

# Rent cost analysis for Singapore

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## 1. Background introduction

In Singapore, the graduate ceremony usually would be held during end of July and till beginning of October. Meanwhile, most of fresh graduates would start their career life. Although the national territorial area of Singapore is just 721.5 square kilometers, which is even less than one ten thousandth of my hometown, China, the rent cost for different areas among Singapore are totally different. For the newbies just come from universities, the first issue they need to settle is to choose a cost-effective living place.

As we all know, Singapore overall urbanization is on the top of world. The main purpose of this analysis is to check whether the rent cost is mainly resulted from surrounding venues and facilities or just from the district function assigned by the government.

If all districts have good supporting facilities but with a great price difference, then we can conclude the main cause for high rent price variation is due to advanced urban planning of Singapore which assigned different district special responsibility and functions. And it would be a good choice for newbies to choose live slightly far away from financial center. If there is big gap on supporting venues as well, by using machine learning with existing data, this analysis would give several recommended living place choices.

## 2. Data description

In order to solve the problem, please refer to the needed data description as below

- 1) According to geographical location distribution, Singapore is divided into 28 main districts [1].

- 2) As each district may include multiple general locations, need to get the general location list for each districts [2].
- 3) Based on Foursquare.com API to collect the most common venues for given districts of Singapore.
- 4) Median rent cost for each district of Q2 2019 in Singapore [3]

### **3. Methodology**

If want to analyze whether there is correlation between venues and average rent price. Need to collect quantity and categories of venues surrounding each district, and search for average rent cost for each district with the house area data.

Once table sheet generation and pre-operation done, use bar chart to check the matched supporting installation and life service. Scatter plot (Y: venue character; X: avg rent cost/QT) help to verify the correlation of trend.

In the end, by using K-means machine learning algorithm, we can classify districts into different group, and provide some rent choice recommendation for career newbies.

### **4. Data pre-operation**

Singapore is divided 28 districts and 9 main part by location.



And each of districts usually consist of several well-known general locations, example shown as below.

Postal district	Postal sector(1st 2 digits of 6-digit postal codes)	General location
0	1	01, 02, 03, 04, 05, 06 Raffles Place, Cecil, Marina, People's Park
1	2	07, 08 Anson, Tanjong Pagar
2	3	14, 15, 16 Bukit Merah, Queenstown, Tiong Bahru
3	4	09, 10 Telok Blangah, Harbourfront
4	5	11, 12, 13 Pasir Panjang, Hong Leong Garden, Clementi New...

There is no existing latitude and longitude data according to different districts. So it is necessary to retrieve corresponding latitude and longitude data for each general location, and calculate the average data as the target data which would be as a reference for foursquare.com to collect surrounding venues data. In addition, as the general location name is not specific and can be located to other place with same/similar name when use geopy.geocoders library to locate. It is necessary to adding “Singapore” str part before every general location name, shown as below.

Postal district	Postal sector(1st 2 digits of 6-digit postal codes)	General location	new general location
0	1	01, 02, 03, 04, 05, 06 Raffles Place	Singapore Raffles Place
1	1	01, 02, 03, 04, 05, 06 Cecil	Singapore Cecil
2	1	01, 02, 03, 04, 05, 06 Marina	Singapore Marina
3	1	01, 02, 03, 04, 05, 06 People's Park	Singapore People's Park
4	2	07, 08 Anson	Singapore Anson
5	2	07, 08 Tanjong Pagar	Singapore Tanjong Pagar
6	3	14, 15, 16 Bukit Merah	Singapore Bukit Merah

