PERTH RESTAURANT LOCATION STUDY

Abstract

Foursquare location data is analysed to identify the most attractive suburbs for locating a new Asian restaurant. Victoria Park, Subiaco, Perth and Northbridge are recommended considering their proven ability to support similar businesses and the potential for increased competition to enlarge the size of the market.

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CONTENTS

1.0 INTRODUCTION

Perth, the capital of Western Australia, is a fast-growing multicultural city with an economy that is underpinned by the resources sector (mining, oil and gas). The client is a new immigrant from Singapore who seeks to open a new Asian restaurant as a family business.

A key part of the planning process is deciding where to locate the business. In this regard, the strategy is to open in a suburb that already has similar businesses. The rationale is as follows:

1. The suburb has a track record of supporting such a business, hence a new business is able to tap into an existing market.
2. Establishing near competitors can actually be advantageous as the increased choice would raise the level of customer interest and enlarge the size of the overall market. For further details, see https://toughnickel.com/industries/Competitive-Advantage-Why-Its-Good-to-be-Near-Competitors.

The business problem that this project aims to address is the need to compare a range of suburbs in regard to their existing business types and identify the best candidate(s) for locating the new restaurant. It is initially assumed that the analysis will be focused on an inner-city zone of nominally 3 km radius from the city centre (Perth Central Business District i.e. CBD) as this zone is known for being a hub of commercial activity (high customer traffic).

2.0 DATA

The analysis in this project is based on the following data.

2.1 Suburb Coordinates

Table 2-1 shows the suburbs surrounding the Perth city centre within ~3 km. In general, the coordinates are obtained by the geocoding tool https://geocode.xyz/AU; the suburb names are supplied as input and the tool produced a single .csv file with the coordinates. However, the originally generated points for Perth and West Perth require shifting approximately 500 m southwards to better reflect the centres of the suburbs and avoid overlaps in the regions later applied to the Foursquare GET requests (see Section 2.2).

Table 2-1 Suburb Coordinates Used to Retrieve Venue Information

	Suburb	Latitude	Longitude
1	Perth	-31.956000	115.859000
	Original values:	*-31.95057*	*115.85866*
2	Northbridge	-31.946537	115.856594
3	Nedlands	-31.979600	115.806140
4	Subiaco	-31.949560	115.823210
5	West Perth	-31.950000	115.843000
	Original values:	*-31.9452*	*115.8467*
6	East Perth	-31.953490	115.876810
7	Crawley	-31.977330	115.820730
8	North Perth	-31.927160	115.853230
9	Victoria Park	-31.975820	115.894760
10	South Perth	-31.979360	115.865460
11	Burswood	-31.959800	115.896370
12	Highgate	-31.939989	115.870257
13	Maylands	-31.933093	115.898772
14	Lathlain	-31.967610	115.906320
15	West Leederville	-31.938620	115.833620
16	Leederville	-31.931690	115.842390

2.2 Venue Information

Foursquare (https://foursquare.com/) is used as the source of location data related to the individual businesses. For each suburb, the coordinates of the suburb are supplied as the main inputs in a GET request and data is retrieved for all venues within a 500 m radius. This radius is selected to maximise the number of venues captured while avoiding duplicates due to venues appearing in multiple GET requests.

For this study, the main features of interest in the data returned by Foursquare for each venue are the venue name, latitude, longitude and venue category. A sample is given in Table 2-2

Table 2-2 Example of Foursquare Data

Venue	Venue Latitude	Venue Longitude	Venue Category
COMO The Treasury	-31.955622	115.860350	Hotel
Alfred's Pizzeria & Smallbar	-31.954890	115.859901	Pizza Place
Petition Beer Corner	-31.955622	115.859919	Beer Bar
Petition Kitchen	-31.955222	115.860066	Bistro
Telegram Coffee	-31.955811	115.860185	Coffee Shop

2.3 Perth City Map

The Python library Folium is used to generate maps of Perth to visualise the results of the analysis.

