Finding an optimal suburb to open Asian supermarket in Melbourne

Introduction: Business Problem

In this project we try to find an optimal suburb for a supermarket. This report is targeted to stakeholders interested in opening an Asian supermarket in Melbourne, the capital city of the State of Victoria in Australia.

According to a news report, the supermarket scene in Australia is very much dominated by two supermarket chains - Woolworths and Coles. In 2018, the two together had more than 60% market share. The remaining market share was shared among Aldi, IGA and other supermarkets. These supermarket chains often sell similar varieties of products and compete at prices, which is a strategy difficult for new market entrants to follow. However, if a supermarket can differentiate itself with a different range of products, it may be able to compete with those supermarket chains.

According to the 2016 Census, 16.3% of the Australian population had Asian ancestry. In Melbourne, 24.4% of the population had Asian ancestry. Therefore there is a market for Asian grocery. This project will look for a suburb to open an Asian supermarket to cater for this market.

In particular, we look for such a suburb with these criteria:

- the suburb has a high population
- the suburb has a low supermarket to population ratio
- the suburb has a high proportion of population with Asian ancestry

Data

In this project, we use suburbs to define our neighborhoods. In Australia, decisions about names and boundaries of suburbs are made by local councils, then approved by State governments.

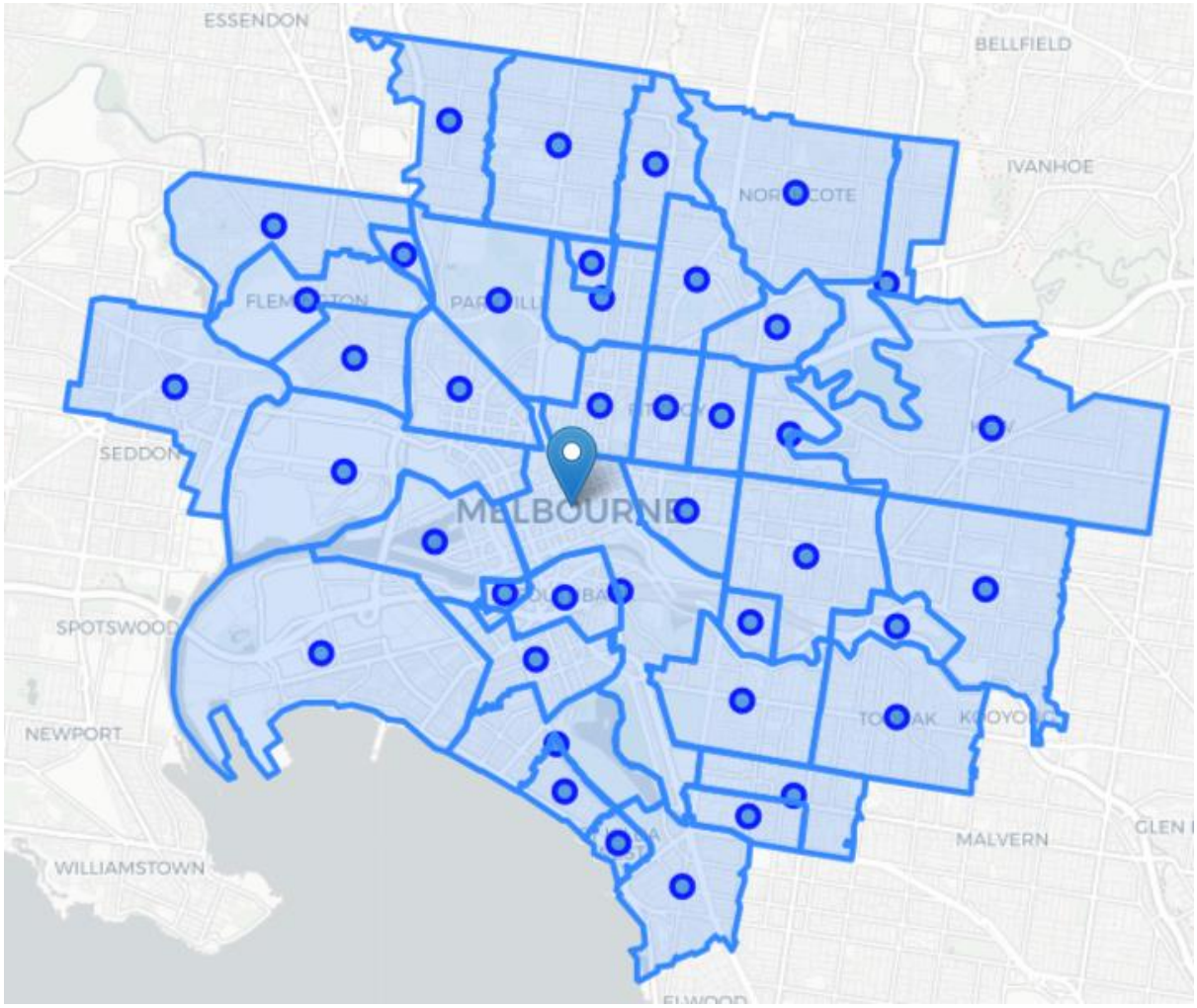
Based on the criteria set out to tackle our business problem, the following data sources were used to generate required information:

