The Battle of Neighborhoods

1. Introduction

1.1 Background

Singapore is an island city-state off southern Malaysia. It has a total land area of 721.5 square kilometers with a current population of about 5.86 million based on the United Nations estimates. It has a tropical climate with multicultural population. It is also highly urbanized and densely populated with plenty of high-rise buildings.

Singapore is one of the fastest growing economies in Southeast Asia and is the fourth most important financial center in the world. In 2018, it ranked second in global competitiveness by the World Economic Forum (WEF), just behind the United States, and took the fifth spot in the AT Kearney Global Cities Outlook which assesses cities across the world based on four parameters: personal well-being, economics, innovation and governance. The Singapore government is actively investing to transform the island-state into a 'Smart City' equipped with cutting-edge technology and a nationwide digital platform. In addition, it is the 5th least corrupted country and has one of the best labor force in the world.

This island city-state itself has an excellent public transport system served by buses and the Mass Rapid Transit (MRT). Crime rate is low and English is the main working language. It is also a city that loves to eat. There is an eatery out there for every budget from noodles at one of the many Hawker stalls to fine dining at some of the top and most expensive Western and Asian restaurants in the world. As it is a cross-roads for Asia, Singapore is a travel hub for Asia with thousands of flights coming in and going out of Changi Airport. Birthday and weekend breaks are common to places such as Malaysia and Hong Kong or to more exotic locations in Thailand, Cambodia, Myanmar, Vietnam, Indonesia etc.

As attractive as it may sound, Singapore is a very highly competitive society. It is akin to survival of the fittest. It has flourished by attracting talents from around the world. It is a brilliant country to live in for the skilled and talented. Salaries are extremely lucrative with plenty of opportunities to wine and dine, and travel around the region. It is no doubt that Singapore will continue to attract talents across the world.

However, according to Mercer's 24th annual Cost of Living Survey, Singapore took the fourth spot as the world's most expensive city for expatriates. Therefore, for those who are planning to venture into Singapore, it will be beneficial to know the various neighborhoods in Singapore, how affordable are the accommodations, and what are the amenities around those neighborhoods for lifestyle conveniences. This will provide an idea of the pay package required to join the glamorous expatriate community in Singapore.

1.2 Purpose

The objective of this project is to have a better understanding of the neighborhoods in Singapore by clustering them into groups with similar characteristics. Together with the information on rent, it is hoped that the results will serve as a guide on the choice of neighborhood to live in taking the pay package into consideration.

2. Data Description and Preparation

The data on the neighborhoods of Singapore and the corresponding current apartment rental per square meter for a single person are extracted from the Neighbourhood Price Index 2019 by Nestpick. The apartment is unfurnished and the average apartment size is around 50 m² (+-10 m²). The rent extracted is the median rent per square meter in USD.

Some neighborhoods are grouped together due to their similarities in the features under consideration in the study conducted by Nestpick. Only the neighborhoods and their median rent per square meter are extracted for the purpose for this project. The grouped neighborhoods were separated into each individual neighborhood with its own median rent per square meter. For the grouped neighborhoods, even though their median rent are the same but they may not be in the same vicinity and may have different amenities. In order to visualize these neighborhoods on the map of Singapore, their latitudes and longitudes were obtained by using Google Map.

The data were compiled into a csv file with four columns: Neighborhood, Median Rent per square meter ($), Latitude and Longitude as shown in Table 1 (first five rows only). There are a total of 71 neighborhoods.

