The Battle of Neighborhoods

Potential Area for a New International Student Apartment in Greater Melbourne

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1.Introduction

1Background

According to the data published by Victorian Government , in 2019, Melbourne welcomed over 220000 international students. However, the living cost in Melbourne CBD area is increasing every year and the capacity of student accommodation in the city is limited.

1.2 Problem

Student apartments are the most reliable means of housing for students, especially if one is completely new to the city and is not familiar with how rental contracts work. However, as they are in high demand, it is not easy to secure a place in one. Therefore this project aims to explore different neighborhoods of the Greater Melbourne Are and find the best area to build a new student apartment for international students to solve this persistent problem as well as to find a new business opportunity.

This research is expected to benefit real-estate investors looking for a profitable location or international students looking for a place to live in Melbourne .

From the student perspective, a lot of factors come into play when finding the best accommodation, including location and rent. However, this study will focus only on the safety and the general atmosphere of the neighborhood. Distance to universities are also an important factor in choosing a student apartment.

2 Data Acquisition and Preprocessing

In this project, three different datasets will be used to solve the problem - Recorded Crime in Local Government Areas in Greater Melbourne, List of Local Government Area, and Foursquare API. After acquiring them from original and reliable sources, they will be wrangled and cleansed into more useful forms for our further analysis.

2.1 Recorded Crime in Greater Melbourne

	Year	Year ending	Police Region	Local Government Area	Incidents Recorded	Rate per 100,000 population
0	2019	December	1 North West Metro	Banyule	7072	5381.4
1	2019	December	1 North West Metro	Brimbank	15178	7219.6
2	2019	December	1 North West Metro	Darebin	11442	6972.0
3	2019	December	1 North West Metro	Hobsons Bay	5002	5124.7
4	2019	December	1 North West Metro	Hume	15929	6836.8

Shown above is crime records classified by local government areas in Greater Melbourne and in 2019 . It was acquired directly from Victorian Government website. For further analysis, the data was simplified as follows:

	Local Government Area	Incidents Recorded
0	Banyule	7072
1	Brimbank	15178
2	Darebin	11442
3	Hobsons Bay	5002
4	Hume	15929

2.2 List of Local Government Areas in Greater Melbourne

The second dataset used was information on local government areas in Greater Melbourne, scrapped from Wikipedia.

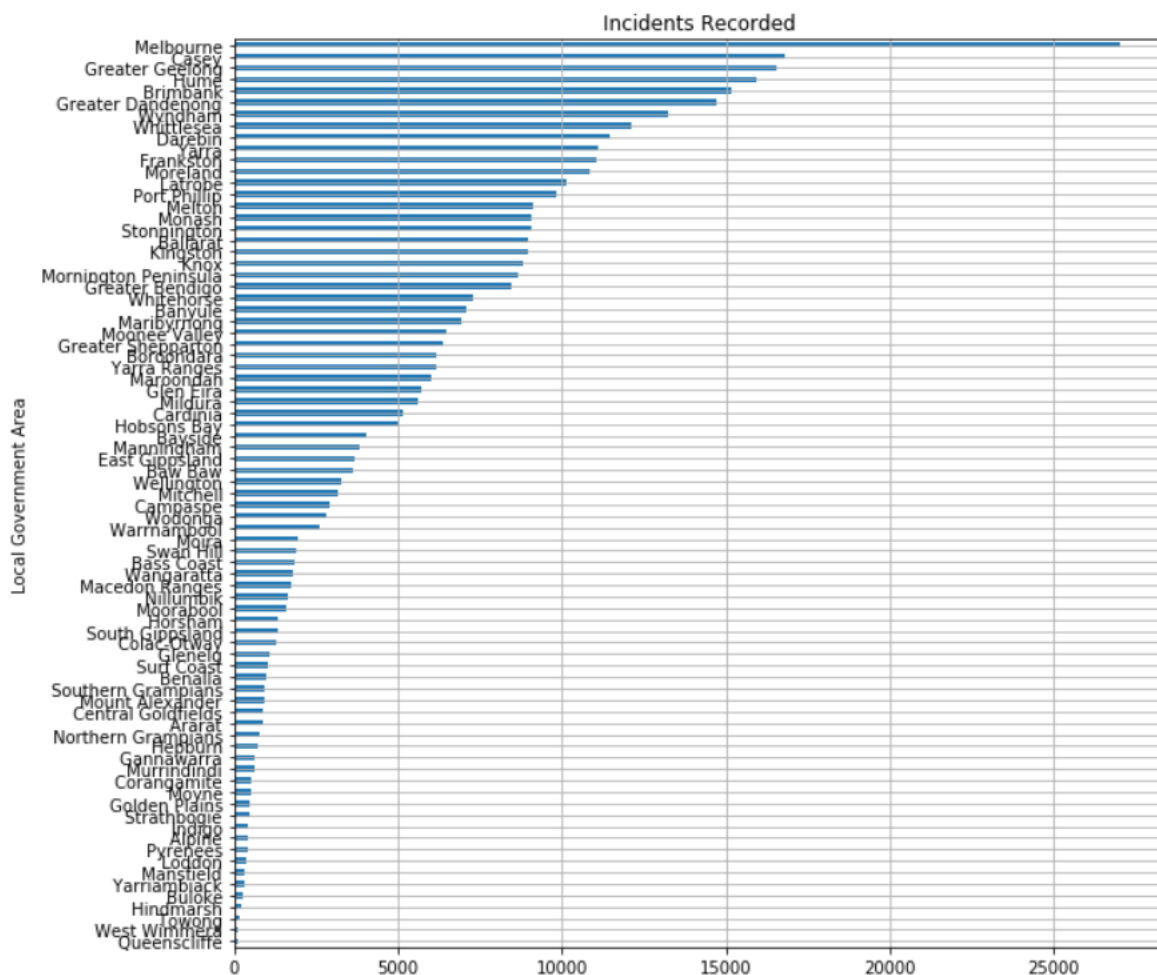|	Local Government Area	Population	Latitude	Longitude	Unnamed: 4
0	Melbourne	169961.0	-37.81	144.96	NaN
1	Port Phillip	113200.0	-37.85	144.97	NaN
2	Stonnington	116207.0	-37.86	145.03	NaN
3	Yarra	98521.0	-37.80	144.99	NaN
4	Banyule	130237.0	-37.73	145.08	NaN