- suburb boundaries data of Victoria in the format of GeoJSON, produced by Department of Industry, Science, Energy and Resources, available at data.gov.au
- locations of existing supermarkets, obtained by using Foursquare API
- 2016 Census data, produced by Australian Bureau of Statistics

Suburb Boundaries

Suburb boundaries data were used to find suburbs which were within 5 km of Melbourne city centre. The result showed there were 41 such suburbs.

Centroids of the 41 suburbs were then computed, which were later used in Foursquare API searches.



Foursquare

Centroids of the 41 suburbs were used in Foursquare API to search for supermarkets nearby. A radius of 2 km and a limit of 50 were used in every search. As there was overlapping of search areas among

41 centroids, duplicate results were removed (according to id). Every supermarket was also checked against boundaries of the 41 suburbs, those outside boundaries were also removed.

Our searches found 108 supermarkets in the 41 suburbs. After further cleaning up, we have a dataframe as below:

	id	name	categories	suburb	postalCode	lat	lng	formattedAddress
0	55f76d71498e11ecf6921ecd	Woolworths Metro Swanston	Supermarket	MELBOURNE	3000	-37.813828	144.965938	[160 Swanston St, Melbourne VIC 3000, Australia]
1	4b7fbe7bf964a520d33b30e3	Coles	Supermarket	MELBOURNE	3008	-37.814913	144.952310	[201 Spencer St, Docklands VIC 3008, Australia]
2	5681d74c498e9e6f447639b5	Woolworths Metro	Supermarket	MELBOURNE	3000	-37.816746	144.964368	[60 Elizabeth St, Melbourne CBD VIC 3000, Aust...
3	4b058750f964a520728b22e3	Coles	Supermarket	MELBOURNE	3000	-37.817720	144.964749	[26 Elizabeth St (Btwn Flinders St & Flinders ...
4	4b1f5352f964a520802524e3	Coles Central	Supermarket	MELBOURNE	3000	-37.810299	144.963081	[Melbourne Central Shopping Centre (211 La Tro...

2016 Census - population data

Population data of suburbs from 2016 Census was imported. After some processing and cleaning, the dataframe looks like below:

	SSC_CODE_2016	Census_Name_2016	suburb	Total_Persons_Persons
0	SSC20002	Abbotsford (Vic.)	ABBOTSFORD	8184
1	SSC20017	Albert Park (Vic.)	ALBERT PARK	6215
2	SSC20074	Ascot Vale	ASCOT VALE	14750
3	SSC20359	Brunswick (Vic.)	BRUNSWICK	24473
4	SSC20360	Brunswick East	BRUNSWICK EAST	11504

2016 Census - ancestry data

Ancestry data of suburbs from 2016 Census was imported. The data was initially categorised in 9 regions: Oceanian, North-West European, Southern and Eastern European, North African and Middle Eastern, South-East Asian, North-East Asian, Southern and Central Asian, Peoples of the Americas, Sub-Saharan African.

