Possible Locations for an Italian Restaurant in Melbourne

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1. Introduction

1.1. Background

Melbourne is the cultural capital of Australia, known for its music, art centres and museums, and celebration and expression of art. Melbourne also has a very strong food culture. Melburnians are extremely diverse with all their dining selections, with cuisine from all over the world. If you are a true foodie who loves a good aesthetically pleasing meal, you will be in heaven exploring the food spots in Melbourne. From beautiful pizza and pasta in Carlton (Melbourne's version of Little Italy), to amazing sushi spots with fresh seafood caught hours prior, and vegan friendly cafes, there is a ton of variety that will keep you on your toes. The city takes its food culture very seriously and is constantly changing their menus to keep up with all the culinary trends.

1.2. Problem

With Carlton (Melbourne's version of Little Italy) being a suburb next to the Melbourne CBD, it is critical to identify a suitable location for an Italian restaurant, considering the established restaurants in this location. With difficulties that have eventuated from restrictions associated with COVID-19, it is imperative that a more suitable location to establish an Italian restaurant is identified. With a significant number of restaurants being in the CBD and surrounding suburbs, it will be important to identify locations that are not crowded with established restaurants, including locations that do not have any current Italian restaurants.

1.3. Interest

Key stakeholders that would be interested in understanding the outcome for this problem include:

- **Business Owners**: With the impact of restrictions associated with COVID-19, a business owner will be very interested in confirming that the location of their new restaurant will provide the optimal opportunity for success. If a restaurant is placed in the wrong location, where competing against other food service businesses, there is the possibility of the business failing.
- **Local and State Government Officials**: These officials will need to understand the optimal locations for businesses. As approval for businesses to operate in a location, these officials would want to understand if a type of business is proposing to enter an already saturated area.
- **Residential Tenants**: As part of the decision process on where people live, having access to a solution that highlights the businesses that are located in a particular area, may influence the location that these people choose to live.

2. Description of data and how used to solve the problem

Based on the definition of the problem to be solved, the following data, with how it will be used, is defined below:

- **Foursquare API** was used to identify the number of restaurants and their type and location in every neighbourhood.
- **Nominatim geocoding** was used to get the coordinates for Melbourne and the identified neighbourhood centres.
- **Nominatim reverse geocoding** was used to generate approximate addresses of neighbourhood centres.
- Accessed a json file from **VIC Suburb/Locality Boundaries** (https://data.gov.au/dataset/ds-dga-af33dd8c-0534-4e18-9245-fc64440f742e/details?q=) was used to draw the borders of City of Melbourne boroughs on the map.

3. Exploratory Data Analysis

3.1. Neighbourhood Candidates

To identify neighbourhood candidates, I needed to find latitude & longitude coordinates for centroids of our candidate neighbourhoods. There will also be a grid of cells covering the area of interest, which is approximately 12x12 kilometres, centered around City of Melbourne centre (Figure 1).

I'll create a grid of area candidates, equally spaced, centered around Melbourne city centre and within ~6km from Melbourne. The neighbourhoods will be defined as circular areas with a radius of 300 metres, so our neighbourhood centres will be 600 meters apart.

To establish the grid of cells, the first latitude & longitude details required are for Melbourne city centre. From these latitude & longitude details, a centralised address is defined using Nominatim geocoding.

