Analyzing the neighbourhoods of Singapore

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1. Introduction

1.1 Background

Housing is an important area of concern for expats and immigrants looking to relocate to a new city.
Finding a house involves several considerations and factors that go behind it including but not limited to:-
Commute time: How much time are we willing to spend on commute per day?
Availability of restaurants of specific cuisine/preference;
The shopping amenities nearby: We should be able to buy our daily/weekly grocery needs in a nearby store;

Expats and immigrants spend several days/weeks exploring different neighbourhoods to understand the local society/community, the apartments, access to nearby public transits, availability of shopping stores nearby, availability of entertainment options nearby, etc.

Singapore - while being a small city - is very diverse in the kind of options it provides for new immigrants across its various localities. Although visiting the neighbourhoods is a must to understand the local community and to get a "feel" for the place, it is advantageous to analyze all neighbourhoods in a single place, to eliminate a few candidates early on in your search for the perfect neighbourhood.

1.2 Problem

This project aims to collect the neighbourhoods of Singapore, obtain the list of amenities available nearby each neighbourhood and provide suggestions for expats on where to settle into.

1.3 Interest

As the Problem statement calls out, any expat/immigrant looking for a place to settle in Singapore will find this report extremely useful. It can also be of interest to anyone else curious to understand Singapore and it's localities and appreciate their diverseness in culture.

2. Data acquisition and cleaning

2.1 Data sources

The Foursquare API would give all the information we need about Restaurants, Movie theatres, Parks, Shopping malls, etc. It receives the coordinates of a neighbourhood as the input, to return information about the available amenities around those coordinates. Hence, we would first need to obtain a repository of all(or most) the neighbourhoods of Singapore and their coordinates.

This information was obtained from here(https://github.com/ianap/sg-neighborhood). This provided us with a list of "Buildings"(which can act as the neighbourhood) along with their coordinate locations.

We then use the FourSquare API to obtain the list of amenities for each building/neighbourhood.

2.2 Data cleaning

2.2.1 Reducing the size of the data

The above mentioned data source returned coordinates of ~16,000 neighbourhoods! Singapore - being a small city - definitely doesn't contain as many neighbourhoods as sixteen thousand! The data source was at a Building level, which means the data is available for specific buildings spread across the city. The nomenclature of these buildings/neighbourhoods weren't uniform(i.e., they did not follow a single naming convention).
Example:- There is a building by the name of "AVA MARINE AQUACULTURE CENTRE", followed by another row which simply has "MOSQUE" as the building name with no neighbourhood name following it.

As a result, in order to simplify the data size, we pick a random sample of Buildings from the original list. Five thousand is a good enough size while providing enough number of Neighbourhoods and Venues to choose from.

2.2.2 Extracting neighbourhood data from Foursquare

The Foursquare API returns the data in the form of a nested dictionary. This dictionary has multiple Key-Value pairs of data nested under other Key-Value pairs. We are concerned only with a few points of data in this entire nested dictionary.

Particularly, we are interested in the "items" dictionary which is stored in a list called "groups" which itself is nested inside another dictionary called "response" which is nested in the main dictionary returned by the API! Too much of Nesting!
So we have to dig through a few layers of the API output to get the data. Thankfully, this is relatively easier than the date cleaning we did in section 2.2.1 as a single line of Python code is able to do this.

3. Exploratory Data Analysis and Use Cases

3.1 Venue Categories

We first wanted to explore the different Venue Categories returned by the FourSquare API. Each Venue belongs to a "Venue Category" which gives a general indication of what the Venue is. Example:- "Indian Restaurant", "Shopping Mall", etc.

Venue Category will be the primary method used to decide on the attributes of a neighbourhood. **Examples:-** Localities with more instances of "Schools" or "Childcare centres" could be recommended to those expats who have young children to take care of; Localities with more of "Museums" can be suggested to those who are interested in Culture and History.

3.1.1 Indian Restaurants

Let's see the neighbourhoods with a sizable presence of "Indian restaurants". The dataset actually has three Venue Categories pertaining to Indian cuisine -> "Indian Restaurant", "North Indian Restaurant" and "South Indian Restaurant".
The dataset doesn't seem to have a lot of values for the latter two, as most of the restaurants serving Indian cuisine are grouped under "Indian Restaurants".
So for this analysis, we will only consider "Indian Restaurants".

Neighbourhoods with most number of Indian Restaurants:-

	Neighbourhood	Venue Category	Total Venues	Indian Restaurant Frequency	North Indian Restaurant Frequency	South Indian Restaurant Frequency
164	KAMPONG KAPOR METHODIST CHURCH	Indian Restaurant	31	0.330000	0.030000	0.0
263	ROCHOR NEIGHBOURHOOD POLICE CENTRE	Indian Restaurant	27	0.280000	0.030000	0.0
176	LAVENDER MEADOWS ACADEMY PTE. LTD.	Indian Restaurant	26	0.281250	0.031250	0.0
7	AQUEEN HERITAGE HOTEL - LITTLE INDIA	Indian Restaurant	25	0.520833	0.041667	0.0
230	PARKROYAL ON KITCHENER ROAD	Indian Restaurant	19	0.190000	0.020000	0.0

These neighbourhoods have the highest number of Indian Restaurants across Singapore. With such high numbers, Indian food lovers would be spoilt for choice if they choose to reside in these neighbourhoods.