2.3 Foursquare API

Finally, Foursquare API was used to call the top 50 popular venues in each neighborhood. This was done using the 'explore' function of requesting URL. We were able to acquire data looking like this.

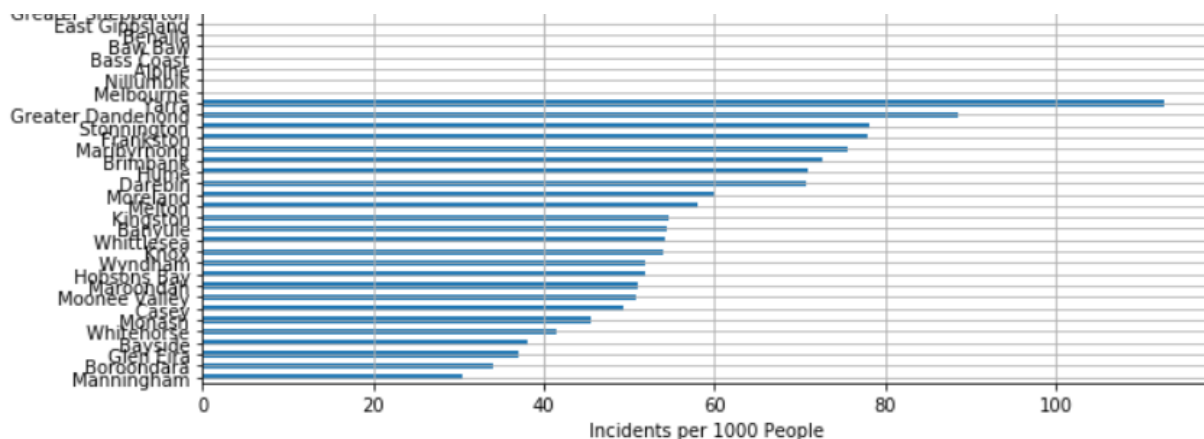|	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Melbourne	-37.81	144.96	Shortstop Coffee & Donuts	-37.811240	144.961000	Donut Shop
1	Melbourne	-37.81	144.96	Brick Lane	-37.811341	144.959816	Café
2	Melbourne	-37.81	144.96	ABC Chicken	-37.810077	144.958490	Korean Restaurant
3	Melbourne	-37.81	144.96	Rose Garden (玫瑰苑燒臘飯店)	-37.808830	144.960400	Chinese Restaurant
4	Melbourne	-37.81	144.96	Games Laboratory	-37.811726	144.959950	Hobby Shop

3 Methodology

3.1 Exploratory Analysis

After cleansing datasets to more useful forms, we created some visualizations to interpret the data we have better,

Incidents Recorded

This is a bar chart displaying areas in descending order of incidents recorded. Melbourne City has the biggest number of reported crime, followed by Casey and Great Geelong. However, as different areas have different sizes of population, it is not wise to directly compare the absolute number of incidents. Instead, we should consider the ratio of crime incidents to people. Thus, I have used the population to calculate the number of recorded crimes per 1000 people in each area.

