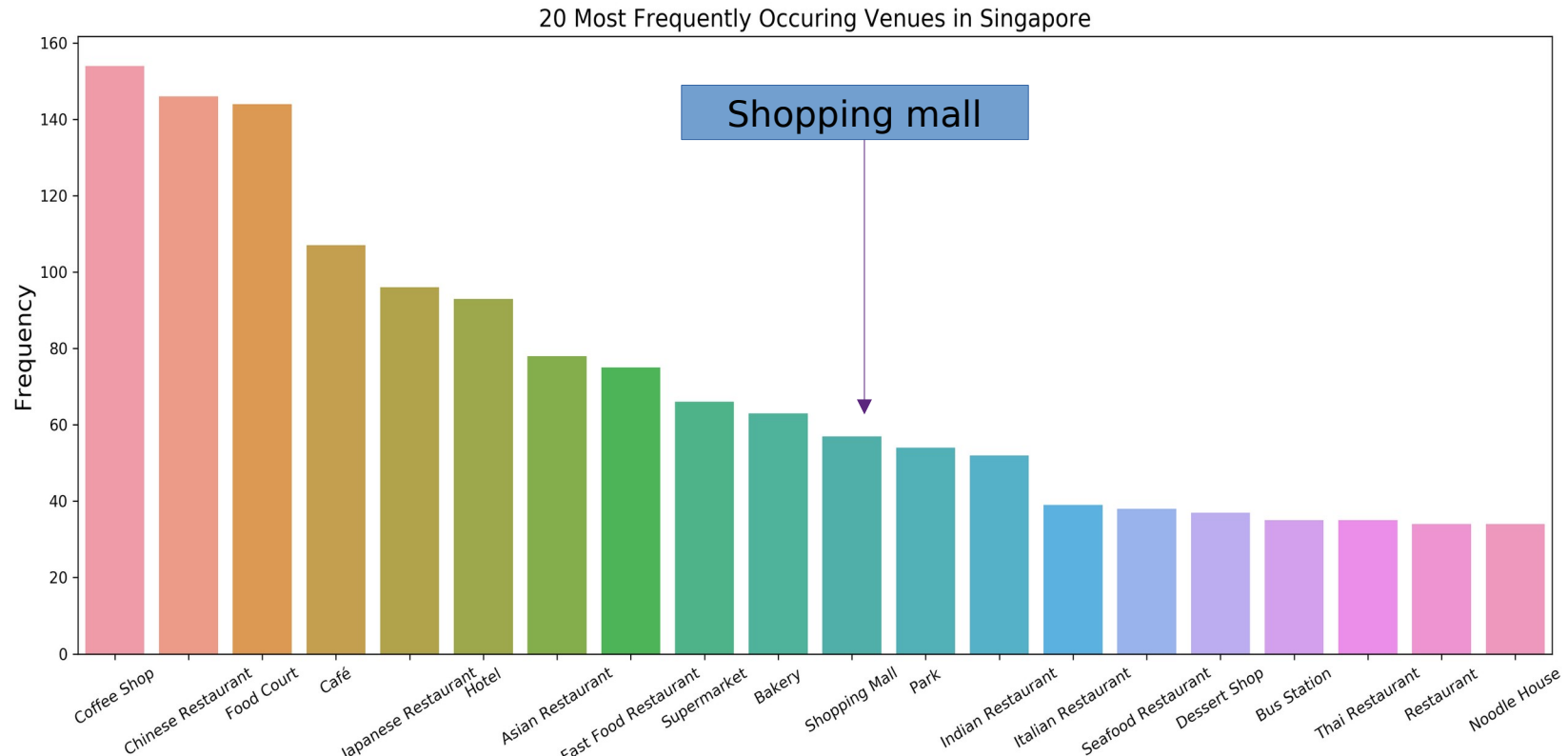
Cluster the similar neighborhoods by K-Means clustering
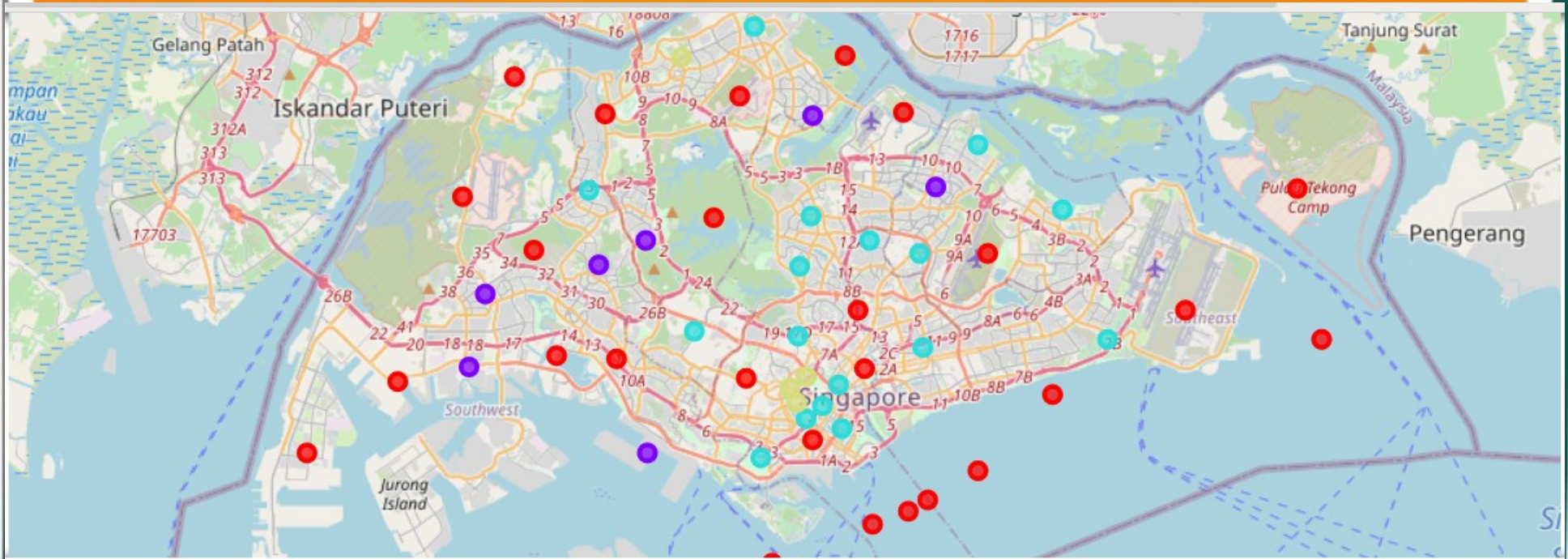
We cluster the data into three clusters, the red dots representing the first cluster, while the cyan ones are for second cluster and the purple ones are for the third cluster