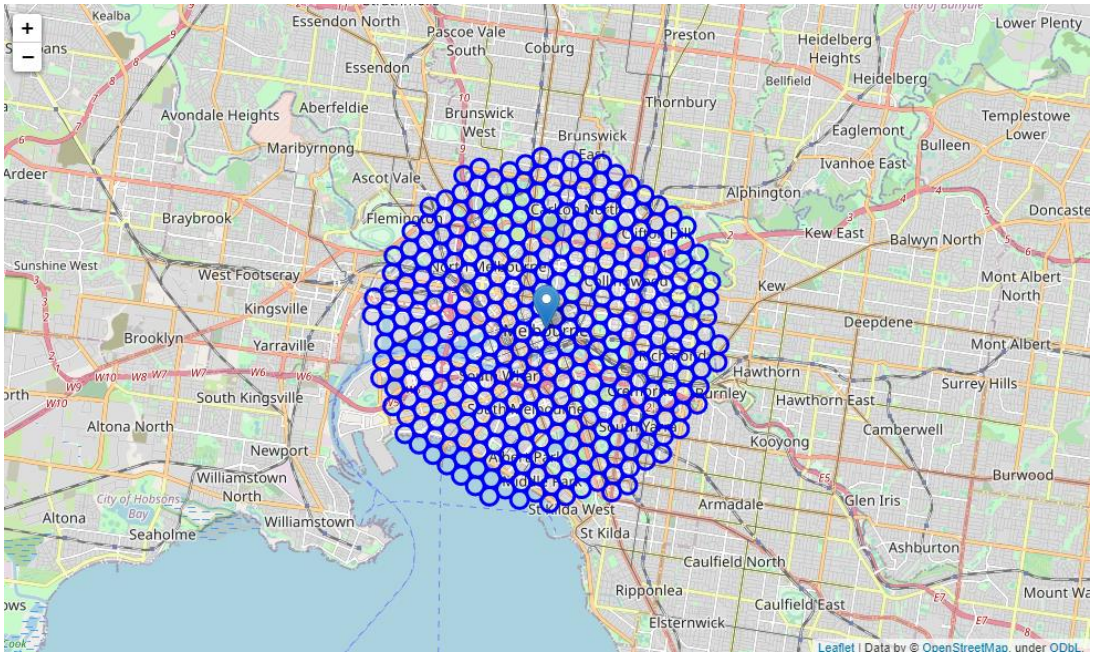

Figure 1 Grid of cells centred around City of Melbourne

3.2. Calculating Distances & Assigning Addresses of Areas

To accurately calculate distances, we need to create a grid of locations in Cartesian 2D coordinate system which allows us to calculate distances in metres (not in latitude/longitude degrees). Then project those coordinates back to latitude/longitude degrees to be shown on Folium map. So, I needed to create functions to convert between WGS84 spherical coordinate system (latitude/longitude degrees) and UTM Cartesian coordinate system (X/Y coordinates in metres).

With the coordinates of the centres of each neighbourhood/area in the grid of cells to be evaluated, equally spaced (distance from every point to its neighbours is the same) and within ~6km from Melbourne. Nominatim is used to get approximate addresses of those locations.

3.3. Identify Restaurants within the Area of Interest

Now that we have our location candidates, Foursquare API is used to get information on restaurants in each neighbourhood/area. We are interested in venues in the 'food' category, but only those that are proper restaurants – coffee shops, pizza places, bakeries etc. are not direct competitors, so we aren't interested in those. I will only include in the list only venues that have 'restaurant' in the category name, and I'll make sure to detect and include all the subcategories of specific the 'Italian restaurant' category, as the information on Italian restaurants is of interest within the neighbourhood/areas. Displayed on the map, is the collected restaurants – Blue, and shows Italian restaurants in a different colour – Red (Figure 2).

Key details identified from the collection of restaurant information includes:

- Total number of restaurants: 1,085
- Total number of Italian restaurants: 116
- Percentage of Italian restaurants: 10.69%
- Average number of restaurants in each neighbourhood/area: 3.92

We now have all the restaurants in the area of interest within a few kilometres from Melbourne, and we know which ones are Italian restaurants, including which restaurants exactly are in vicinity of every neighbourhood candidate centre.