Kampong Kapor Methodist Church
Rochor Neighbourhood Police Centre
Lavender Meadows Academy Pte. Ltd.
Aqueen Heritage Hotel - Little India
ParkRoyal On Kitchener Road

Neighbourhoods with the highest frequency of Indian Restaurants:-

	Neighbourhood	Venue Category	Total Venues	Indian Restaurant Frequency	North Indian Restaurant Frequency	South Indian Restaurant Frequency
7	AQUEEN HERITAGE HOTEL - LITTLE INDIA	Indian Restaurant	25	0.520833	0.041667	0.0
8	AQUEEN HERITAGE HOTEL - LITTLE INDIA	North Indian Restaurant	2	0.520833	0.041667	0.0
336	UNITED WORLD PRESCHOOL @ SIGLAP PTE. LTD.	Indian Restaurant	2	0.400000	0.000000	0.0
164	KAMPONG KAPOR METHODIST CHURCH	Indian Restaurant	31	0.330000	0.030000	0.0
165	KAMPONG KAPOR METHODIST CHURCH	North Indian Restaurant	3	0.330000	0.030000	0.0

These neighbourhoods have the highest "frequency" of Indian Restaurants. Frequency here means the percentage of all the venues that are Indian Restaurants.

The neighbourhood *AQUEEN HERITAGE HOTEL - LITTLE INDIA* has 25 Indian Restaurants and a frequency of 52%. This means that these 25 Indian Restaurants make up 52% of all the venues in that neighbourhood. This means that more than half the venues in this neighbourhood simply constitutes Indian Restaurants!

The neighbourhood *UNITED WORLD PRESCHOOL @ SIGLAP PTE. LTD.* has a frequency of 40% with just two Indian restaurants! This means that this neighbourhood has only five venues in total with two of them(40%) being Indian Restaurants! Neighbourhoods such as this could be great for families who want to stay in a quiet place with little noise or distractions. Indian families will also have access to a couple of Indian restaurants!

3.1.2 Museums and Art Galleries

Let's see the neighbourhoods with a sizable presence of Cultural/Heritage centres like "Museums/Art Galleries".
These are the Venue Categories pertaining to Museums and Art Galleries:- "Art Museum", "History Museum", "Museum", "Science Museum", "Art Gallery", "Performing Arts Venue".

Neighbourhoods with the most number of Art Museums:-

	Neighbourhood	Venue Category	Total Venues	Art Museum Frequency	History Museum Frequency	Museum Frequency	Science Museum Frequency	Art Gallery Frequency	Performing Arts Venue Frequency
146	THE PICTUREHOUSE (THE CATHAY CINEPLEX)	Art Museum	2	0.020833	0.020833	0.020833	0.0	0.010417	0.0
26	Consulate of Burkina Faso	Art Museum	2	0.020000	0.000000	0.000000	0.0	0.020000	0.0
45	DRAMA CENTRE	Art Museum	2	0.020000	0.000000	0.000000	0.0	0.010000	0.0
81	MINT MUSEUM OF TOYS	Art Museum	2	0.020000	0.000000	0.000000	0.0	0.000000	0.0
6	BULKHAUL HOUSE	Art Museum	1	0.010000	0.000000	0.000000	0.0	0.000000	0.0

Neighbourhoods with the most number of History Museums:-

	Neighbourhood	Venue Category	Total Venues	Art Museum Frequency	History Museum Frequency	Museum Frequency	Science Museum Frequency	Art Gallery Frequency	Performing Arts Venue Frequency
147	THE PICTUREHOUSE (THE CATHAY CINEPLEX)	History Museum	2	0.020833	0.020833	0.020833	0.0	0.010417	0.000000
136	STAMFORD PRESCHOOL CHILDCARE MACDONALD HOUSE P...	History Museum	2	0.000000	0.023256	0.023256	0.0	0.000000	0.000000
90	NATIONAL GALLERY SINGAPORE	History Museum	2	0.000000	0.025641	0.000000	0.0	0.025641	0.012821
87	NATIONAL FIRE AND CIVIL EMERGENCY PREPAREDNESS...	History Museum	1	0.000000	0.016949	0.016949	0.0	0.033898	0.000000
134	SRI THENDAYUTHAPANI TEMPLE	History Museum	1	0.000000	0.028571	0.028571	0.0	0.028571	0.000000