Table 1

	Neighborhood	Median_Rent_sqm ($)	Latitude	Longitude
0	Tanjong Pagar	50.78	1.27642	103.843
1	Orchard	46.42	1.30527	103.833
2	Bishan	31.63	1.35191	103.849
3	Ang Mo Kio	31.63	1.36984	103.847
4	Chinatown	50.78	1.27335	103.844

3. Methodology

To have a better sense on the locations of each of the neighborhoods in Singapore, Folium was used to create a map of Singapore with the neighborhoods superimposed on it as shown in Figure 1.
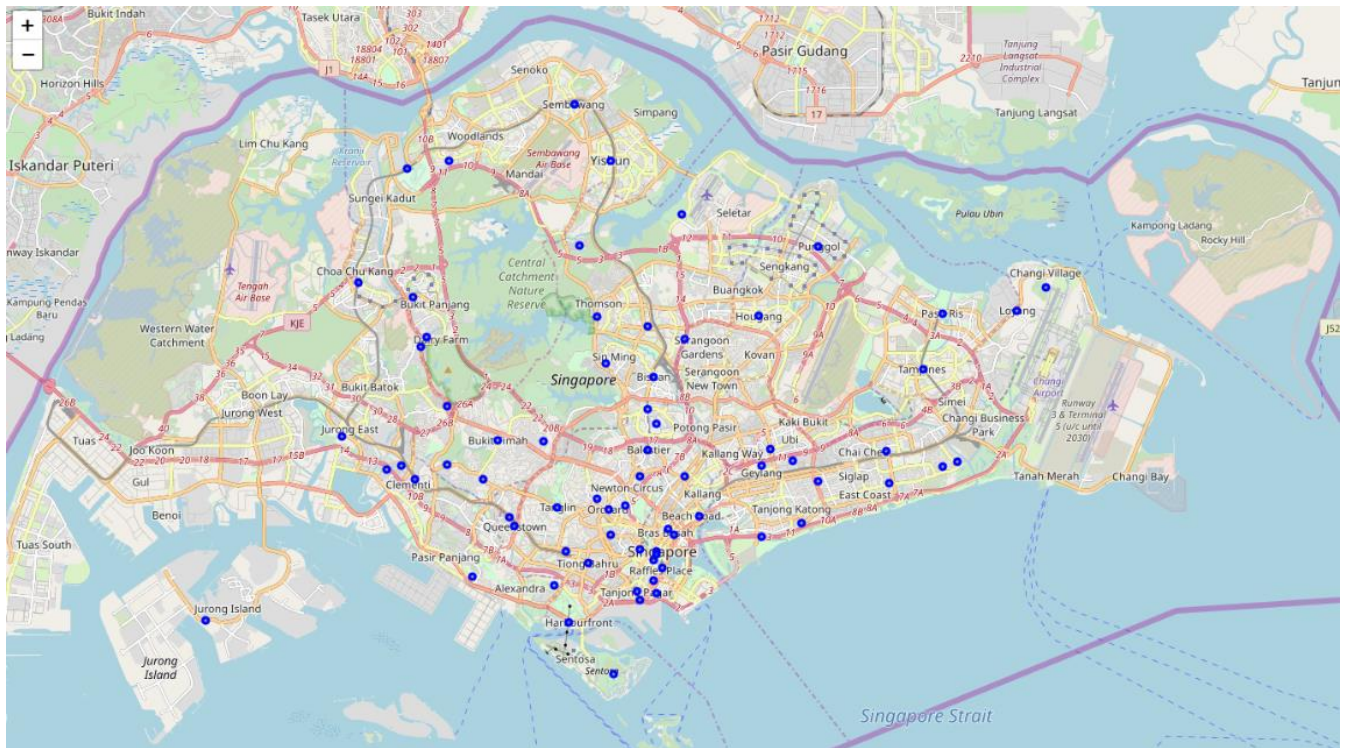

Figure 1 Neighborhoods in Singapore

Then each of the neighborhood was explored using Foursquare API with limit for 100 venues within the radius of 500 meters from the neighborhood. The top and last 5 rows are shown in Tables 2 and 3 respectively.