3.0 METHODOLOGY

The analysis in this project proceeds according to the following methodology:

1. Build list of suburbs within ~3 km of the Perth CBD and pass to the geocoding tool https://geocode.xyz/AU, then save the output as a .csv file.
2. Load the .csv file into a Jupyter notebook (using Python language), storing the data in a pandas dataframe (“suburbs”), then tidy-up the dataframe (remove unnecessary columns and text).
3. For each suburb, send a GET request to the Foursquare API for data relating to all venues within a 500 m radius of the suburb centre. Then store the data in another dataframe (“venues”).
4. Remove from further consideration the suburbs that have less than 10 venues as these are considered to be small markets that may not support an additional restaurant.
5. Perform one-hot encoding to separate the venue categories (returned by Foursquare) into individual columns and place a “1” in the applicable column for each venue (other columns left as “0”).
6. Group the venues by suburb and, for each suburb, calculate the fractional splits across the venue categories (e.g. if a value of 0.4 is calculated for category "Bakery" in a suburb, then 40% of the venues in that suburb are bakeries).
7. Identify the 3 most frequently occurring venue categories for each suburb.
8. Use the k-means clustering function from scikit-learn Python library to divide the suburbs into 4 clusters based on the fractional splits and plot the resulting clusters on a map. Clustering is used to potentially gain broad insights quickly e.g. immediately screen-out a group of suburbs that are unattractive because they are known to be focused on European rather than Asian cuisine.
9. Assess the cluster characteristics and identify the clusters that should be included in further analysis.
10. For each suburb in the identified clusters, calculate the total fractional split belonging to all Asian-type restaurants and then produce a bubble plot. The higher the proportion of venues falling under the broad category of “Asian Restaurant”, the larger the bubble and the more attractive the suburb is for locating the new restaurant.

4.0 RESULTS

The GET requests to Foursquare returned a total of 388 venues across the suburbs. Table 4-1 provides a sample of the results. Table 4-2 shows the distribution of venues across suburbs.

Table 4-1 Sample of Foursquare Results

("venues" dataframe, head and tail only)

	Suburb	Suburb Latitude	Suburb Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Perth	-31.95600	115.85900	COMO The Treasury	-31.955622	115.860350	Hotel
1	Perth	-31.95600	115.85900	Alfred's Pizzeria & Smallbar	-31.954890	115.859901	Pizza Place
2	Perth	-31.95600	115.85900	Petition Beer Corner	-31.955622	115.859919	Beer Bar
3	Perth	-31.95600	115.85900	Petition Kitchen	-31.955222	115.860066	Bistro
4	Perth	-31.95600	115.85900	Telegram Coffee	-31.955811	115.860185	Coffee Shop
...	...	...	...	...	...	...	...
383	Leederville	-31.93169	115.84239	Oxford Yard	-31.934660	115.841700	Café
384	Leederville	-31.93169	115.84239	Domino's Pizza	-31.933310	115.841590	Pizza Place
385	Leederville	-31.93169	115.84239	The Sweet Remedy	-31.932110	115.841412	Café
386	Leederville	-31.93169	115.84239	Loftus Recreation Centre	-31.935180	115.845488	Gym / Fitness Center
387	Leederville	-31.93169	115.84239	Amani	-31.936086	115.841395	Wine Bar

Table 4-2 Number of Foursquare Results per Suburb

Suburb	No. of Venues
Burswood	26
Crawley	11
East Perth	26
Highgate	23
Lathlain	6
Leederville	10
Maylands	7
Nedlands	8
North Perth	20
Northbridge	40
Perth	100
South Perth	11
Subiaco	37
Victoria Park	27
West Leederville	11
West Perth	25

Lathlain, Maylands and Nedlands each have less than 10 venues. As these are considered small markets, they are removed from further consideration.

After applying one-hot encoding, calculation of fractional splits (across the venue categories) and k-means clustering to the remaining suburbs, the resulting clusters are summarised in Table 4-3. The 3 most common venues for each suburb and their fractional representations are shown. The clusters are visualised on the map in Figure 4-1.

Several Cluster 1 suburbs feature some type of Asian restaurant within their top 3 most common venues. The other clusters do not have any suburbs featuring Asian restaurants within the top 3. Since the strategy is to establish a new Asian restaurant in an area that already has a high concentration of such restaurants, only Cluster 1 is retained for further analysis.

For the remaining clusters/suburbs, Table 4-4 shows the various venue categories that are considered as coming under the broad definition of Asian restaurant. For each suburb, the individual fractions are summed to give the total, which represents the number of Asian restaurants as a proportion of total venues. The bubble plot of Asian restaurant proportion is shown in Figure 4-2.