Neighbourhoods with the most number of General Museums:-

	Neighbourhood	Venue Category	Total Venues	Art Museum Frequency	History Museum Frequency	Museum Frequency	Science Museum Frequency	Art Gallery Frequency	Performing Arts Venue Frequency
148	THE PICTUREHOUSE (THE CATHAY CINEPLEX)	Museum	2	0.020833	0.020833	0.020833	0.0	0.010417	0.0
137	STAMFORD PRESCHOOL CHILDCARE MACDONALD HOUSE P...	Museum	2	0.000000	0.023256	0.023256	0.0	0.000000	0.0
99	NOMU	Museum	2	0.000000	0.011494	0.022989	0.0	0.000000	0.0
2	ARMENIAN APOSTOLIC CHURCH OF SAINT GREGORY THE...	Museum	1	0.000000	0.019231	0.019231	0.0	0.019231	0.0
12	CAPITOL THEATRE	Museum	1	0.015625	0.015625	0.015625	0.0	0.015625	0.0

Neighbourhoods with the most number of Science Museums:-

	Neighbourhood	Venue Category	Total Venues	Art Museum Frequency	History Museum Frequency	Museum Frequency	Science Museum Frequency	Art Gallery Frequency	Performing Arts Venue Frequency
123	SCIENCE CENTRE BOARD (SCB)	Science Museum	1	0.0	0.0	0.0	0.066667	0.0	0.0

Neighbourhoods with the most number of Art Galleries:-

	Neighbourhood	Venue Category	Total Venues	Art Museum Frequency	History Museum Frequency	Museum Frequency	Science Museum Frequency	Art Gallery Frequency	Performing Arts Venue Frequency
92	NATIONAL UNIVERSITY OF SINGAPORE (FIRE FIGHTIN...	Art Gallery	2	0.000000	0.000000	0.071429	0.0	0.142857	0.0
21	COPYRIGHT TRIBUNAL (MINLAW)	Art Gallery	2	0.012821	0.000000	0.012821	0.0	0.025641	0.0
111	PENINSULA PLAZA	Art Gallery	2	0.000000	0.014925	0.000000	0.0	0.029851	0.0
142	TELOK BLANGAH PARCVIEW	Art Gallery	2	0.000000	0.000000	0.000000	0.0	0.133333	0.0
36	DBS NUS Yusof Ishak House	Art Gallery	2	0.000000	0.000000	0.111111	0.0	0.222222	0.0

Neighbourhoods with the most number of Performing Arts Venues:-

	Neighbourhood	Venue Category	Total Venues	Art Museum Frequency	History Museum Frequency	Museum Frequency	Science Museum Frequency	Art Gallery Frequency	Performing Arts Venue Frequency
	'Highest number of Peroforming Arts Venues are'								
153	UOB Marina Square	Performing Arts Venue	2	0.000000	0.00	0.0	0.0	0.00	0.020000
65	HOTEL MICHAEL	Performing Arts Venue	2	0.010000	0.01	0.0	0.0	0.00	0.020000
126	SENTOSA BOARDWALK	Performing Arts Venue	2	0.013514	0.00	0.0	0.0	0.00	0.027027
41	DBS Resorts World Sentosa Universal Studio	Performing Arts Venue	2	0.010000	0.01	0.0	0.0	0.00	0.020000
51	ESPLANADE THEATRE	Performing Arts Venue	2	0.000000	0.01	0.0	0.0	0.01	0.020000

It looks like Singapore's concentration of Museums is more spread out as no Neighbourhood seems to have more than two Museums of any kind within its boundaries. This is rather expected as unlike Restaurants, Museums are lesser in quantity and do not congregate over any particular locality(since they do not cater to any particular community unlike Indian Restaurants that cater to Indian populations).

But in general, staying in and around these areas/buildings should be a good idea for those who enjoy walking through Museum exhibits and will want to visit various museums quite frequently ->
The PictureHouse(Cathay Cineplex);
Drama Centre;
Mint Museum;
Stamford Preschool Childcare Macdonald House Pte. Limited;
Science Centre Board (Scb);

3.1.3 Shopping malls

Let's see the neighbourhoods with a sizable presence of "Shopping malls".
The Venue Categories that define Shopping Malls and Areas include -> "Shopping Mall" and "Shopping Plaza".
However, there are other Venue Categories defined as just Shops like "Watch Shop", "Wine Shop" etc.
We will include a few of such places as well, to add more categories to our analysis. People who like to go "shopping" would obviously want to explore individual shops as well and not restrict themselves to Malls and Plazas.

As a result, we will consider the following Venue Categories for our analysis for Shopping Malls -> "Shopping Mall", "Shopping Plaza", "Watch Shop", "Wine Shop", "Gourmet Shop", "Gift Shop", "Pie Shop", "Pop-Up Shop", "Record Shop".