Table 2

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Tanjong Pagar	1.27642	103.843	Binomio Spanish Restaurante	1.277713	103.842248	Spanish Restaurant
1	Tanjong Pagar	1.27642	103.843	Oasia Downtown Hotel	1.27607	103.844334	Hotel
2	Tanjong Pagar	1.27642	103.843	Teppei Japanese Restaurant	1.276473	103.843809	Japanese Restaurant
3	Tanjong Pagar	1.27642	103.843	DON DON DONKI	1.274742	103.843383	Discount Store
4	Tanjong Pagar	1.27642	103.843	Salmon Samurai	1.275067	103.84373	Sushi Restaurant

Table 3

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
2633	Ulu Pandan	1.32083	103.776	Pine Grove Gym	1.318048	103.774293	Gym
2634	Ulu Pandan	1.32083	103.776	Pine's Mart	1.317796	103.774531	Convenience Store
2635	Ulu Pandan	1.32083	103.776	yo:HA @ulu pandan Gym	1.322451	103.779005	Gym
2636	Ulu Pandan	1.32083	103.776	Bus Stop 12179 (Montview)	1.316958	103.776836	Bus Station
2637	Ulu Pandan	1.32083	103.776	Corona Florist	1.325048	103.774843	Garden Center

A total of 2,638 venues were returned by Foursquare. Figure 2 shows the number of venue categories in each neighborhood.
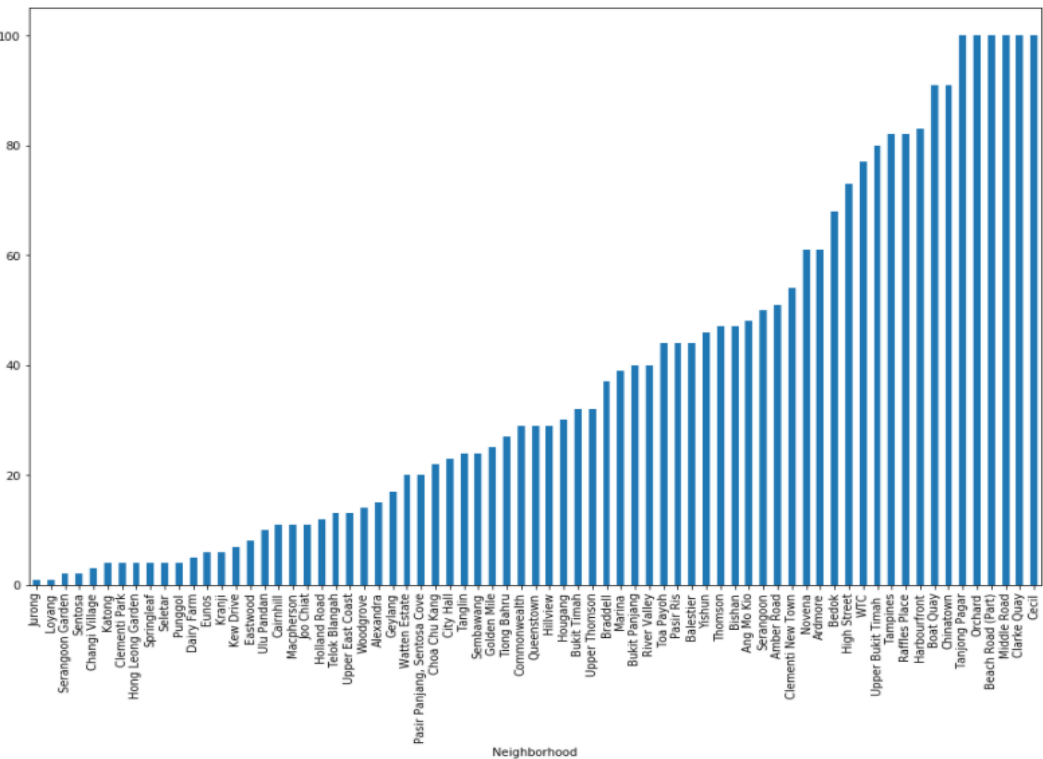

Figure 2 Number of Venue Category by neighborhood

Each neighborhood was further analyzed by venue category to obtain its top 10 venue categories as shown in Table 4 (first five rows only).