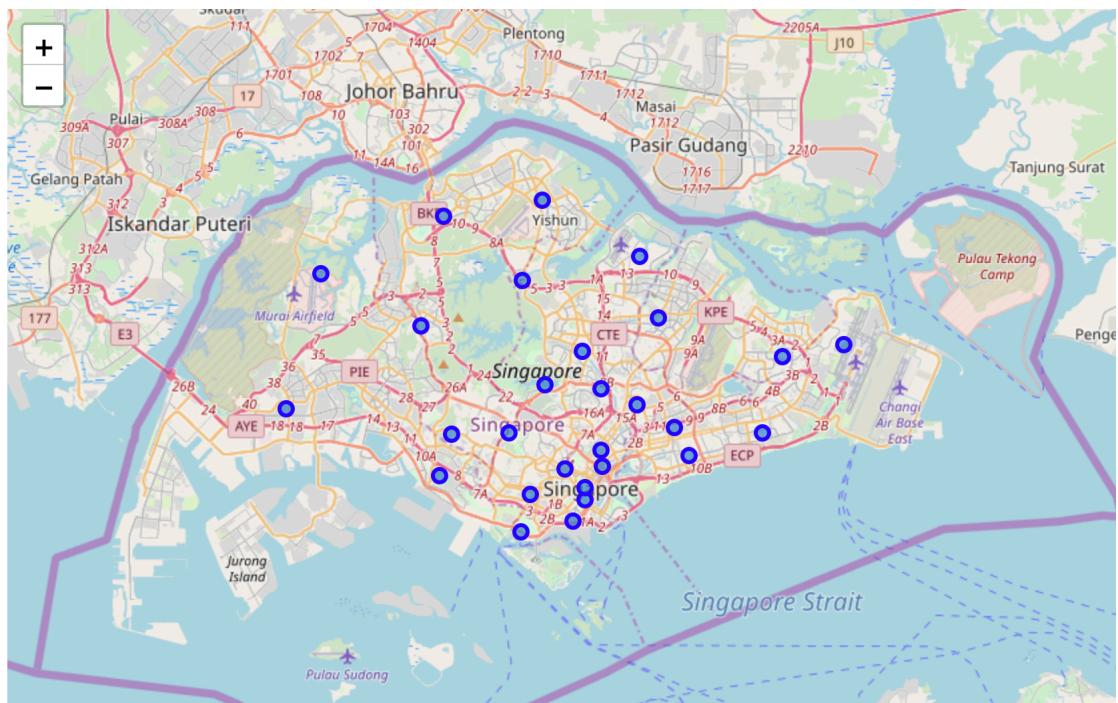
After got the name list of general location and adding specific title “Singapore”, it would be convenient for us to retrieve latitude and longitude data accordingly. However, there are no feedback location data for two locations (Hong Leong Garden and Beach Road (part)), need to remove these 2 rows in advance. After clean the unknown data, latitude and longitude data for every general location shown as below.

index	Postal district	Postal sector(1st 2 digits of 6-digit postal codes)	General location	new general location	latitude	longitude
0	0	1	01, 02, 03, 04, 05, 06 Raffles Place	Singapore Raffles Place	1.283595	103.851568
1	1	1	01, 02, 03, 04, 05, 06 Cecil	Singapore Cecil	1.278716	103.847738
2	2	1	01, 02, 03, 04, 05, 06 Marina	Singapore Marina	1.290475	103.852036
3	3	1	01, 02, 03, 04, 05, 06 People's Park	Singapore People's Park	1.285810	103.844160
4	4	2	07, 08 Anson	Singapore Anson	1.271452	103.842987

The last step of data pre-operation is calculate the average latitude and longitude data based on each postal district number.