Neighbourhoods with the most number of Shopping Malls:-

	Neighbourhood	Venue Category	Total Venues	Shopping Mall Frequency	Shopping Plaza Frequency	Watch Shop Frequency	Wine Shop Frequency	Gourmet Shop Frequency	Gift Shop Frequency	Pie Shop Frequency	Pop-Up Shop Frequency	Record Shop Frequency
28	CATHAY CINELEISURE ORCHARD	Shopping Mall	8	0.080000	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
251	ORCHARD BUILDING	Shopping Mall	7	0.070000	0.0	0.0	0.0	0.0	0.01	0.0	0.0	0.0
376	UOB Ngee Ann City	Shopping Mall	7	0.070000	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0
238	OCBC Paragon	Shopping Mall	7	0.070000	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0
190	MADRASAH AL-MA'ARIF AL-ISLAMIAH	Shopping Mall	6	0.073171	0.0	0.0	0.0	0.0	0.00	0.0	0.0	0.0

Neighbourhoods with the most number of Shopping Plazas:-

	Neighbourhood	Venue Category	Total Venues	Shopping Mall Frequency	Shopping Plaza Frequency	Watch Shop Frequency	Wine Shop Frequency	Gourmet Shop Frequency	Gift Shop Frequency	Pie Shop Frequency	Pop-Up Shop Frequency	Record Shop Frequency
60	COMMUNITY MEDIATION CENTRE (STATE COURTS)	Shopping Plaza	1	0.010204	0.010204	0.0	0.00	0.0	0.00	0.0	0.00	0.0
73	Consulate of Burkina Faso	Shopping Plaza	1	0.020000	0.010000	0.0	0.00	0.0	0.01	0.0	0.01	0.0
84	DBS Liang Court	Shopping Plaza	1	0.010000	0.010000	0.0	0.00	0.0	0.01	0.0	0.00	0.0
102	EMBASSY OF MONGOLIA	Shopping Plaza	1	0.020000	0.010000	0.0	0.00	0.0	0.01	0.0	0.01	0.0
111	FRAGRANCE HOTEL - RIVERSIDE	Shopping Plaza	1	0.000000	0.010000	0.0	0.01	0.0	0.01	0.0	0.00	0.0

Neighbourhoods with the most number of Watch Shops:-

	Neighbourhood	Venue Category	Total Venues	Shopping Mall Frequency	Shopping Plaza Frequency	Watch Shop Frequency	Wine Shop Frequency	Gourmet Shop Frequency	Gift Shop Frequency	Pie Shop Frequency	Pop-Up Shop Frequency	Record Shop Frequency
1	ALEXANDRA NEIGHBOURHOOD POLICE POST	Watch Shop	1	0.000000	0.0	0.035714	0.0	0.0	0.0	0.0	0.0	0.0
58	COMMONWEALTH 10	Watch Shop	1	0.000000	0.0	0.034483	0.0	0.0	0.0	0.0	0.0	0.0
162	KALLANG TRIVISTA	Watch Shop	1	0.000000	0.0	0.062500	0.0	0.0	0.0	0.0	0.0	0.0
207	MOE HERITAGE CENTRE	Watch Shop	1	0.000000	0.0	0.023810	0.0	0.0	0.0	0.0	0.0	0.0
266	PCF SPARKLETOTS PRESCHOOL @ BUONA VISTA 32 (CC)	Watch Shop	1	0.026316	0.0	0.026316	0.0	0.0	0.0	0.0	0.0	0.0

Neighbourhoods with the most number of Wine Shops:-

	Neighbourhood	Venue Category	Total Venues	Shopping Mall Frequency	Shopping Plaza Frequency	Watch Shop Frequency	Wine Shop Frequency	Gourmet Shop Frequency	Gift Shop Frequency	Pie Shop Frequency	Pop-Up Shop Frequency	Record Shop Frequency
6	AYER RAJAH AMENITY CENTRE	Wine Shop	1	0.000000	0.00	0.0	0.019231	0.000000	0.00	0.0	0.0	0.0
41	CHOMP CHOMP FOOD CENTRE	Wine Shop	1	0.021739	0.00	0.0	0.021739	0.000000	0.00	0.0	0.0	0.0
53	CITIBANK Shell Serangoon Gardens	Wine Shop	1	0.020408	0.00	0.0	0.020408	0.000000	0.00	0.0	0.0	0.0
64	CONCORD INTERNATIONAL HOSPITAL	Wine Shop	1	0.063830	0.00	0.0	0.021277	0.021277	0.00	0.0	0.0	0.0
112	FRAGRANCE HOTEL - RIVERSIDE	Wine Shop	1	0.000000	0.01	0.0	0.010000	0.000000	0.01	0.0	0.0	0.0