It is noticeable that Melbourne still remains the most dangerous place in terms of recorded crime ratio to population. However, Casey dropped to the bottom.

3.2 Cluster Analysis

Afterwards, K-means clustering was conducted in order to group the areas according to what venues they have using Foursquare data, in order to feel the atmosphere of each area. As the first step of cluster analysis, one hot encoding was conducted to give binary values to each venue categories.

Art llery	Arts & Crafts Store	Asian Restaurant	Athletics & Sports	Australian Restaurant	BBQ Joint	Bakery	Bar	Bookstore	Bowling Alley	Breakfast Spot	Brewery	Bubble Tea Shop	Burger Joint	Business Service	Café	Campground	Chinese Restaurant	City Hall	Coffe Sho
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Then, the data was grouped by area names to find out how many venues of each category exist in the areas within the top 50 venues. However, as some areas display less than 50 venues due to lack of Foursquare data, the category counts were altered to frequency of how often the category appears among others. Based on the frequency, we could attain a list of most common venue categories in each area as follows.

	Neighborhood	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 Mos
0	Banyule	Café	Wine Bar	Fast Food Restaurant	Dessert Shop	Dim Sum Restaurant	Dive Bar	Dog Run	
1	Bayside	Convenience Store	Sandwich Place	Liquor Store	Dog Run	Gym	Video Store	Asian Restaurant	Fast Food
2	Boroondara	Gym	Pizza Place	Park	Café	Light Rail Station	Electronics Store	Dessert Shop	Dim Sum
3	Brimbank	Train Station	Wine Bar	Fast Food Restaurant	Department Store	Dessert Shop	Dim Sum Restaurant	Dive Bar	
4	Casey	Theater	Wine Bar	Fast Food Restaurant	Department Store	Dessert Shop	Dim Sum Restaurant	Dive Bar	

After observing each clusters and the characteristics they possess, we have given names for each clusters that best depicts their characteristics.

- Cluster 0 : Food and Leisure area (café, restaurant, bar, …)

	Local Government Area	Unnamed: 4	CrimeToPop	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 Mos
0	Banyule	NaN	54.301005	0.0	Café	Wine Bar	Fast Food Restaurant	Dessert Shop	Dim Sum Restaurant	Dive Bar	Dog Run	
44	Greater Dandenong	NaN	88.564307	0.0	Gas Station	Café	Wine Bar	Fast Food Restaurant	Dessert Shop	Dim Sum Restaurant	Dive Bar	
83	Shire of Nillumbik	NaN	NaN	0.0	Café	Wine Bar	Fast Food Restaurant	Dessert Shop	Dim Sum Restaurant	Dive Bar	Dog Run	