Postal district	Postal sector(1st 2 digits of 6-digit postal codes)	General location	Postal district	index	latitude	longitude
0	1	01, 02, 03, 04, 05, 06	Raffles Place, Cecil, Marina, People's Park	1	1.5	1.284649 103.848875
1	2	07, 08	Anson, Tanjong Pagar	2	4.5	1.273935 103.842958
2	3	14, 15, 16	Bukit Merah, Queenstown, Tiong Bahru	3	7.0	1.287149 103.820801
3	4	09, 10	Telok Blangah, Harbourfront	4	9.5	1.268018 103.816258
4	5	11, 12, 13	Pasir Panjang, Hong Leong Garden, Clementi New...	5	12.0	1.296861 103.774398
5	6	17	High Street, Beach Road (part)	6	14.0	1.291004 103.848850
6	7	18, 19	Middle Road, Golden Mile	7	16.5	1.302019 103.857891

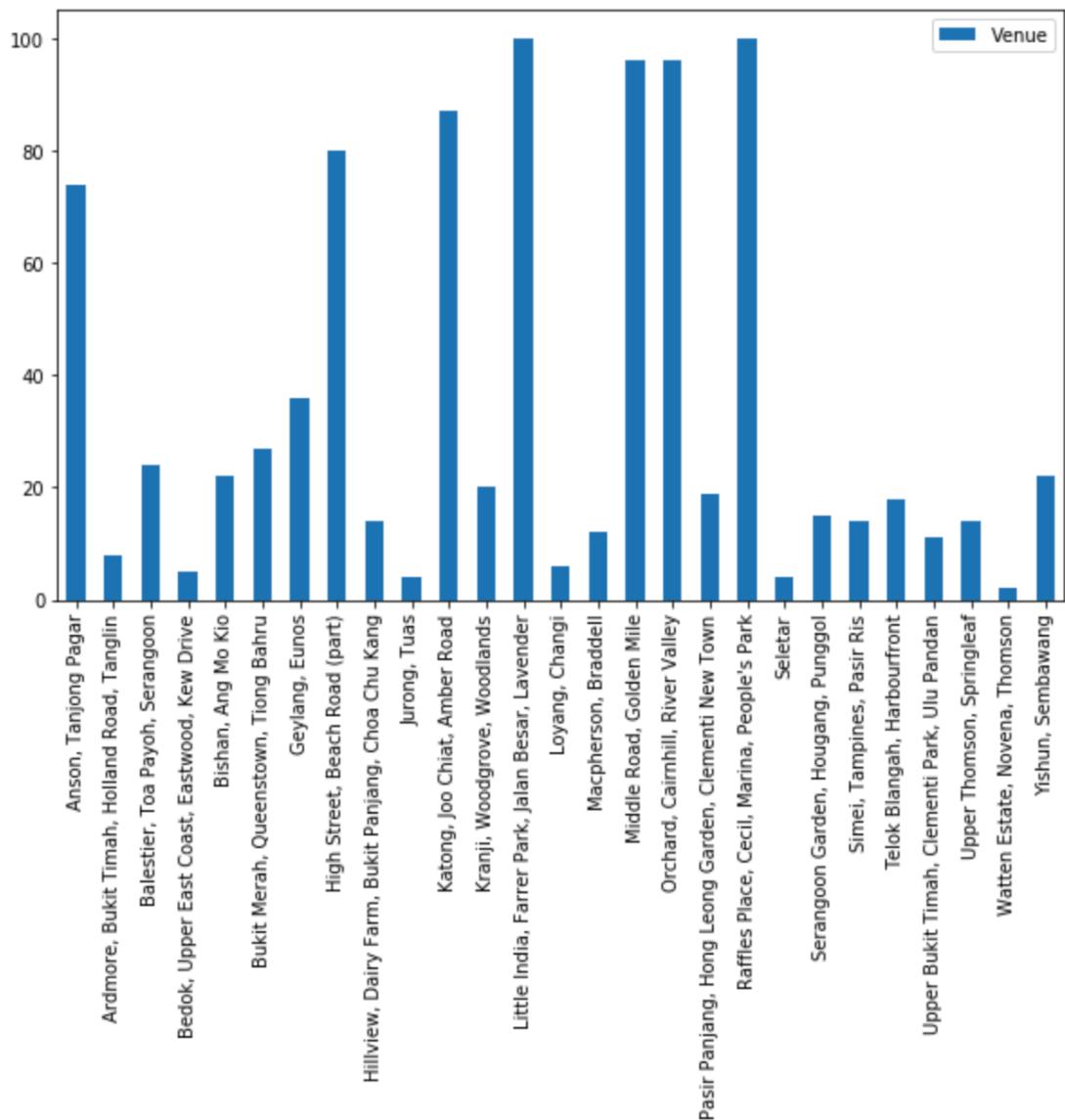
I used python folium library to visualize geographic details of Singapore and its district. I created a map of Singapore with districts superimposed on top. I used latitude and longitude values to get the visual as below:



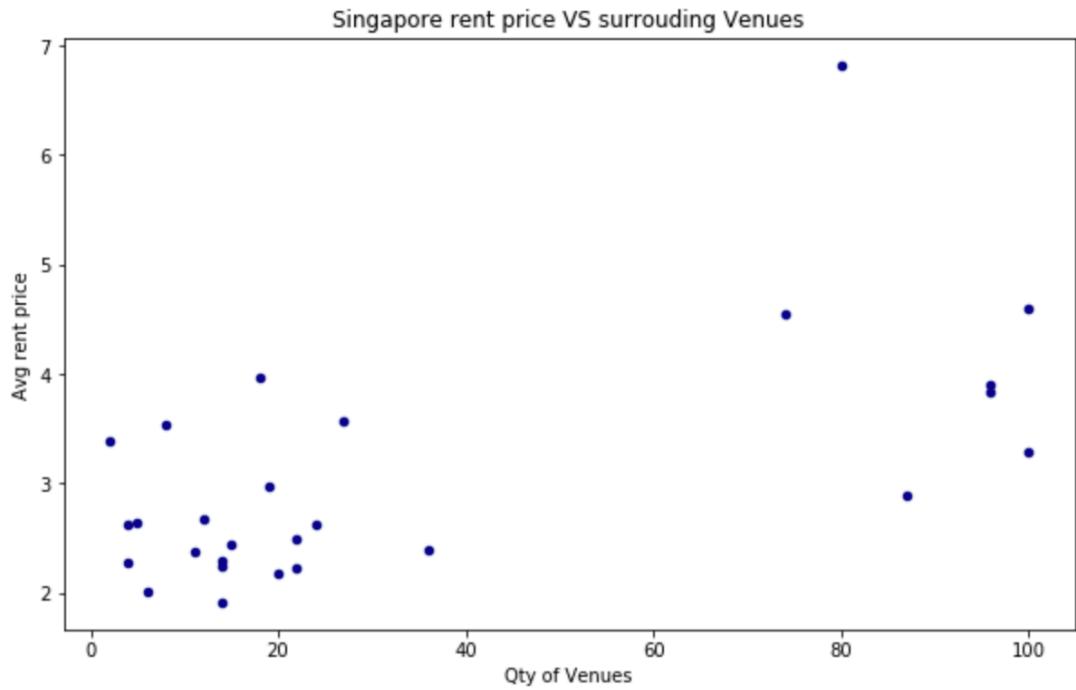
## 5. Results and discussion

According to bar chart of the venues quantity as below, it is obvious that financial centers and shopping centers like Orchard and Raffles have strong advantage compared with western and northern districts. It not only reflects that great urban planning of Singapore aimed to construct Singapore into center of finance and economy, but also shows that there are some missed venues from foursquare.com as I once lived in northern and western and the venues around there are also various.