As we are interested in Asian ancestry, we took regions South-East Asian, North-East Asian, Southern and Central Asian in our calculation. After some processing and cleaning, the dataframe looks like below:

	SSC (UR)	suburb	asian_1st_response	asian_2nd_response	asian_ancestry	total_individuals	asian_proportion
0	Abbotsford (Vic.)	ABBOTSFORD	1662	176	1838	8167	0.225052
1	Albert Park (Vic.)	ALBERT PARK	303	80	383	6214	0.061635
2	Ascot Vale	ASCOT VALE	1784	216	2000	14717	0.135897
3	Brunswick (Vic.)	BRUNSWICK	2807	425	3232	24455	0.132161
4	Brunswick East	BRUNSWICK EAST	1259	208	1467	11479	0.127799

Methodology

In this project we try to find an optimal suburb for opening an Asian supermarket in Melbourne, Australia. Such a suburb should have high population, low supermarket to population ratio, and high proportion of population with Asian ancestry. We limited our analysis to 5 km radius from Melbourne city centre.

In data section, we collected the following: boundaries of 41 suburbs within 5 km from Melbourne city centre, location information of every supermarket within the 41 suburbs (Foursquare API), population and Asian ancestry data of the 41 suburbs (2016 Census).

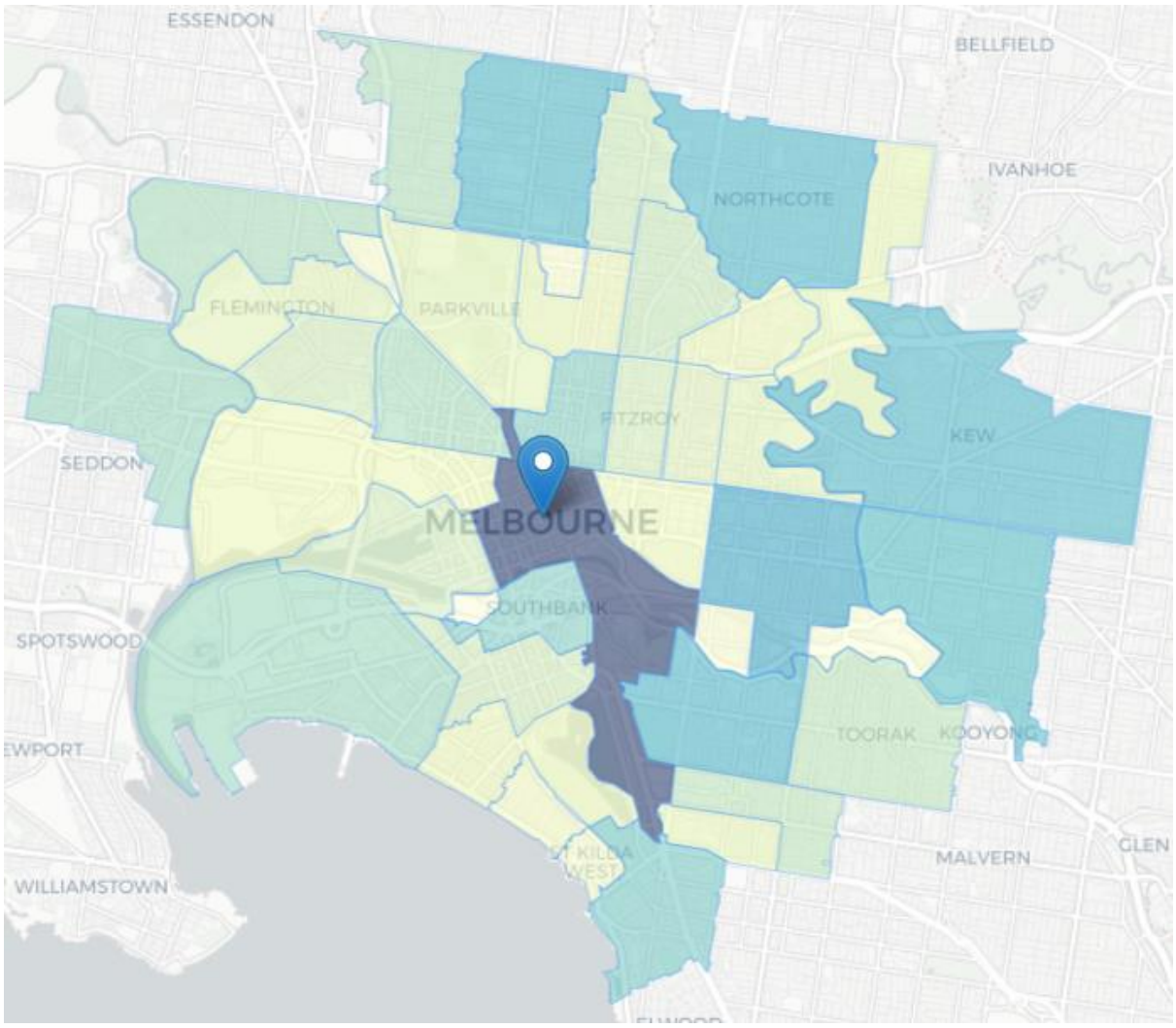
In analysis section, we will look at number of supermarkets, population, supermarket to population ratio, Asian ancestry proportion in each suburb. We will narrow down our choice to suburbs with sufficient population, then suburbs currently with low supermarket to population ratio, and lastly suburbs with high Asian ancestry population. This will ensure that there will be sufficient room for competition, and enough population to be our target customers.