Table 4-3 Clustering Results

	Suburb	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	1st Venue Frac.	2nd Venue Frac.	3rd Venue Frac.
0	Perth	-31.956000	115.859000	1	Coffee Shop	Bar	Asian Restaurant	0.1	0.06	0.05
1	Northbridge	-31.946537	115.856594	1	Café	BBQ Joint	Chinese Restaurant	0.15	0.05	0.05
2	Subiaco	-31.949560	115.823210	1	Café	Coffee Shop	Japanese Restaurant	0.162162	0.135135	0.0810811
3	West Perth	-31.950000	115.843000	0	Café	Coffee Shop	Hotel	0.32	0.12	0.04
4	East Perth	-31.953490	115.876810	1	Café	Park	Pizza Place	0.230769	0.115385	0.0769231
5	Crawley	-31.977330	115.820730	3	Café	College Cafeteria	College Gym	0.272727	0.0909091	0.0909091
6	North Perth	-31.927160	115.853230	1	Café	Italian Restaurant	Indian Restaurant	0.15	0.1	0.1
7	Victoria Park	-31.975820	115.894760	1	Café	Japanese Restaurant	Korean BBQ Restaurant	0.148148	0.0740741	0.0740741
8	South Perth	-31.979360	115.865460	2	Café	Bakery	Coffee Shop	0.545455	0.0909091	0.0909091
9	Burswood	-31.959800	115.896370	1	Hotel	Buffet	Casino	0.115385	0.115385	0.0769231
10	Highgate	-31.939989	115.870257	1	Café	Bakery	Mexican Restaurant	0.130435	0.130435	0.0869565
11	West Leederville	-31.938620	115.833620	0	Café	Coffee Shop	Train Station	0.363636	0.0909091	0.0909091
12	Leederville	-31.931690	115.842390	1	Café	Coffee Shop	Beer Store	0.2	0.1	0.1