- **Cluster 1 : Comprehensive area (restaurant, gym, train station,shops …)**

	Local Government Area	Unnamed: 4	CrimeToPop	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
2	Darebin	NaN	70.800512	1.0	Light Rail Station	Café	Wine Bar	Fast Food Restaurant	Dessert Shop	Dim Sum Restaurant	Dive Bar	Dog Run	Donut Shop	Dry Cleaner
3	Hobsons Bay	NaN	51.850316	1.0	Business Service	Wine Bar	Fast Food Restaurant	Dessert Shop	Dim Sum Restaurant	Dive Bar	Dog Run	Donut Shop	Dry Cleaner	Dumpling Restaurant
5	Maribyrnong	NaN	75.689102	1.0	Arts & Crafts Store	Paper / Office Supplies Store	Italian Restaurant	Bowling Alley	Light Rail Station	Wine Bar	Fast Food Restaurant	Dim Sum Restaurant	Dive Bar	Dog Run
7	Melton	NaN	58.087076	1.0	Pizza Place	Cosmetics Shop	Café	Fried Chicken Joint	Liquor Store	Mexican Restaurant	Convenience Store	Pub	Sandwich Place	Grocery Store
8	Moonee Valley	NaN	50.757333	1.0	Gym	Café	Sandwich Place	Light Rail Station	Breakfast Spot	Food	Bakery	Indian Restaurant	Park	Farmers Market
9	Moreland	NaN	59.832164	1.0	Whisky Bar	Construction & Landscaping	Shopping Mall	Supermarket	Farmers Market	Department Store	Dessert Shop	Dim Sum Restaurant	Dive Bar	Dog Run
13	Yarra	NaN	112.635885	1.0	Coffee Shop	Café	Brewery	African Restaurant	Burger Joint	Gastropub	Indian Restaurant	Japanese Restaurant	Dive Bar	Music Venue
18	Boroondara	NaN	34.122313	1.0	Gym	Pizza Place	Park	Café	Light Rail Station	Electronics Store	Dessert Shop	Dim Sum Restaurant	Dive Bar	Dog Run
22	Knox	NaN	53.951214	1.0	Martial Arts Dojo	Gym	Athletics & Sports	Bowling Alley	Wine Bar	Dessert Shop	Dim Sum Restaurant	Dive Bar	Dog Run	Donut Shop
26	Maroondah	NaN	51.115764	1.0	Playground	Tennis Court	Farmers Market	Deli / Bodega	Department Store	Dessert Shop	Dim Sum Restaurant	Dive Bar	Dog Run	Donut Shop
29	Monash	NaN	45.412516	1.0	Fast Food Restaurant	Grocery Store	Rental Car Location	Fried Chicken Joint	Dry Cleaner	Electronics Store	Department Store	Dessert Shop	Dim Sum Restaurant	Dive Bar
36	Whitehorse	NaN	41.380054	1.0	Thai Restaurant	Fast Food Restaurant	Park	Dumpling Restaurant	Café	Supermarket	Chinese Restaurant	Sandwich Place	Burger Joint	Grocery Store
39	Bayside	NaN	38.063527	1.0	Convenience Store	Sandwich Place	Liquor Store	Dog Run	Gym	Video Store	Asian Restaurant	Fast Food Restaurant	Dessert Shop	Dim Sum Restaurant
42	Frankston	NaN	77.930135	1.0	Electronics Store	Department Store	Café	Kids Store	Sandwich Place	Sporting Goods Shop	Sports Club	Pet Store	Train Station	Convenience Store
43	Glen Eira	NaN	37.086144	1.0	Coffee Shop	Gym / Fitness Center	Café	Sushi Restaurant	Tapas Restaurant	Bar	Sandwich Place	Playground	Greek Restaurant	Grocery Store
48	Stonnington	NaN	78.110613	1.0	Café	Japanese Restaurant	Italian Restaurant	Gym	Burger Joint	Supermarket	Noodle House	Convenience Store	Liquor Store	City Hall
79	Melbourne	NaN	NaN	1.0	Korean Restaurant	Café	Coffee Shop	Chinese Restaurant	Shopping Mall	Japanese Restaurant	Market	Plaza	Food Truck	Cupcake Shop
80	Port Phillip	NaN	NaN	1.0	Light Rail Station	Café	BBQ Joint	Playground	Racetrack	Soccer Field	Hotel	Australian Restaurant	Athletics & Sports	Indian Restaurant
84	Shire of Yarra Ranges	NaN	NaN	1.0	Campground	Wine Bar	Fast Food Restaurant	Dessert Shop	Dim Sum Restaurant	Dive Bar	Dog Run	Donut Shop	Dry Cleaner	Dumpling Restaurant

For Cluster 2, 3 and 4, there are no significant features. It is probably because those areas are physically distanced away from Melbourne City and crowded areas.

4. Results

4.1 Safety

Upon different analysis, we were able to discover the best neighborhoods based on our criteria of safety and atmosphere. Now we will review all the analysis made in this project before we make a conclusion on which area to live as an international student or invest as a student accommodation builder.

Like mentioned in the beginning, our key criteria of location decision will be based on safety and atmosphere.

For safety, we normalized crime to population ratio and reversed the score so that 1 represents the neighborhood with least crime per person

	Local Government Area	CrimeToPop	Cluster Labels	Safety
0	Banyule	54.301005	0.0	0.710293
1	Brimbank	72.721523	2.0	0.486003
2	Darebin	70.800512	1.0	0.509393
3	Hobsons Bay	51.850316	1.0	0.740133
4	Hume	70.986747	NaN	0.507126
5	Maribyrnong	75.689102	1.0	0.449869
6	Melbourne	NaN	NaN	NaN
7	Melton	58.087076	1.0	0.664194
8	Moonee Valley	50.757333	1.0	0.753442
9	Moreland	59.832164	1.0	0.642945

4.2 Atmosphere

For atmosphere, we gave an arbitrary score to each cluster based on personal preference, as preference is not easy to quantify without subjectivity. Highest score was given to Comprehensive Area (Cluster 1) which I prefer.