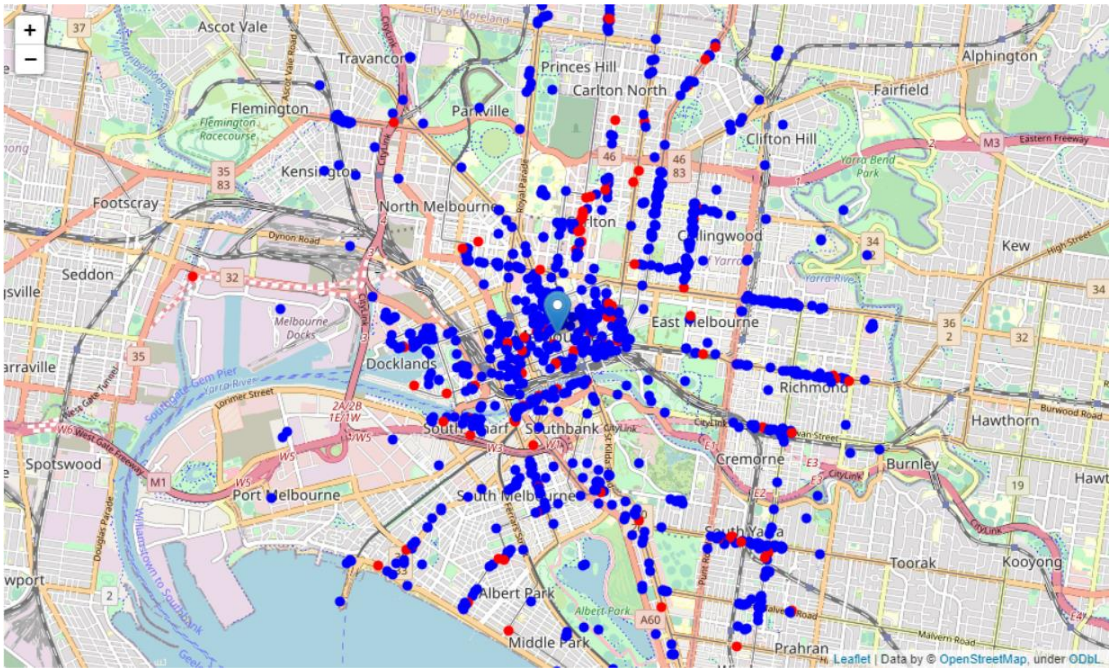

Figure 2 Restaurants – Blue and Italian Restaurants in a different colour – Red in area of interest

3.4. Analysis Methodology

The analysis will focus effort on detecting areas of the City of Melbourne region that have low restaurant density, particularly those with a low number of Italian restaurants. The analysis will be limited to an area of ~6km around the city centre.

The next step in the analysis will be the calculation and exploration of '**restaurant density**' across different areas of the City of Melbourne – I will use **heatmaps** to identify a few promising areas close to the centre with low numbers of restaurants in general (and no Italian restaurants in the vicinity) and focus attention on those areas.

In the final step, I will focus on the most promising areas and within those create **clusters of locations that meet some basic requirements** established in discussion with stakeholders: I will take into consideration locations with **no more than two restaurants in a radius of 250 metres**, and want locations **without Italian restaurants in a radius of 400 metres**. I will present a map of all such locations but also create clusters (using **k-means clustering**) of those locations to identify general zones / neighbourhoods / addresses which should be a starting point for final 'street level' exploration and search for optimal venue location by stakeholders.

3.5. Restaurant Density Heat Maps

On average, Italian restaurants can be found within ~900m from every area centre candidate. That's fairly close, so we need to filter our areas carefully. To be able to extract some meaningful information, a map showing heatmap / density of restaurants will be created. This map will also show borders of the City of Melbourne on the map and circles indicating distances of 1km, 2km and 3km from Melbourne.

The heat map in Figure 3, highlights the density of all restaurants. Looks like a few pockets of low restaurant density closest to city centre can be found north-west, east, and south-east from the City of Melbourne.

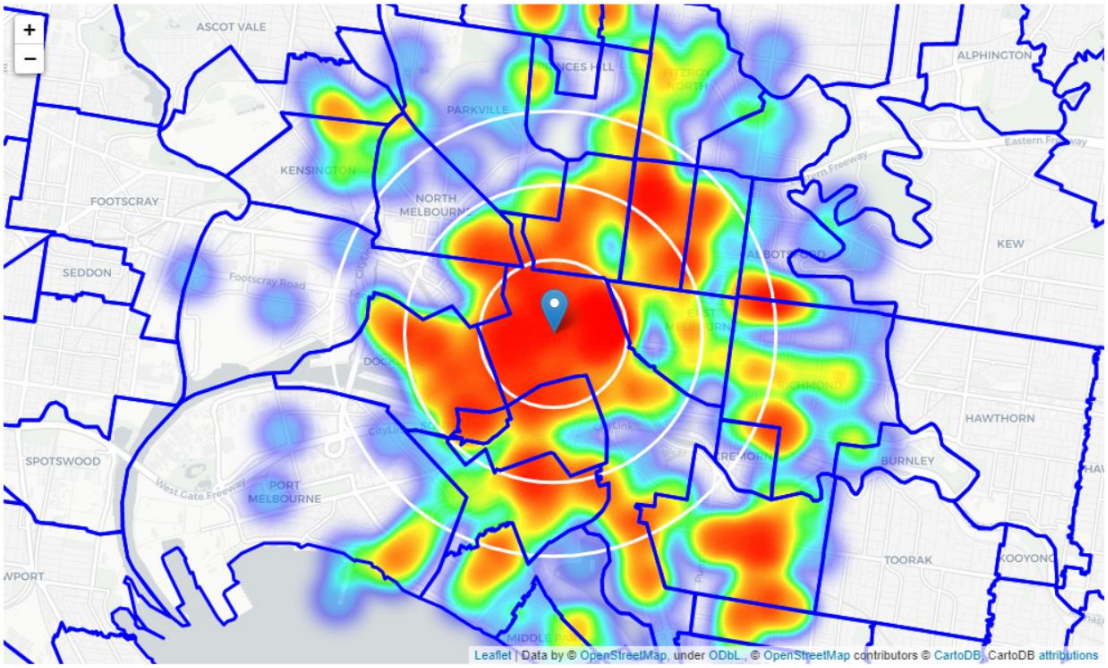

Figure 3 Restaurant Density Heat Map

The heat map in Figure 4, highlights the high density of restaurants in the Melbourne CBD, south and north-east of the CBD.

