

Battle of the Neighborhood: Singapore Foodie Tour

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1. Introduction

1.1 Background

Tourism in Singapore is a major industry and it is a huge contributor to the Singaporean economy, attracting millions of international tourists every year. The *Travel and Tourism Competitiveness Report 2017* ranks Singapore 13th out of 136 countries overall, which was the third best in Asia only behind Japan (ranked 4th) and Hong Kong (ranked 11th). The report ranks Singapore's business environment, international openness, travel and tourism policy and enabling conditions as the best in the world (ranked 1st). Singapore also has an exceptional food scene, in Singapore food is viewed as crucial to its national identity and a unifying cultural thread, as it encompasses diverse elements derived from several ethnic groups.

1.2 Problem

A hypothetical travel agency is looking to open a location in Singapore, where they will be offering food-specific tours for international tourists visiting Singapore. Therefore, it is looking for a location, with many local restaurants and high tourism density. My task would be to recommend an appropriate location that will fulfill the agency's requirements.

2. Data Summary

Singapore is divided into 55 planning areas within 5 major regions: Central, East, North, North-East, West Region. The regional geographical data I will be using to solve the problem consists of the region names, estimated population, area (km²), latitudes and longitudes. The regions will then be further broken down into smaller neighborhoods, otherwise known as planning areas in Singapore. This data will consist of the planning area names, estimated population, area (km²), latitudes and longitudes as well.

Most of the regional and planning area-specific geographical data is scraped directly from Wikipedia pages. However, the latitudes and longitudes of the regions and planning areas are not available on Wikipedia, and is sourced from the OneMap API (<https://docs.onemap.sg/>). Then, the two datasets are joined by the names of the region or planning areas.

3. Methodology

Since I wanted to identify which areas in Singapore have the most tourist activities, I have decided that the presence of hotels and tourist attractions in a region would be good indicators of these activities. Hence, I have found the top 10 common venues within each region, and compared them. Then from the comparisons, I have selected one region that has the most presence of hotels and tourist attractions, and further broke it down into planning areas. Within the same process as above, I have found the top 10 common venues within each planning area. With that dataset, I run k-means to cluster the planning areas into 5 clusters, then the resulting clusters are visualized in the form of a map.

In this analysis, the pandas library is used to create the dataframes, the json library is used to handle the JSON files which are imported from the Foursquare API. The geopy library is used to find various latitudes and longitudes required in the clustering process. The sklearn.cluster library is used to run k-means clustering, and lastly, the folium library is used to render the map of Singapore and its regions.

4. Results

| | Region | 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 | Central Region | Hotel | Italian Restaurant | Waterfront | Coffee Shop | Café | Restaurant | Gym / Fitness Center | Sandwich Place | Cocktail Bar | Korean Restaurant |
| 1 | East Region | Coffee Shop | Café | Bakery | Japanese Restaurant | Sandwich Place | Fast Food Restaurant | Food Court | Shopping Mall | Dessert Shop | Supermarket |
| 2 | North Region | Food Court | Coffee Shop | Park | Fast Food Restaurant | Asian Restaurant | Grocery Store | Shopping Mall | Café | Chinese Restaurant | Supermarket |
| 3 | North-East Region | Café | Asian Restaurant | Coffee Shop | Airport | Fast Food Restaurant | Dessert Shop | Food Court | Thai Restaurant | Airport Terminal | Restaurant |
| 4 | West Region | Chinese Restaurant | Food Court | Coffee Shop | Japanese Restaurant | Café | Supermarket | Shopping Mall | Indian Restaurant | Garden | Fast Food Restaurant |

Figure 1

Figure 1 shows the comparison for the most common venues between the five major regions in Singapore. We can observe that the central region is most likely to have more tourist activities, given the hotel is its most common venue and waterfront, commonly a tourist attraction, is its third most common venue. Hence, the central region is selected to be broken down into planning areas, to narrow down the location recommendations for the travel agency.

The central region consists of 22 planning areas: Bishan, Bukit Merah, Bukit Timah, Downtown Core, Marina East, Marina South, the Museum Planning Area, Newton, Orchard, Outram, River Valley, Rochor, Singapore River, Straits View, Geylang, Kallang, Marine Parade, Novena, Queenstown, Southern Islands, Tanglin, Toa Payoh.