Figure 4-1 Cluster Visualisation

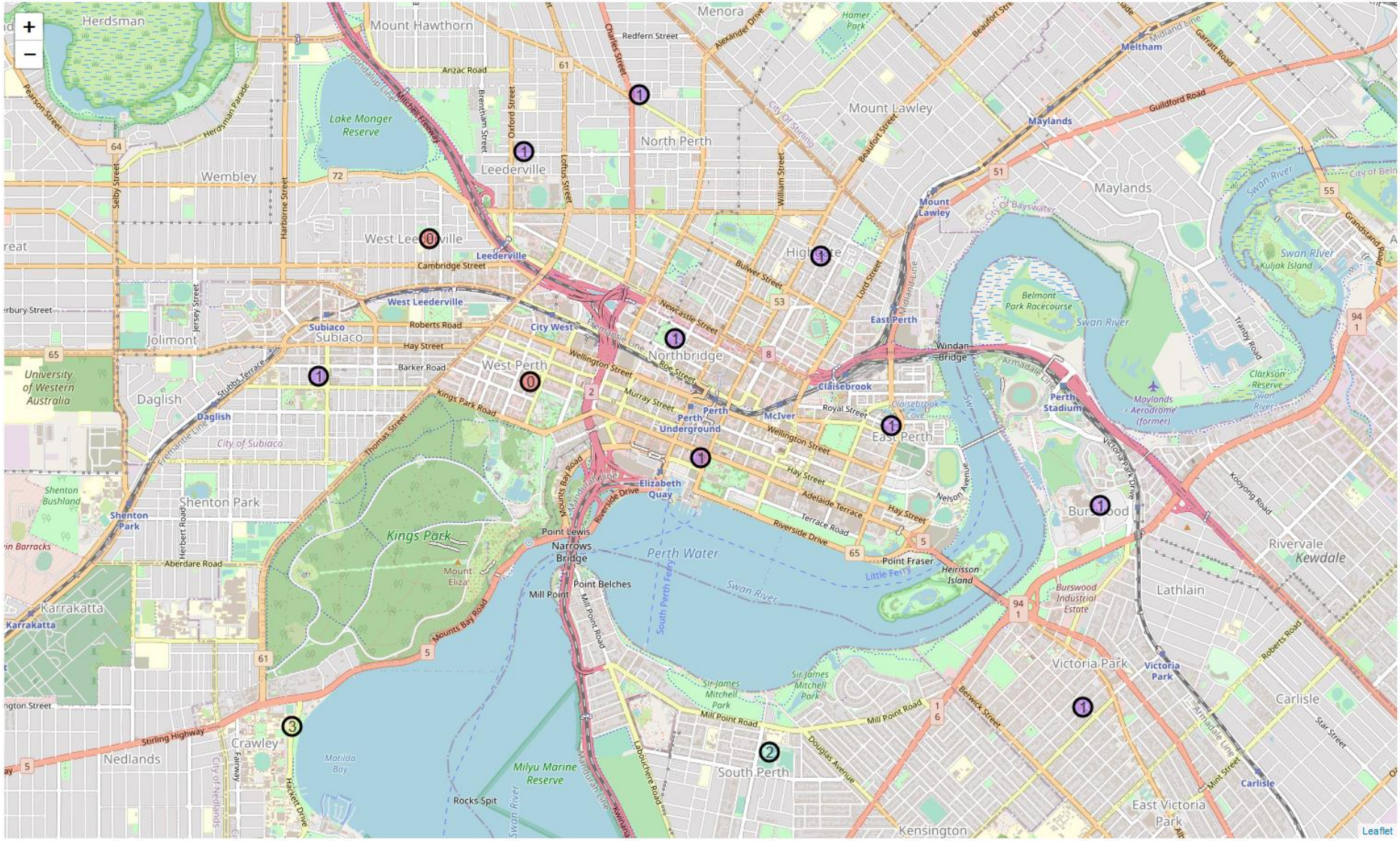
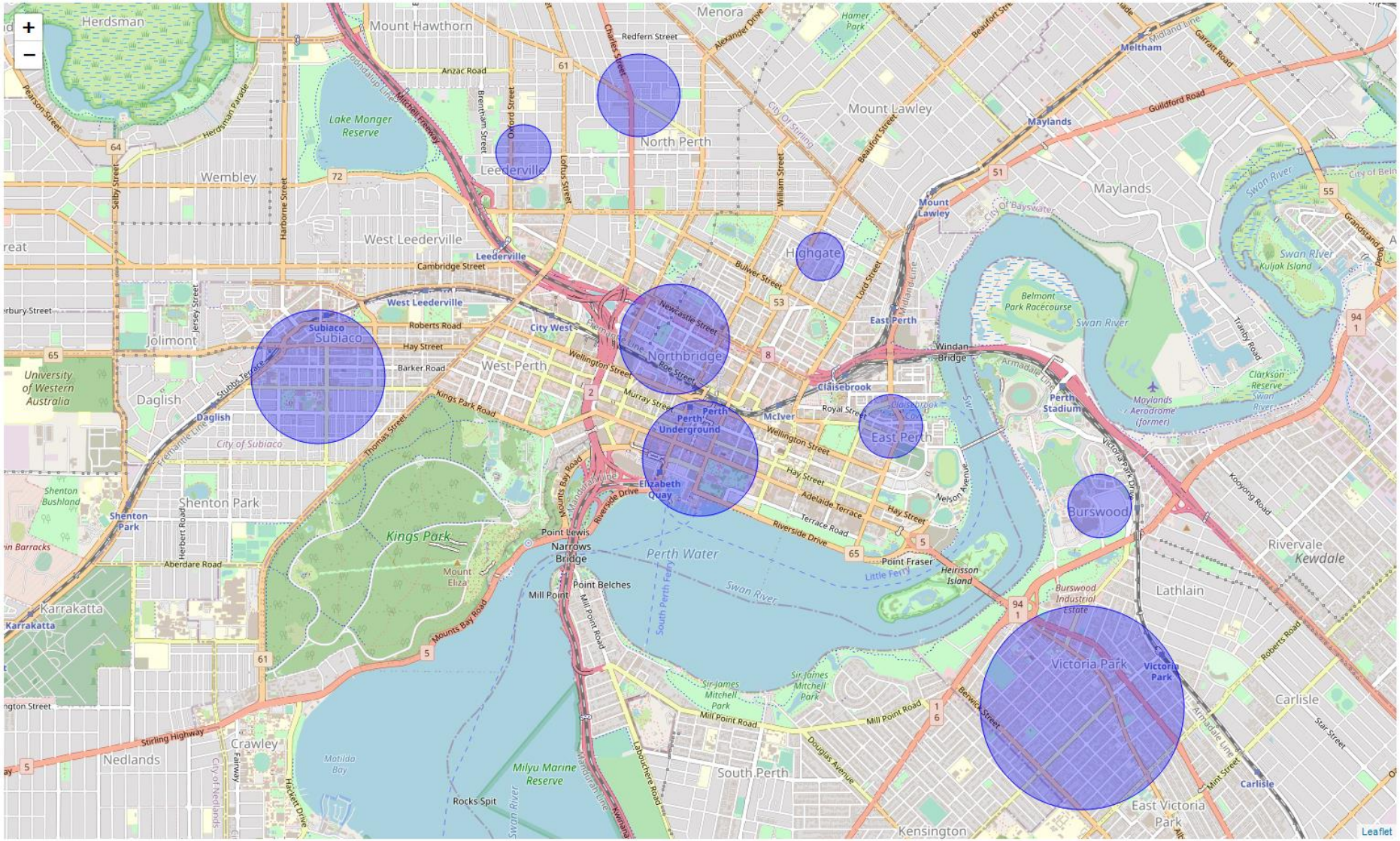