The heat map in Figure 4, highlights the density of Italian restaurants. This map is not so 'hot' (Italian restaurants represent a subset of ~10% of all restaurants in the City of Melbourne), but it also indicates higher density of existing Italian restaurants directly north and south from Melbourne, with closest pockets of low Italian restaurant density positioned north-west, north-east and south-east from the city centre.

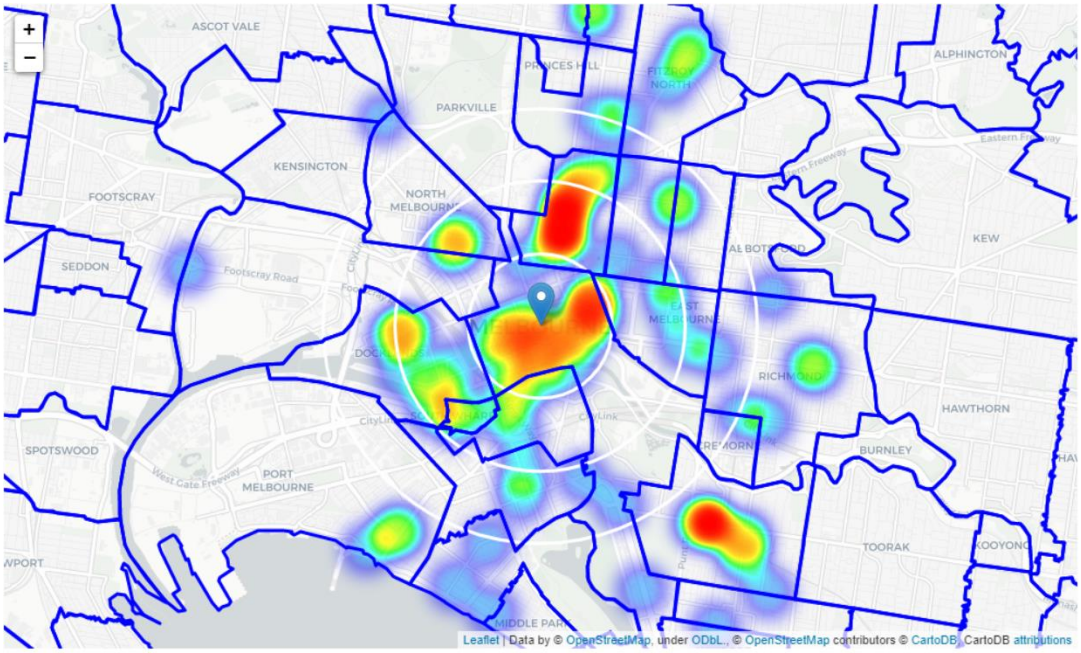

Figure 4 Italian Restaurant Density Heat Map

Based on this I will now focus analysis on areas north-west, north-east and south-east from central Melbourne – I will move the centre of the area of interest and reduce its size to have a radius of 2.5km. This places the location candidates mostly in boroughs Docklands and East Melbourne (another potentially interesting borough is Richmond with large low restaurant density south-east from the city centre, however this borough is less interesting to stakeholders as it's mostly a sports precinct that does not have consistent visitors throughout the week).

3.6. Docklands and East Melbourne

Analysis of popular web sites indicate that Docklands and East Melbourne are:

- **Docklands**: The myriad public artworks make for an inspiring breadcrumb trail on a stroll around the Docklands, where there's something for everyone from foodies to footy fans, excited kids and shoppers with keen eyes for a bargain.
- **East Melbourne**: Genteel East Melbourne is marked by stately Victorian terraces, art deco buildings and parks. Spring Street offers European-style cafes and glitzy musicals at the opulent Princess Theatre. Office workers lunch in sprawling Fitzroy Gardens, while the wide steps of nearby Parliament House are a popular meeting place.