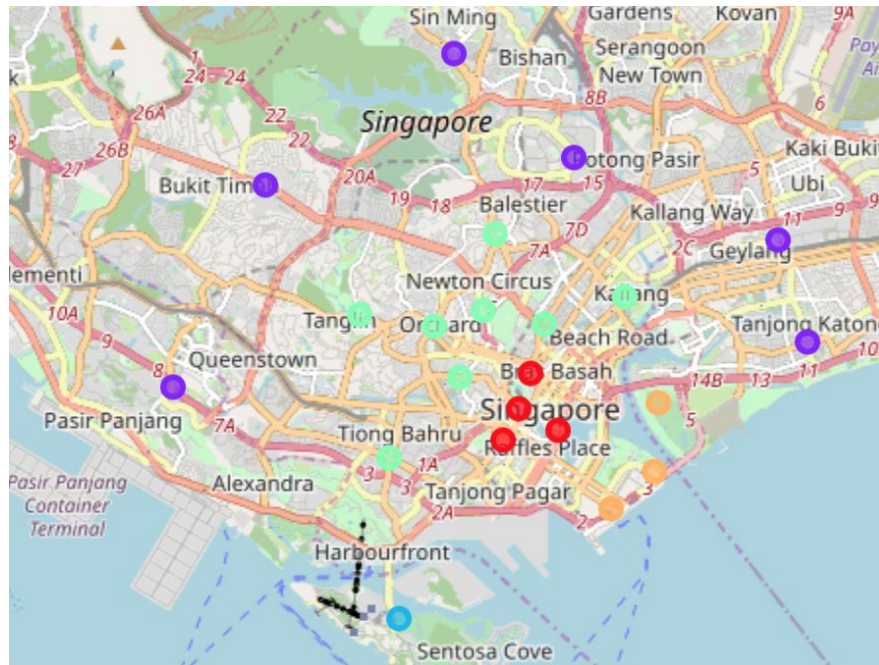


Figure 2

Figure 2 shows a visualization of the central region with the 5 cluster groups. It seems like the main difference between the clusters is their geographical distance from the region centre. For instance, the four elements in Cluster 0 (red dots) are packed in the centre of the region whereas the five elements in Cluster 1 (purple dots) are more spread out throughout the central region.

| | Name (English) | 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 |
|----|-------------------|-------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------------|
| 3 | Downtown Core | 0 | Hotel | Waterfront | Shopping Mall | Gym | Italian Restaurant | Event Space | Boutique | Coffee Shop | Performing Arts Venue | Cocktail Bar |
| 9 | Museum | 0 | Hotel | Japanese Restaurant | Wine Bar | Cocktail Bar | Ice Cream Shop | Bistro | Movie Theater | Park | Performing Arts Venue | Shopping Mall |
| 13 | Outram | 0 | Hotel | Japanese Restaurant | Wine Bar | Coffee Shop | Yoga Studio | Spanish Restaurant | Korean Restaurant | Café | Cocktail Bar | Gym |
| 17 | Singapore River | 0 | Hotel | Japanese Restaurant | Wine Bar | Cocktail Bar | French Restaurant | Waterfront | Plaza | Beer Garden | Café | Park |

Cluster 0 (Represented by red dots)

Cluster 0 definitely seems to be a location with high tourist density, given its high presence of hotels and recreational venues like wine bars, event space and movie theaters. However, there does not seem to be a lot of restaurants with local cuisines.

| | Name (English) | 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 | Bishan | 1 | Chinese Restaurant | Coffee Shop | Ice Cream Shop | Flower Shop | Café | Food Court | Thai Restaurant | Spa | Park | Seafood Restaurant |
| 2 | Bukit Timah | 1 | Bakery | Café | Japanese Restaurant | Chinese Restaurant | Italian Restaurant | Soccer Field | Coffee Shop | Pizza Place | Indian Restaurant | Thai Restaurant |
| 4 | Geylang | 1 | Chinese Restaurant | Asian Restaurant | Food Court | Seafood Restaurant | Noodle House | BBQ Joint | Vietnamese Restaurant | Vegetarian / Vegan Restaurant | Dim Sum Restaurant | Italian Restaurant |
| 8 | Marine Parade | 1 | Chinese Restaurant | Hotel | Coffee Shop | Bar | Multiplex | Seafood Restaurant | Vietnamese Restaurant | Indian Restaurant | Italian Restaurant | Japanese Restaurant |
| 14 | Queenstown | 1 | Chinese Restaurant | Coffee Shop | Food Court | Sandwich Place | Japanese Restaurant | Indian Restaurant | Gym / Fitness Center | Café | Italian Restaurant | Supermarket |
| 21 | Toa Payoh | 1 | Chinese Restaurant | Food Court | Bakery | Noodle House | Coffee Shop | Dessert Shop | Seafood Restaurant | Asian Restaurant | Hotel | Supermarket |