Table 4

	Neighborhood	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Alexandra	Chinese Restaurant	Coffee Shop	Asian Restaurant	Bus Station	Basketball Court
1	Amber Road	Chinese Restaurant	Supermarket	Café	Dessert Shop	Bar
2	Ang Mo Kio	Coffee Shop	Bubble Tea Shop	Food Court	Dessert Shop	Fast Food Restaurant
3	Ardmore	Hotel	American Restaurant	Japanese Restaurant	Hotel Bar	French Restaurant
4	Balestier	Chinese Restaurant	Hotel	Food Court	Asian Restaurant	Bakery

	Neighborhood	6th Most Common Venue	7th Most Common Venue	8th Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Alexandra	Park	Pool	Gym	Train Station	Hainan Restaurant
1	Amber Road	Shopping Mall	Department Store	Hotel	Convenience Store	Indian Restaurant
2	Ang Mo Kio	Japanese Restaurant	Supermarket	Sandwich Place	Seafood Restaurant	Noodle House
3	Ardmore	Spa	Buffet	Burger Joint	Chinese Restaurant	Bar
4	Balestier	Bus Station	Noodle House	Tea Room	Supermarket	General Entertainment

K-Means clustering was then used to group the neighborhoods with similar characteristics. After that, the features median rent per square meter, latitude and longitude were merged with those in Table 4. The merged features are shown partially in Table 5 (first five rows only).

Table 5

	Neighborhood	Median_Rent_sqm ($)	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue
0	Tanjong Pagar	50.78	1.27642	103.843	7	Japanese Restaurant	Italian Restaurant	Coffee Shop
1	Orchard	46.42	1.30527	103.833	7	Boutique	Hotel	Sushi Restaurant
2	Bishan	31.63	1.35191	103.849	0	Coffee Shop	Café	Bubble Tea Shop
3	Ang Mo Kio	31.63	1.36984	103.847	0	Coffee Shop	Bubble Tea Shop	Food Court
4	Chinatown	50.78	1.27335	103.844	7	Japanese Restaurant	Coffee Shop	Café

A reasonably high number of clusters was selected in order to give more choices as well as more specific amenity's preference in selecting a neighborhood to live in. Initially the number of clusters was set to 8, then 10 and 12, and Folium was used to create visualization on the clusters of neighborhoods on the map of Singapore. One noticeable factor is that basically there are two major clusters, one smaller cluster, and all the other neighborhoods stand-alone by itself as a cluster. Figure 3 shows one of the visualization on the clusters of neighborhoods where the number of clusters is 10. The stand-alone clusters are circle in red.
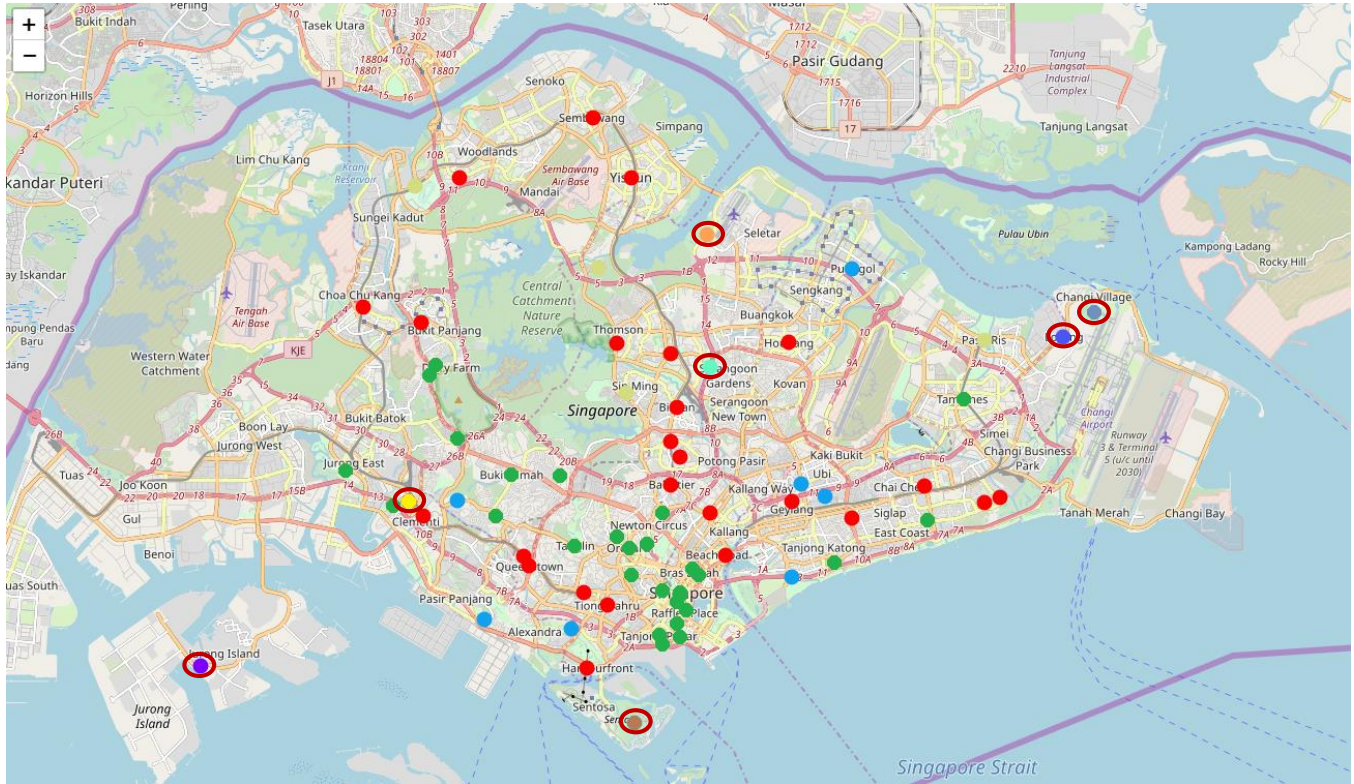
Figure 3 Clusters of Neighborhoods in Singapore