First Cluster (Cluster Labels=0)

```python
sg_merged.loc[sg_merged['Cluster Labels'] == 0]
```

	Neighborhood	Shopping Mall	Cluster Labels	Longitude	Latitude	Region
18	Kallang	0.0	0	103.865107	1.312327	Central Region
32	Pioneer	0.0	0	103.667422	1.306725	West Region
31	Paya Lebar	0.0	0	103.917381	1.360554	East Region
41	Simpang	0.0	0	103.857281	1.444517	North Region
29	Outram	0.0	0	103.843701	1.281626	Central Region
43	Southern Islands	0.0	0	103.826155	1.229460	Central Region
26	North-Eastern Islands	0.0	0	104.049107	1.387936	North-East Region
44	Straits View	0.0	0	103.868795	1.246133	Central Region
45	Sungei Kadut	0.0	0	103.755742	1.419650	North Region
23	Marine Parade	0.0	0	103.913258	1.268724	Central Region
22	Marina South	0.0	0	103.884283	1.251698	Central Region
21	Marina East	0.0	0	103.892283	1.256292	Central Region
20	Mandai	0.0	0	103.812815	1.427104	North Region
19	Lim Chu Kang	0.0	0	103.716885	1.435699	North Region
16	Jurong East	0.0	0	103.734817	1.317268	West Region
37	Seletar	0.0	0	103.881743	1.420722	North-East Region
47	Tanglin	0.0	0	103.815114	1.307610	Central Region
48	Tengah	0.0	0	103.725202	1.362108	West Region
12	Clementi	0.0	0	103.760437	1.316511	West Region
49	Toa Payoh	0.0	0	103.862479	1.336457	Central Region
10	Changi Bay	0.0	0	104.058846	1.324230	East Region
9	Changi	0.0	0	104.001643	1.337079	East Region
8	Central Water Catchment	0.0	0	103.801664	1.376076	North Region
50	Tuas	0.0	0	103.628906	1.276268	West Region
1	Bedok	0.0	0	103.944936	1.301108	East Region
51	Western Islands	0.0	0	103.727146	1.224018	West Region
52	Western Water Catchment	0.0	0	103.694919	1.384956	West Region