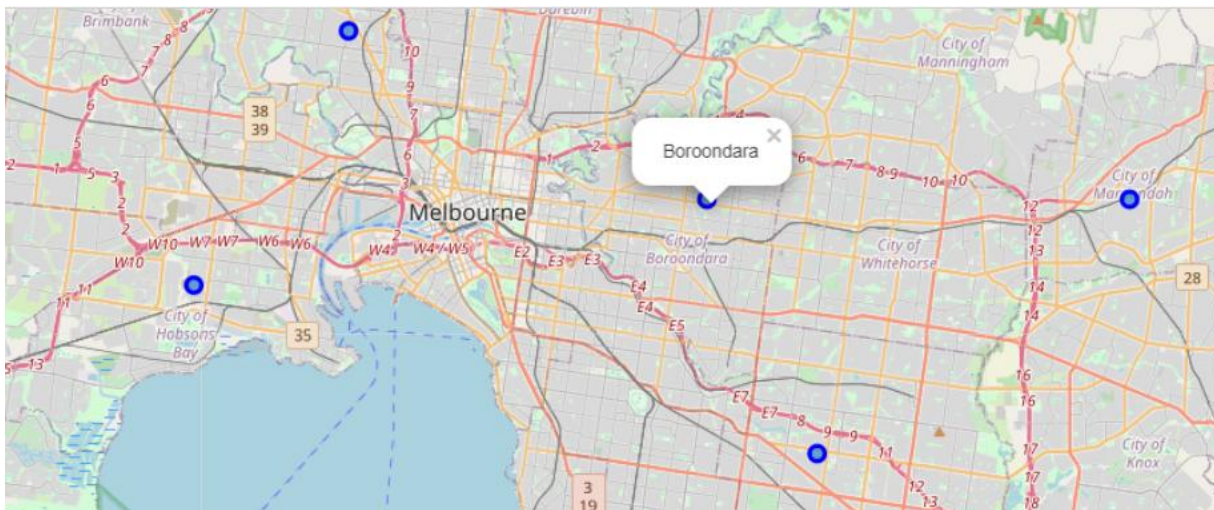|	Local Government Area	CrimeToPop	Cluster Labels	Safety	Atmosphere
0	Banyule	54.301005	0.8	0.710293	0.0
1	Brimbank	72.721523	2.0	0.486003	1.0
2	Darebin	70.800512	1.0	0.509393	0.9
3	Hobsons Bay	51.850316	1.0	0.740133	0.9
4	Hume	70.986747	0.6	0.507126	0.0

4.3 Final score

Then by adding the two scores, we were able to find the area with the highest scores, Boroondara.

	Local Government Area	Safety	Atmosphere	Score
18	Boroondara	0.955992	0.9	1.855992
29	Monash	0.818521	0.9	1.718521
8	Moonee Valley	0.753442	0.9	1.653442
26	Maroondah	0.749077	0.9	1.649077
3	Hobsons Bay	0.740133	0.9	1.640133
22	Knox	0.714552	0.9	1.614552
7	Melton	0.664194	0.9	1.564194
9	Moreland	0.642945	0.9	1.542945
1	Brimbank	0.486003	1.0	1.486003
12	Wyndham	0.740015	0.7	1.440015
2	Darebin	0.509393	0.9	1.409393
5	Maribyrnong	0.449869	0.9	1.349869

5. Conclusion

5.1 Final result of analysis

From this analysis, we have found that the five areas below are the best places to build a student apartment, based on safety and atmosphere of the neighborhood. The top five areas all belong to the comprehensive area, with many restaurants,shops and other services. Therefore, what differentiates them is the safety score, which was calculated from incidents recorded crimes per 1000 people.

5.2 Limitations and recommendation for future study

However, when we map the top five neighborhoods to live in, it is easily noticeable that they are all located in far out suburbs. This is due to many limitations this research holds.

Among numerous factors that determine a good neighborhood, we only took into consideration what type of venues are popular and how many crime incidents are recorded for the sake of simplification. This means that serious crimes like homicide was treated the same as a comparatively petty crime like shoplifting. Moreover, the number of stores in the neighborhood may be as important as what type of stores there are.

To overcome the limitations of this study, we will need further data such as distance to city center, housing prices or ratio of the number of stores to population. Also, taking crime categories into factor and weighting them differently may be helpful.

Despite some limitations, this research was still enjoyable in that we were able to explore the neighborhoods in depth.