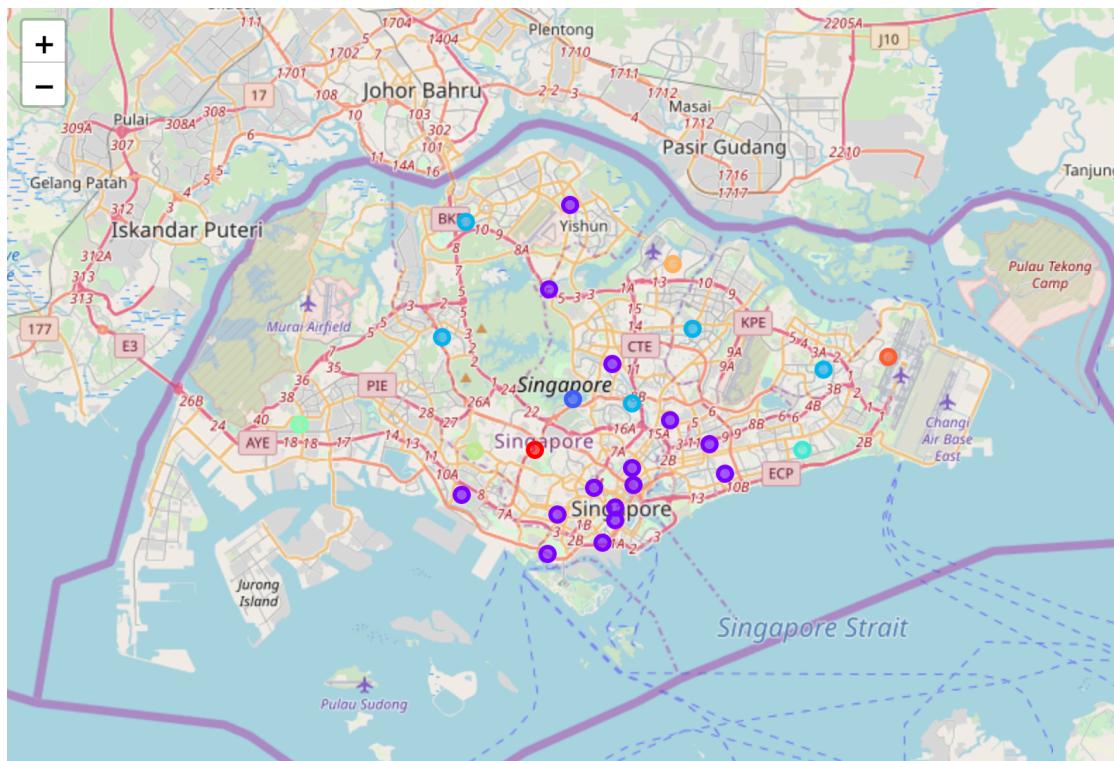
If you want to choose a place with more public supporting activity surrounding, downtown would be a better choice for you compared with other parts.



Based on the scatter plot of average rent price VS quantity of surrounding venues. It is easy to for us to observe that there is an infrastructure gap existing between different districts. Singapore districts can be separate into two parts, majority are with venues less than 40, and the other part with more than 80 venues within 3000m. But as a result with more convenience, the average rent cost would be higher compared with other districts. Especially district 6 (High Street, Beach Road (part)), a distinguished flyer with 6.82 avg/QT.



Finally, by using k-means to classify these districts into 9 groups as below.



It is not hard to conclude that the biggest group is the purple group, which including the downtown place and the key transport districts to north.

Meanwhile, other groups are distributed into other part of island scatteredly. So, for newbies, if not mind living a little far away from downtown, northern district would be a good choice, as there are good supportive venues with

competitive rent cost. If enjoy the after-work life and focus on life quality, downtown is definitely the first choice regardless of rent cost. As for the non-purple group district, the advantage should be close to your working place.

## **6. Conclusion**

For career newbies, I hope the “results and discussion” part would be helpful to you to choose your living location. Just wish you with a good start of your career life. Thanks.

## **7. Reference**

- [1] <https://www.squarefoot.com.sg/trends-and-analysis/non-residential>
- [2] [https://en.wikipedia.org/wiki/Postal\\_codes\\_in\\_Singapore](https://en.wikipedia.org/wiki/Postal_codes_in_Singapore)
- [3] <https://www.squarefoot.com.sg/market-watch/median-rents>