Neighbourhoods with the most number of Gourmet Shops:-

	Neighbourhood	Venue Category	Total Venues	Shopping Mall Frequency	Shopping Plaza Frequency	Watch Shop Frequency	Wine Shop Frequency	Gourmet Shop Frequency	Gift Shop Frequency	Pie Shop Frequency	Pop-Up Shop Frequency	Record Shop Frequency
17	BUKIT HO SWEE VIEW	Gourmet Shop	1	0.000000	0.0	0.0	0.0	0.010204	0.0	0.0	0.0	0.0
210	MUTIARA VIEW	Gourmet Shop	1	0.026316	0.0	0.0	0.0	0.026316	0.0	0.0	0.0	0.0
361	THE TRIZON	Gourmet Shop	1	0.000000	0.0	0.0	0.0	0.083333	0.0	0.0	0.0	0.0
350	THE COSMOPOLITAN	Gourmet Shop	1	0.021277	0.0	0.0	0.0	0.021277	0.0	0.0	0.0	0.0
342	TAMPINES WAFER FAB PARK	Gourmet Shop	1	0.000000	0.0	0.0	0.0	0.058824	0.0	0.0	0.0	0.0

Neighbourhoods with the most number of Gift Shops:-

'Highest number of Gift shops are'

	Neighbourhood	Venue Category	Total Venues	Shopping Mall Frequency	Shopping Plaza Frequency	Watch Shop Frequency	Wine Shop Frequency	Gourmet Shop Frequency	Gift Shop Frequency	Pie Shop Frequency	Pop-Up Shop Frequency	Record Shop Frequency
226	NOMU	Gift Shop	2	0.011494	0.0	0.0	0.0	0.0	0.022989	0.0	0.0	0.0
358	THE PICTUREHOUSE (THE CATHAY CINEPLEX)	Gift Shop	2	0.010417	0.0	0.0	0.0	0.0	0.020833	0.0	0.0	0.0
141	HOTEL MICHAEL	Gift Shop	2	0.010000	0.0	0.0	0.0	0.0	0.020000	0.0	0.0	0.0
330	STAMFORD PRESCHOOL CHILDCARE MACDONALD HOUSE P..	Gift Shop	2	0.011628	0.0	0.0	0.0	0.0	0.023256	0.0	0.0	0.0
85	DBS Resorts World Sentosa Universal Studio	Gift Shop	2	0.010000	0.0	0.0	0.0	0.0	0.020000	0.0	0.0	0.0

Neighbourhoods with the most number of Pie Shops:-

'Highest number of Pie shops are'

	Neighbourhood	Venue Category	Total Venues	Shopping Mall Frequency	Shopping Plaza Frequency	Watch Shop Frequency	Wine Shop Frequency	Gourmet Shop Frequency	Gift Shop Frequency	Pie Shop Frequency	Pop-Up Shop Frequency	Record Shop Frequency
95	EAST LODGE CLEMENTI	Pie Shop	1	0.000000	0.0	0.0	0.0	0.0	0.0	0.038462	0.0	0.0
126	HAI LAM SUA TEE KONG TOA TEMPLE	Pie Shop	1	0.000000	0.0	0.0	0.0	0.0	0.0	0.023810	0.0	0.0
401	ZEH SHING KEONG TEMPLE	Pie Shop	1	0.014706	0.0	0.0	0.0	0.0	0.0	0.014706	0.0	0.0

Neighbourhoods with the most number of Pop-Up Shops:-

'Highest number of Pop-Up shops are'

	Neighbourhood	Venue Category	Total Venues	Shopping Mall Frequency	Shopping Plaza Frequency	Watch Shop Frequency	Wine Shop Frequency	Gourmet Shop Frequency	Gift Shop Frequency	Pie Shop Frequency	Pop-Up Shop Frequency	Record Shop Frequency
21	BULKHAUL HOUSE	Pop-Up Shop	1	0.050000	0.00	0.0	0.0	0.0	0.01	0.0	0.010000	0.0
46	CHYE SING BUILDING	Pop-Up Shop	1	0.040000	0.00	0.0	0.0	0.0	0.01	0.0	0.010000	0.0
66	COPYRIGHT TRIBUNAL (MINLAW)	Pop-Up Shop	1	0.012821	0.00	0.0	0.0	0.0	0.00	0.0	0.012821	0.0
71	Consulate of Burkina Faso	Pop-Up Shop	1	0.020000	0.01	0.0	0.0	0.0	0.01	0.0	0.010000	0.0
92	DRAMA CENTRE	Pop-Up Shop	1	0.050000	0.00	0.0	0.0	0.0	0.01	0.0	0.010000	0.0

Neighbourhoods with the most number of Record Shops:-

'Highest number of Record shops are'

	Neighbourhood	Venue Category	Total Venues	Shopping Mall Frequency	Shopping Plaza Frequency	Watch Shop Frequency	Wine Shop Frequency	Gourmet Shop Frequency	Gift Shop Frequency	Pie Shop Frequency	Pop-Up Shop Frequency	Record Shop Frequency
161	KAI SAN TEMPLE	Record Shop	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.047619
168	KEPPEL DISTRIPARK	Record Shop	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.166667
243	OCBC Silat Ave - FairPrice	Record Shop	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.090909
337	TAI YEONG KONG TEMPLE	Record Shop	1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.166667

Looking at the above data, it seems that most Singapore Neighbourhoods don't have a high concentration of specific Shops(almost every neighbourhood that has a certain kind of "shop" seems to have only one of such shops within its boundary). The only exception to this rule is "Shopping Malls".
This too, makes sense, to some extent. A shopping neighbourhood/district is likely to have a high concentration of Malls. But a neighbourhood is unlikely to be dominated by a large number of similar businesses(unless the business is high-end like Jewellery, etc.).