Table 4-4 Calculation of Asian Restaurant Proportion (Cluster 1 Only)

	Suburb	Asian Restaurant	Chinese Restaurant	Dim Sum Restaurant	Dumpling Restaurant	Indian Restaurant	Indonesian Restaurant	Japanese Restaurant	Korean BBQ Restaurant	Korean Restaurant	Malay Restaurant	Ramen Restaurant	Sushi Restaurant	Thai Restaurant	Vietnamese Restaurant	Total
0	Burswood	0.038462	0.038462	0.000	0.00	0.000000	0.000000	0.038462	0.000000	0.00	0.000000	0.000	0.000000	0.000000	0.000000	0.115385
1	East Perth	0.000000	0.000000	0.000	0.00	0.000000	0.000000	0.000000	0.038462	0.00	0.000000	0.000	0.038462	0.000000	0.038462	0.115385
2	Highgate	0.000000	0.000000	0.000	0.00	0.043478	0.043478	0.000000	0.000000	0.00	0.000000	0.000	0.000000	0.000000	0.000000	0.086957
3	Leederville	0.100000	0.000000	0.000	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000	0.000000	0.000000	0.000000	0.100000
4	North Perth	0.050000	0.000000	0.000	0.00	0.100000	0.000000	0.000000	0.000000	0.00	0.000000	0.000	0.000000	0.000000	0.000000	0.150000
5	Northbridge	0.000000	0.050000	0.025	0.00	0.025000	0.000000	0.025000	0.000000	0.00	0.000000	0.025	0.000000	0.000000	0.050000	0.200000
6	Perth	0.050000	0.000000	0.000	0.01	0.010000	0.000000	0.030000	0.010000	0.03	0.000000	0.010	0.020000	0.010000	0.030000	0.210000
7	Subiaco	0.054054	0.000000	0.000	0.00	0.054054	0.000000	0.081081	0.000000	0.00	0.000000	0.000	0.000000	0.027027	0.027027	0.243243
8	Victoria Park	0.037037	0.037037	0.000	0.00	0.037037	0.000000	0.074074	0.074074	0.00	0.037037	0.000	0.000000	0.037037	0.037037	0.370370

Figure 4-2 Bubble Plot of Asian Restaurant Proportion (Cluster 1 Only)



5.0 DISCUSSION

The Foursquare GET requests returned relatively few venues for Lathlain, Maylands and Nedlands (less than 10 venues each), which is why these suburbs were removed from further consideration. The lower venue count for these suburbs is understandable as the suburbs are on the fringes of the map (Lathlain to the east, Maylands to the northeast and Nedlands to the southeast) and see less commercial traffic.

Based on Table 4-4 and Figure 4-2, the suburbs that have the most Asian-type restaurants as a proportion of total venues are (in decreasing order):

1. Victoria Park (37% of venues)
2. Subiaco (24% of venues)
3. Perth (21% of venues)
4. Northbridge (20% of venues)

These suburbs should be given prime consideration for locating the new Asian restaurant due to their proven ability to support such businesses and the potential for increased competition to enlarge the size of the market. Suburbs with a lesser proportion of Asian restaurants (e.g. North Perth, East Perth and Burswood) or restaurants that are predominantly non-Asian (e.g. Highgate, where the most common type of restaurant is Mexican) can also be considered subject to further market research.

6.0 CONCLUSION

It is recommended that Victoria Park, Subiaco, Perth and Northbridge (in decreasing order of attractiveness) are considered for locating the new Asian restaurant.