Analysis

Some exploratory analysis was performed and some additional info was derived from our raw data.

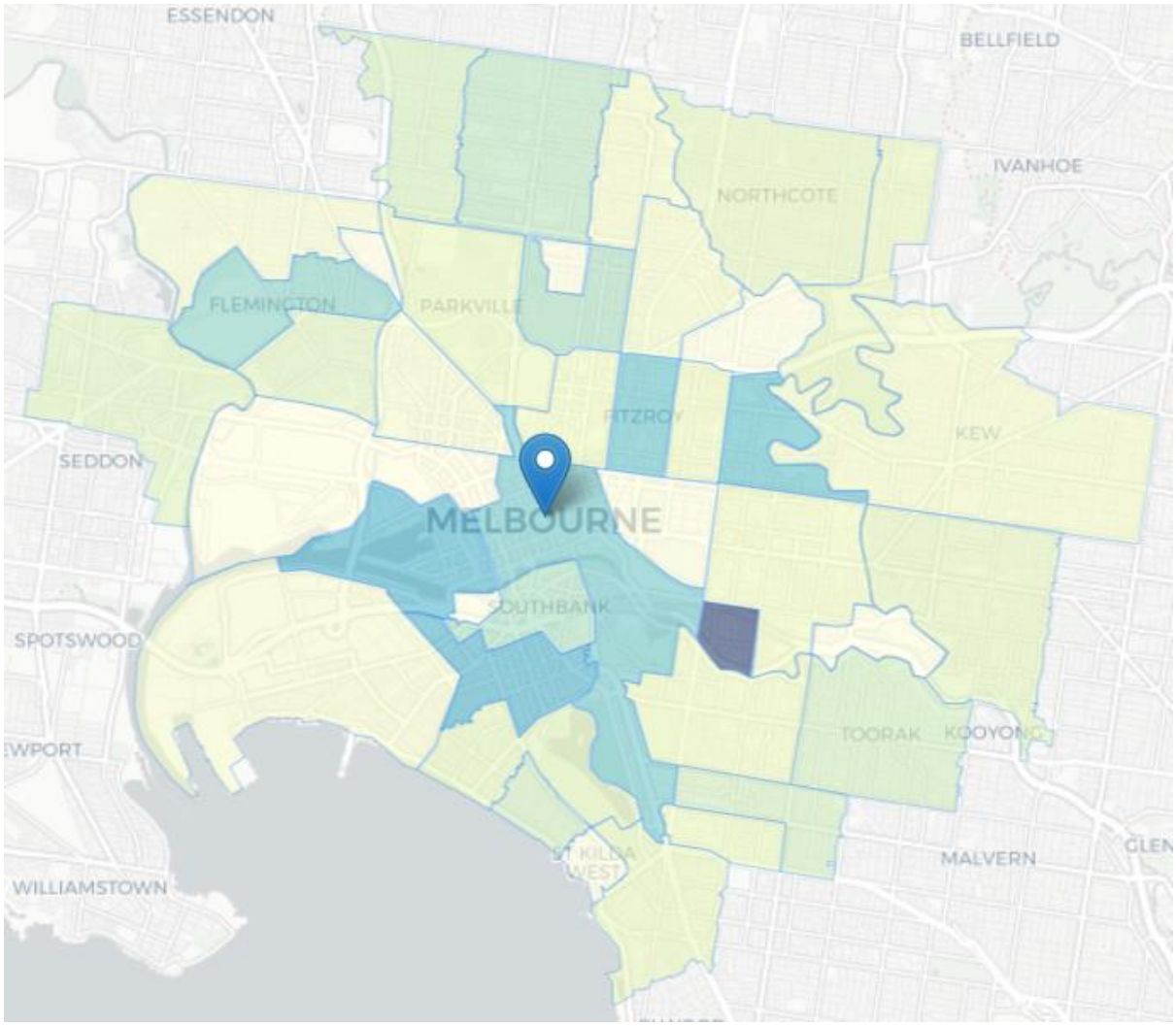
Number of supermarkets in each suburb was visualised on map:

Population was also visualised on map:

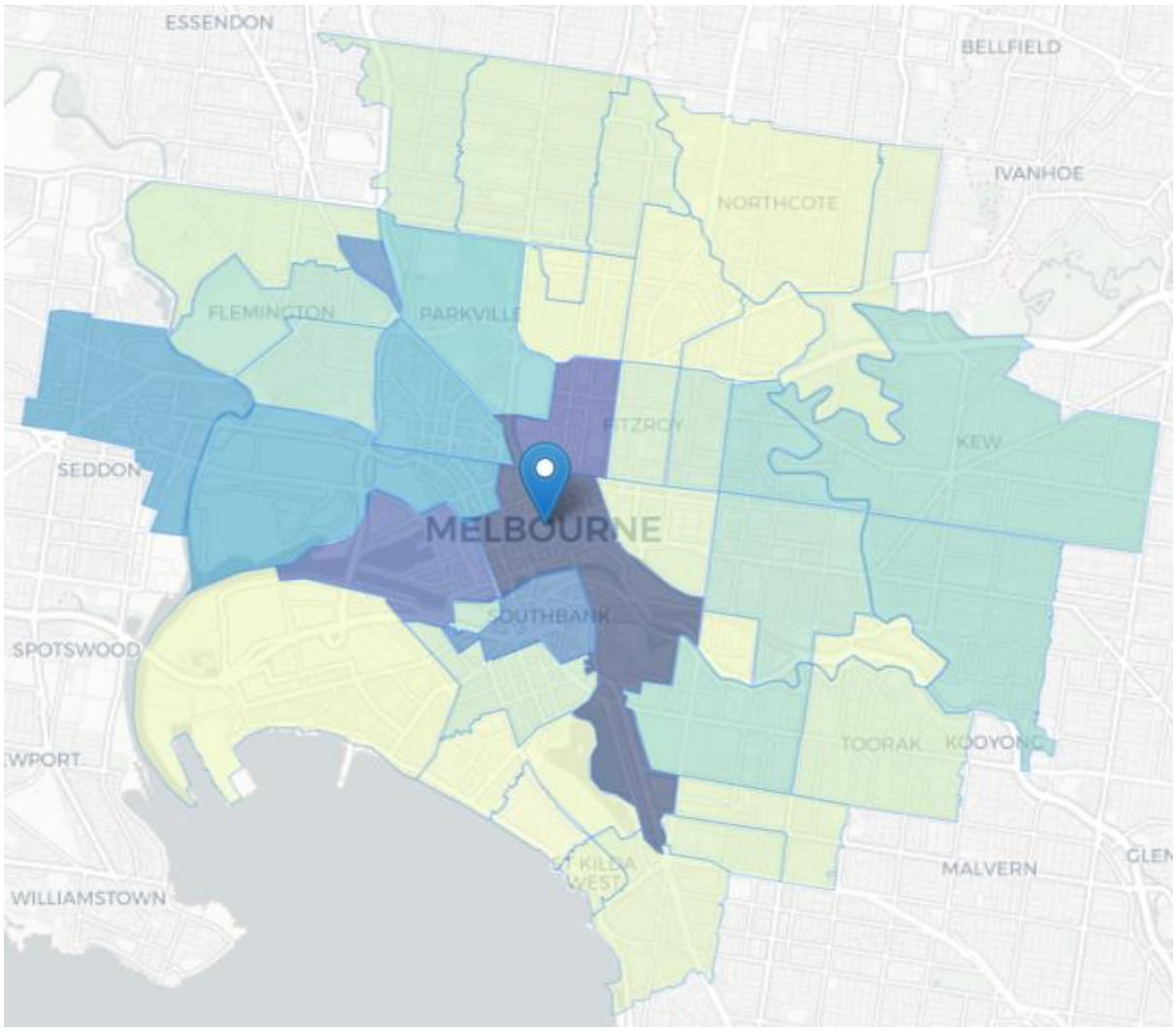


We then used our raw data to compute supermarket to population ratio and visualised the ratio on map:

	suburb	supermarket_to_population_ratio
0	BURNLEY	0.000000
1	WINDSOR	0.000137
2	PRINCES HILL	0.000000
3	DOCKLANDS	0.000547
4	CLIFTON HILL	0.000000


ESSENDON
BELLFIELD
IVANHOE
NORTHCOTE
FLEMINGTON
PARKVILLE
FITZROY
KEW
SEDDON
MELBOURNE
SOUTHBANK
SPOTSWOOD
TOORAK
MALVERN
WILLIAMSTOWN

Lastly, we also visualised the data of Asian ancestry proportion on map:



We then created a new dataframe containing data of population, supermarket to population ratio, and Asian ancestry proportion:

	suburb	Total_Persons_Persons	supermarket_to_population_ratio	asian_proportion
0	ABBOTSFORD	8184	0.000489	0.225052
1	ALBERT PARK	6215	0.000161	0.061635
2	ASCOT VALE	14750	0.000068	0.135897
3	BRUNSWICK	24473	0.000286	0.132161
4	BRUNSWICK EAST	11504	0.000087	0.127799

We looked at the descriptive statistics of the dataframe:

	Total_Persons_Persons	supermarket_to_population_ratio	asian_proportion
count	41.000000	41.000000	41.000000
mean	12531.902439	0.000197	0.192468
std	9329.088487	0.000202	0.134619
min	106.000000	0.000000	0.051728
25%	6300.000000	0.000068	0.092269
50%	10920.000000	0.000148	0.147868
75%	16345.000000	0.000241	0.221971
max	47285.000000	0.000991	0.578072

We looked for the best 5 suburbs to open an Asian supermarket based on the following:

- Population is equal to or higher than 10920, which is the median of the 41 suburbs
- Supermarket to population ratio is equal to or lower than 0.000148, which is the median of the 41 suburbs
- 5 suburbs with the highest Asian proportion after meeting the above 2 criteria

This is the results:

	suburb	Total_Persons_Persons	supermarket_to_population_ratio	asian_proportion