Let's look at the neighbourhoods with the highest frequencies of Shopping Malls:-

'Highest frequency of Shopping Malls are'

	Neighbourhood	Venue Category	Total Venues	Shopping Mall Frequency	Shopping Plaza Frequency	Watch Shop Frequency	Wine Shop Frequency	Gourmet Shop Frequency	Gift Shop Frequency	Pie Shop Frequency	Pop-Up Shop Frequency	Record Shop Frequency
118	GEMS WORLD ACADEMY (SINGAPORE)	Shopping Mall	1	0.250000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
335	SWEETLANDS CHILDCARE WOODLANDS 896B PTE. LTD.	Shopping Mall	1	0.200000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
391	WOODLANDS POLICE DIVISIONAL HEADQUARTERS	Shopping Mall	1	0.142857	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
229	NORTH VIEW BIZHUB	Shopping Mall	1	0.125000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
108	FERRA	Shopping Mall	2	0.117647	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Surprisingly, the neighbourhoods with the highest frequency of Shopping Malls have only a single Shopping Mall.
This means that the earlier neighbourhoods that had a lot of Shopping Malls also had various other Venues to dilute their Shopping Mall Frequency; and the neighbourhoods that have the highest frequency for Shopping Malls have very little of other venues which increases their frequency for Shopping Malls.

These are the neighbourhoods with the highest number of Shopping Malls. As expected, it includes some high profile shopping areas like Orchard Road/Building ->
Cathay Cineleisure Orchard;
Orchard Building;
Uob Ngee Ann City;
Ocbc Paragon;
Madrasah Al-Ma'Arif Al-Islamiah;

The following areas have the highest frequency of Shopping Malls but beware, their actual count of such malls is just one. Their frequency is 25% and 20% respectively. This means these neighbourhoods don't have a lot of other venues/activities nearby.
Families looking for a quiet lifestyle with some shopping amenities nearby and nothing much can prefer such areas ->
Gems World Academy;
Sweetlands Childcare Woodlands 896B Pte. Ltd.;

3.2 Use Cases

3.2.1 A couple looking for good Schools for their kids

A young married couple with a 4-year old child are relocating to Singapore for work. Their top priority is to find a good School and Child Care service for their kid. As a result, they want to prioritize this aspect even in their house-hunting.

The couple are in search of a good quality school and Child Care service. The two Venue Categories in our data that fits these needs are "High School" and "Child Care Services". The "High School" would also have kindergarten for a four year old.

Neighbourhoods with the most number of High Schools:-

	Neighbourhood	Venue Category	Total Venues	High School Frequency	Child Care Service Frequency
	'Highest number of Schools are'				
10	CELADON VIEW	High School	1	0.033333	0.0
40	PASIR RIS CENTRAL HAWKER CENTRE	High School	1	0.022727	0.0
77	RIVERLIFE CHURCH	High School	1	0.033333	0.0
119	THE PERIWINKLE	High School	1	0.111111	0.0

Neighbourhoods with the most number of Child Care Services:-

	Neighbourhood	Venue Category	Total Venues	High School Frequency	Child Care Service Frequency
	'Highest number of Child Care Services are'				
59	Pro-Teach Schoolcare (Wellington)	Child Care Service	1	0.0	0.100000
99	SIXTH AVENUE VILLE	Child Care Service	1	0.0	0.034483

Hmm.. It looks like the Schools in Singapore are fairly distributed as no neighbourhood seems to have a lot of Schools. As expected their Frequency is also less than 10%.

We can also see that neighbourhoods having a High School don't have a Child Care Centre, and vice-versa.

Since this data doesn't indicate the quality of the school itself(the parents will have to research the school and reach out to former students to understand the quality), our intent was to simply identify neighbourhoods that could have a large quantity of schools that the parents could choose to relocate to.
Since no neighbourhood seems to have an "abundance" of such schools, the parents may not be able to choose a neighbourhood and will have to first prioritize researching the schools instead in order to select a neighbourhood.

3.2.2 A young professional looking for good restaurants AND Movie theatres nearby

A young professional is relocating to Singapore through their job. They are unmarried. They enjoy watching movies and Theatre plays, and their favourite cuisine is Chinese.