First Cluster

Second Cluster

Second Cluster (Cluster Labels=1)

```
sg_merged.loc[sg_merged['Cluster Labels'] == 1]
```

	Neighborhood	Shopping Mall	Cluster Labels	Longitude	Latitude	Region
39	Sengkang	0.029851	1	103.895550	1.388638	North-East Region
34	Queenstown	0.043478	1	103.773753	1.276400	Central Region
3	Boon Lay	0.038462	1	103.698202	1.312923	West Region
6	Bukit Panjang	0.032258	1	103.773045	1.366217	West Region
17	Jurong West	0.030928	1	103.704815	1.343955	West Region
4	Bukit Batok	0.036145	1	103.752601	1.356029	West Region
54	Yishun	0.030000	1	103.843395	1.419031	North Region

Third Cluster

Third Cluster (Cluster Labels=2)

```
sg_merged.loc[sg_merged['Cluster Labels'] == 2]
```

	Neighborhood	Shopping Mall	Cluster Labels	Longitude	Latitude	Region
42	Singapore River	0.020000	2	103.840498	1.290871	Central Region
46	Tampines	0.010417	2	103.968145	1.324290	East Region
40	Serangoon	0.010000	2	103.867606	1.366010	North-East Region
38	Sembawang	0.023256	2	103.818933	1.457080	North Region
0	Ang Mo Kio	0.010000	2	103.842565	1.376729	North-East Region
33	Punggol	0.012346	2	103.913796	1.406764	North-East Region
30	Pasir Ris	0.018868	2	103.949546	1.379571	East Region
24	Museum	0.020000	2	103.847505	1.295972	Central Region
15	Hougang	0.010000	2	103.888800	1.360946	North-East Region
14	Geylang	0.010000	2	103.889852	1.321163	Central Region
13	Downtown Core	0.010000	2	103.856088	1.286587	Central Region
11	Choa Chu Kang	0.012048	2	103.748492	1.387486	West Region
7	Bukit Timah	0.022472	2	103.793357	1.328117	Central Region
5	Bukit Merah	0.010000	2	103.821630	1.274457	Central Region
2	Bishan	0.010000	2	103.837734	1.355160	Central Region
36	Rochor	0.010000	2	103.854284	1.304995	Central Region
27	Novena	0.010000	2	103.837228	1.326091	Central Region

Fourth Cluster

Fourth Cluster (Cluster Labels=3)

```
sg_merged.loc[sg_merged['Cluster Labels'] == 3]
```

	Neighborhood	Shopping Mall	Cluster Labels	Longitude	Latitude	Region
35	River Valley	0.07	3	103.836371	1.297884	Central Region
28	Orchard	0.06	3	103.834065	1.304012	Central Region
53	Woodlands	0.05	3	103.787925	1.443618	North Region
25	Newton	0.05	3	103.840985	1.308506	Central Region

Observation

1. **First cluster** has no shopping malls, as we can see, the neighborhoods in the first clusters are mostly in suburb areas and distant islands. The density of population of most of these neighborhoods are quite low.

2. **Second cluster** shows a moderate amount of shopping malls, located mostly in West Region.

3. **Third cluster** shows a limited amount of shopping malls, located mostly in Central Region.

4. **Fourth cluster** has the highest rate of shopping malls. It's easy to identify most places are in central region. For example, Orchard is a well-known shopping center in Singapore. While Woodlands, even in North Region, but it's the regional center of the North Region and being located immediately across from Johor Bahru, Malaysia, Woodlands is highly accessible, connected as the border between two countries, which brings a large amount of business including shopping malls.

Recommendations

I would strongly recommend the stakeholders invest in the **second cluster**. The third cluster could be our second recommendation.

- It's too competitive for a new shopping mall in the fourth cluster since it already has a high amount of shopping malls in such areas.

- Investing in the first cluster could be relatively risky, since most locations are in suburb area, which are less populated and are of industrial zones instead of residential areas.

- In the second cluster, most neighborhoods are well-located in the central and west region, and currently there are a moderate amount of shopping malls, but not too competitive as the fourth cluster, which creates great potential for shopping mall investments.

- The third cluster doesn't have many shopping malls as of now. But it also has great potential and possibly could provide a lot of opportunities.

Conclusion and future directions

- Accuracy of the models still has room to improve.

- Need to gather more data sets to have a better understanding the potential of different planning areas in Singapore, which includes:

- 1. The population density of each neighborhood

- 2. Annual household income of each neighborhood

- 3. The rental prices in each neighborhood

- 4. The amount of hotels in each neighborhood etc.