7	CARLTON	18535	0.000108	0.504290
24	NORTH MELBOURNE	14940	0.000067	0.332573
21	KEW	24605	0.000081	0.217153
33	SOUTH YARRA	25147	0.000119	0.201518
30	RICHMOND	27705	0.000108	0.190466

Results and Discussion

Our analysis has picked Carlton, North Melbourne, Kew, South Yarra, and Richmond as the best 5 suburbs among 41 suburbs within 5 km of Melbourne city centre to open an Asian supermarket. These suburbs all have relatively high population, low supermarket to population ratio, and high Asian proportion.

It is worth noting that we chose the median to filter suburbs on population and supermarket to population ratio. These choices were rather arbitrary. If different values were chosen for filtering, our results would be different. How large is required of a population to sustain one supermarket? This can only be answered by further market researches.

It should also be noted that our analysis only took number of supermarkets within suburbs, without regarding their exact locations. For sure, people living in small suburbs do shop at supermarket in neighboring suburbs. Hence a more detailed analysis should take note of the exact locations of supermarkets and also locations where the population resides within a suburb.

Conclusion

Purpose of this project was to identify an optimal suburb to open an Asian supermarket in Melbourne, Australia. We used population, supermarket to population ratio, Asian ancestry proportion as selection criteria. While we have picked the best 5 suburbs for our project, the exact location to open the supermarket will require further market researches by the stakeholders. These researches will need to look at the exact locations of existing supermarkets and where population resides in the suburb.