In the charts below, also pay attention to the "Frequency" columns of the other venue types(For the "Movie Theater" chart, pay attention to the Frequency columns for the Chinese Restaurant an idea of how popular those venues are)

Neighbourhoods with the most number of Movie Theaters:-

	Neighbourhood	Venue Category	Total Venues	Movie Theater Frequency	Theater Frequency	Performing Arts Venue Frequency	Cantonese Restaurant Frequency	Chinese Restaurant Frequency	Hainan Restaurant Frequency	Hakka Restaurant Frequency	Dim Sum Restaurant Frequency
	'Highest number of Movie Theaters are'										
129	SINGAPORE MANAGEMENT UNIVERSITY (SCH OF ECONOM...	Movie Theater	3	0.030000	0.02	0.0	0.0	0.000000	0.0	0.0	0.01
3	BALMORAL TOWER	Movie Theater	2	0.125000	0.00	0.0	0.0	0.062500	0.0	0.0	0.00
54	GOODWOOD GRAND	Movie Theater	2	0.105263	0.00	0.0	0.0	0.052632	0.0	0.0	0.00
161	THE BALMORAL SPRING	Movie Theater	2	0.090909	0.00	0.0	0.0	0.090909	0.0	0.0	0.00
10	CAMBERLEY INTERNATIONAL PRE-SCHOOL PRIVATE LIM...	Movie Theater	2	0.125000	0.00	0.0	0.0	0.062500	0.0	0.0	0.00

Neighbourhoods with the most number of Theaters:-

	Neighbourhood	Venue Category	Total Venues	Movie Theater Frequency	Theater Frequency	Performing Arts Venue Frequency	Cantonese Restaurant Frequency	Chinese Restaurant Frequency	Hainan Restaurant Frequency	Hakka Restaurant Frequency	Dim Sum Restaurant Frequency
	'Highest number of Theatres are'										
171	UNIVERSAL STUDIOS SINGAPORE THEME PARK	Theater	2	0.010000	0.020000	0.020000	0.000000	0.020000	0.0	0.0	0.000000
156	THE ADELPHI	Theater	2	0.013699	0.027397	0.013699	0.013699	0.013699	0.0	0.0	0.013699
141	SOUTH BEACH	Theater	2	0.000000	0.020000	0.010000	0.010000	0.010000	0.0	0.0	0.020000
130	SINGAPORE MANAGEMENT UNIVERSITY (SCH OF ECONOM...	Theater	2	0.030000	0.020000	0.000000	0.000000	0.000000	0.0	0.0	0.010000
1	ASIAN CIVILISATIONS MUSEUM BOARD	Theater	1	0.000000	0.012500	0.000000	0.000000	0.012500	0.0	0.0	0.000000

Neighbourhoods with the most number of Performing Arts Venues:-

	Neighbourhood	Venue Category	Total Venues	Movie Theater Frequency	Theater Frequency	Performing Arts Venue Frequency	Cantonese Restaurant Frequency	Chinese Restaurant Frequency	Hainan Restaurant Frequency	Hakka Restaurant Frequency	Dim Sum Restaurant Frequency
	'Highest number of Performing Arts Venues are'										
68	HOLLAND DRIVE MARKET AND FOOD CENTRE	Performing Arts Venue	2	0.00	0.000000	0.025974	0.012987	0.038961	0.0	0.0	0.012987
74	INSTITUTE OF PUBLIC ADMINISTRATION AND MANAGEMENT	Performing Arts Venue	2	0.00	0.000000	0.027778	0.013889	0.055556	0.0	0.0	0.013889
89	MARINA MANDARIN	Performing Arts Venue	2	0.01	0.010000	0.020000	0.000000	0.030000	0.0	0.0	0.020000
111	ONE FULLERTON	Performing Arts Venue	2	0.00	0.018868	0.037736	0.000000	0.018868	0.0	0.0	0.000000
134	SITE OFFICE	Performing Arts Venue	2	0.00	0.000000	0.027397	0.013699	0.054795	0.0	0.0	0.013699

Neighbourhoods with the most number of Dim Sum Restaurants:-

	Neighbourhood	Venue Category	Total Venues	Movie Theater Frequency	Theater Frequency	Performing Arts Venue Frequency	Cantonese Restaurant Frequency	Chinese Restaurant Frequency	Hainan Restaurant Frequency	Hakka Restaurant Frequency	Dim Sum Restaurant Frequency
	'Highest number of Dim Sum Restaurant are'										
182	UOB Promenade MRT Station	Dim Sum Restaurant	2	0.018519	0.00	0.00	0.00	0.018519	0.0	0.0	0.037037
139	SOUTH BEACH	Dim Sum Restaurant	2	0.000000	0.02	0.01	0.01	0.010000	0.0	0.0	0.020000
87	MARINA MANDARIN	Dim Sum Restaurant	2	0.010000	0.01	0.02	0.00	0.030000	0.0	0.0	0.020000
101	NATIONAL LIBRARY	Dim Sum Restaurant	1	0.000000	0.01	0.00	0.00	0.030000	0.0	0.0	0.010000
173	UOB Forum the Shopping Mall	Dim Sum Restaurant	1	0.011364	0.00	0.00	0.00	0.034091	0.0	0.0	0.011364