Cluster 1 (Represented by purple dots)

Cluster 1 seems to have a lot of restaurants with local cuisines, however, it also seems to be more of a residential area, as the presence of hotels is scarce.

| | Name (English) | 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 |
|----|-------------------|-------------------|------------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------------|
| 18 | Southern Islands | 2 | Theme Park Ride / Attraction | Theme Park | Beach | Scenic Lookout | Restaurant | Spa | Hotel | Resort | Shoe Store | Chocolate Shop |

Cluster 2 (Represented by blue dot)

Cluster 2 shows a tourist destination in Singapore, named Sentosa. Although it does meet the requirement of the travel agency, in terms of high tourist density and many local restaurants, it is already a very well-established tourist destination, making it difficult to compete with existing tourist services provided on the island.

| | Name (English) | 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 |
|----|-------------------|-------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-------------------------------|--------------------------|----------------------------|
| 1 | Bukit Merah | 3 | Café | Japanese Restaurant | Hotel | Food Court | Park | Coffee Shop | Scenic Lookout | Chinese Restaurant | Bookstore | Supermarket |
| 5 | Kallang | 3 | Hotel | Chinese Restaurant | Indian Restaurant | Thai Restaurant | Bakery | BBQ Joint | Coffee Shop | Food Court | Supermarket | Restaurant |
| 10 | Newton | 3 | Hotel | Japanese Restaurant | Shopping Mall | Sushi Restaurant | Chinese Restaurant | Clothing Store | Coffee Shop | Cosmetics Shop | Boutique | Bubble Tea Shop |
| 11 | Novena | 3 | Hotel | Indian Restaurant | Chinese Restaurant | Café | Bakery | Restaurant | Food Court | Japanese Restaurant | Italian Restaurant | Dessert Shop |
| 12 | Orchard | 3 | Hotel | Japanese Restaurant | Shopping Mall | Boutique | Sushi Restaurant | Bakery | Coffee Shop | Clothing Store | Chinese Restaurant | Cosmetics Shop |
| 15 | River Valley | 3 | Hotel | Japanese Restaurant | Shopping Mall | Sushi Restaurant | Coffee Shop | Wine Bar | Bakery | Cosmetics Shop | Bubble Tea Shop | Chinese Restaurant |
| 16 | Rochor | 3 | Hotel | Café | Indian Restaurant | Chinese Restaurant | Japanese Restaurant | Clothing Store | Ice Cream Shop | Vegetarian / Vegan Restaurant | Bakery | Cocktail Bar |
| 20 | Tanglin | 3 | Hotel | Japanese Restaurant | Sushi Restaurant | Boutique | Garden | French Restaurant | Chinese Restaurant | Coffee Shop | Cosmetics Shop | Modern European Restaurant |

Cluster 3 (Represented by green dots)

Cluster 3 seems to be the most ideal area to open the new location for the travel agency, as its areas have high tourist density given the hotel is their most common venue, and they have a lot of restaurants and coffee shop carrying local cuisines.

| | Name (English) | 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 |
|----|-------------------|-------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|---------------------------|
| 6 | Marina East | 4 | Hotel | Scenic Lookout | Garden | Bridge | Italian Restaurant | Thai Restaurant | Hotel Bar | Event Space | American Restaurant | Hotel Pool |
| 7 | Marina South | 4 | Hotel | Scenic Lookout | Waterfront | Garden | Italian Restaurant | Hotel Bar | Bridge | Café | Japanese Restaurant | Buffet |
| 19 | Straits View | 4 | Hotel | Scenic Lookout | Garden | Bridge | Waterfront | Italian Restaurant | Gym / Fitness Center | Gastropub | Japanese Restaurant | Lounge |

Cluster 4 (Represented by orange dots)

Cluster 4 is similar to Cluster 0; it definitely seems to be a location with high tourist density, given its high presence of hotels and recreational venues like garden, gastropub and waterfront. However, there does not seem to be a lot of restaurants with local cuisines.

5. Conclusion

I would recommend opening the new location of the agency in any planning areas within Cluster 3. Compared with Cluster 0 and 4, Cluster 3 carries more restaurants with local cuisines. Compared to Cluster 1, Cluster 3 has a higher tourist density, given it has more hotels in its planning areas. Therefore, given its high tourism density and presence of local restaurants, it would be ideal to open a travel agency in these areas:

- Bukit Merah
- Kallang
- Newton
- Novena
- Orchard
- River Valley
- Rochor
- Tanglin