4. Results

The first major cluster (red) has lots of Chinese restaurant/food court/coffee shop nearby. If other ethnic food is preferred such as Japanese/Italian/Korean/French as well as café, then they are closed by cluster 2 (green). Cluster 3 (blue) provides the conveniences of public transport of bus/boat/ferry and recreation activities such as gym/trail/karaoke bar.

The stand-alone clusters are Loyang, Changi Village, Seragoon Garden, Jurong Island, Seletar, Sentosa and Clementi Park. The venue categories for these clusters range from yoga studio to pub to monument/landmark. A closer look at these clusters shows that these neighborhoods are on the lower end of the venue categories as shown in Figure 2. Most of them are also situated at the periphery of the island-state.

Examining the median rent per square meter for each of these clusters does not show any obvious pattern. The median rent per square meter for the first major cluster (red) ranges from $26.8 to $49.3, from $28.3 to $57.5 for the second major cluster (green) and from $32.64 to

$42.07 for cluster 3 (blue). As for the stand-alone clusters, the median rent per square meter ranges from $26.5 to $36.3 which seems to be slightly lower than the main 3 clusters except for Sentosa with a median rent per square meter of $42.1.

5. Discussion

As the stand-alone clusters/neighborhoods have very few venue categories, they can be excluded from future analysis. Then the 3 main clusters can be further subdivided into more granular clusters to narrow down to more specific venue category. Also, there is a high possibility that the median rent per square meter for a neighborhood is depended on its proximity to the city center as well as the type of apartment buildings such as public HDB flats, public-private executive condominiums and private condominiums/apartments, and less so on venue categories. As Singapore is a very small island-state with excellent public transport system, it is reasonable to assume that amenities and services are easily accessible. These are scope for future analysis.

6. Conclusion

This analysis contributes to a better understanding of the neighborhoods in Singapore. However, the clustering exercise does not provide sufficient information to assist in the choice of neighborhood to live in. Further analysis can be carried out to include other features such as proximity of neighborhoods to the city center and the type of apartment buildings in order to provide better insights to serve as a guide in selecting the neighborhood of choice in Singapore.