Neighbourhoods with the most number of Cantonese Restaurants:-

	Neighbourhood	Venue Category	Total Venues	Movie Theater Frequency	Theater Frequency	Performing Arts Venue Frequency	Cantonese Restaurant Frequency	Chinese Restaurant Frequency	Hainan Restaurant Frequency	Hakka Restaurant Frequency	Dim Sum Restaurant Frequency
	'Highest number of Cantonese Restaurant are'										
39	EMERALD PARK	Cantonese Restaurant	1	0.014706	0.00	0.000000	0.014706	0.147059	0.014706	0.0	0.000000
65	HOLLAND DRIVE MARKET AND FOOD CENTRE	Cantonese Restaurant	1	0.000000	0.00	0.025974	0.012987	0.038961	0.000000	0.0	0.012987
71	INSTITUTE OF PUBLIC ADMINISTRATION AND MANAGEMENT	Cantonese Restaurant	1	0.000000	0.00	0.027778	0.013889	0.055556	0.000000	0.0	0.013889
131	SITE OFFICE	Cantonese Restaurant	1	0.000000	0.00	0.027397	0.013699	0.054795	0.000000	0.0	0.013699
137	SOUTH BEACH	Cantonese Restaurant	1	0.000000	0.02	0.010000	0.010000	0.010000	0.000000	0.0	0.020000

Neighbourhoods with the most number of Chinese Restaurants:-

'Highest number of Chinese Restaurant are'

	Neighbourhood	Venue Category	Total Venues	Movie Theater Frequency	Theater Frequency	Performing Arts Venue Frequency	Cantonese Restaurant Frequency	Chinese Restaurant Frequency	Hainan Restaurant Frequency	Hakka Restaurant Frequency	Dim Sum Restaurant Frequency
40	EMERALD PARK	Chinese Restaurant	10	0.014706	0.0	0.000000	0.014706	0.147059	0.014706	0.0	0.0
91	MARKET & HAWKER CENTRE (BLK 20 GHIM MOH ROAD)	Chinese Restaurant	7	0.000000	0.0	0.031250	0.000000	0.218750	0.000000	0.0	0.0
164	THE STAR PERFORMING ART CENTRE	Chinese Restaurant	7	0.000000	0.0	0.030769	0.000000	0.107692	0.000000	0.0	0.0
175	UOB Harbourfront CCL Station	Chinese Restaurant	6	0.010000	0.0	0.000000	0.000000	0.060000	0.000000	0.0	0.0
117	RADIATION PROTECTION & NUCLEAR SCIENCE DEPARTMENT	Chinese Restaurant	6	0.021739	0.0	0.000000	0.000000	0.130435	0.000000	0.0	0.0

All the Neighbourhoods listed here are popular and brimming with venues for Theatres and Chinese Restaurants :-
Balmoral Tower;
Goodwood Grand;
The Balmoral Spring;
Uob Promenade Mrt Station;
South Beach;

The individual can choose to stay in either of these neighbourhoods.

4. Conclusion

In this report, I have collected the data around the thousands of Venues and their Categories across multiple Neighbourhoods of Singapore, with an intention of assisting potential/new expats in deciding where to stay.
As expected, a majority of the effort went into the initial stage of **Data Collection:** Finding an appropriate source of data was time-consuming. After spending some time exploring the websites of various Singapore-based institutes, I found a good-enough data source which already listed the coordinates of various Buildings of Singapore. These Building coordinates would act as a suitable substitute for Neighbourhoods.

The stage was **Data Cleaning & Exploration:** Going through the data, identifying data that isn't necessary(Ex:- Age of the building, etc) and removing them, filtering out the data to a smaller sample size and using the FourSquare API to get information on all the Venues around each Building/Neighbourhood.

The final stage was the **Exploration:** Identifying specific Venue Categories and Modelling the Data to the form suitable for our consumption. This involved several stages:- (1). Filtering out the original table to those Neighbourhoods that have at least one Venue of interest; (2). OneHot Encoding to obtain a Boolean check for each (Neighbourhood x Venue Category): The value will be TRUE if that Neighbourhood has at least one Venue belonging to that Category, else FALSE; (3). Joining the data from (1) and (2) to get a final list of Venues for each Neighbourhood that belong to a particular Category;

As shown in the "Use Cases" section of this Report -> We are able to build a code/model wherein users can enter any constraints they might have and we will be able to identify appropriate Neighbourhoods for them(with minimal tweaking in the code).