"Docklands is a modern harbour development dominated by high-rises and the colourful Melbourne Star Observation Wheel, and popular for its shopping and waterside dining." (google.com)

"There's a smorgasbord of dining options at The District, Newquay, Victoria Harbour and Waterfront City, tucked in among the entertainment zone, beneath luxury apartments and lining the marina." (https://www.visitvictoria.com/Regions/Melbourne/Destinations/Docklands)

"East Melbourne is an established area to the east of the central city, home to many 19th century homes, iconic landmarks and the heritage listed Fitzroy, Treasury and Parliament gardens." (https://participate.melbourne.vic.gov.au/east-melbourne-profile?_ga=2.221333784.1881709526.1626002896-1518540431.1623374114)

"East Melbourne has long been home to many significant government, health and religious institutions, including the Parliament of Victoria and offices of the Government of Victoria in the Parliamentary and Cathedral precincts" (https://en.wikipedia.org/wiki/East_Melbourne,_Victoria)

Popular with tourists, office workers and hippies, relatively close to city centre and well connected, those boroughs appear to justify further analysis.

Let's define new, narrower regions of interest (Figure 5), which will include low-restaurant-count parts of Docklands and East Melbourne closest to Melbourne city centre. To cater for this narrower region, a denser grid of location candidates restricted to our new region of interest is required (let's make our location candidates 100m apart). This has created a region of interest with 2,261 candidate neighbourhood centres generated.

Figure 5 Narrower region of interest, including Docklands and East Melbourne

3.7. Potential Restaurant Locations

To identify potential restaurant locations, there is a requirement to identify those areas that meet the following criteria:

1. Locations with no more than two restaurants in radius of **250 metres**.
2. No Italian restaurants in a radius of 400 metres.

The results from applying these criteria, are as follows:

- Locations with no more than two restaurants nearby: 1,239.
- Locations with no Italian restaurants within 400m: 1,145.
- Locations with both conditions met: 866.

There are now a number of locations fairly close to Melbourne (mostly in Docklands, East Melbourne and north of the city centre), and we know that each of those locations has no more than two restaurants in a radius of 250m, and no Italian restaurant closer than 400m. Any of those locations is a potential candidate for a new Italian restaurant, at least based on nearby competition.

Those potential locations are shown in the form of a heatmap (Figure 6).

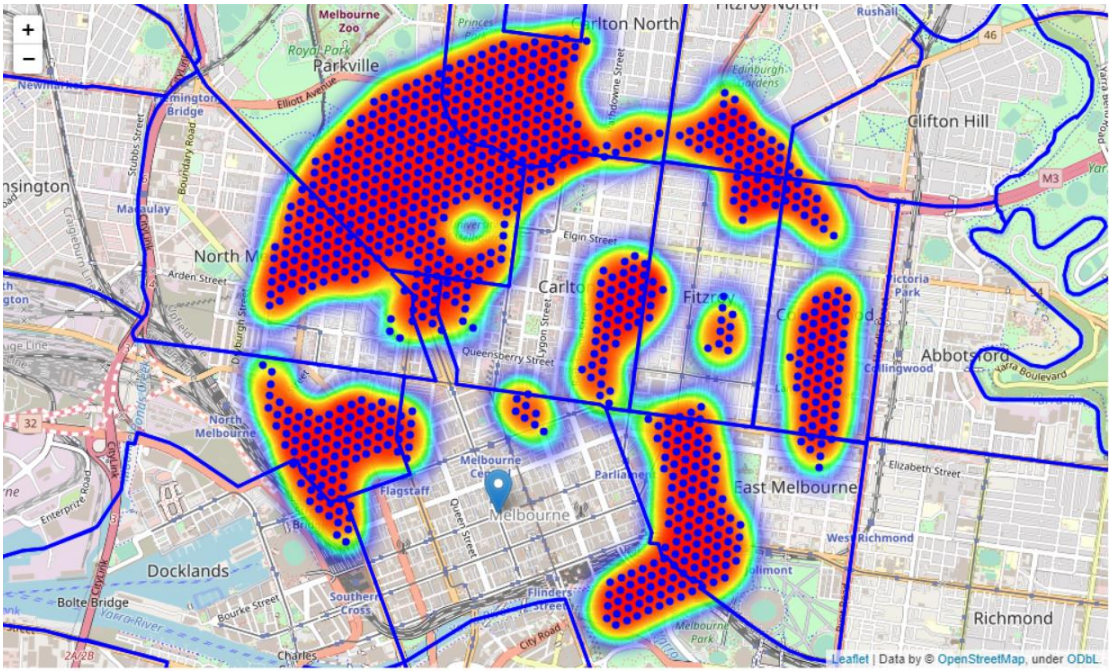

Figure 6 Potential Candidate for a New Italian Restaurant

3.8. Centres of Zones Containing Good Locations

What is defined now is a clear indication of zones with low numbers of restaurants in the vicinity, and no Italian restaurants at all nearby.

To create centres of zones containing good location, clustering of those locations is required (Figure 7). Those zones, their centres and addresses will be the final result of the analysis.

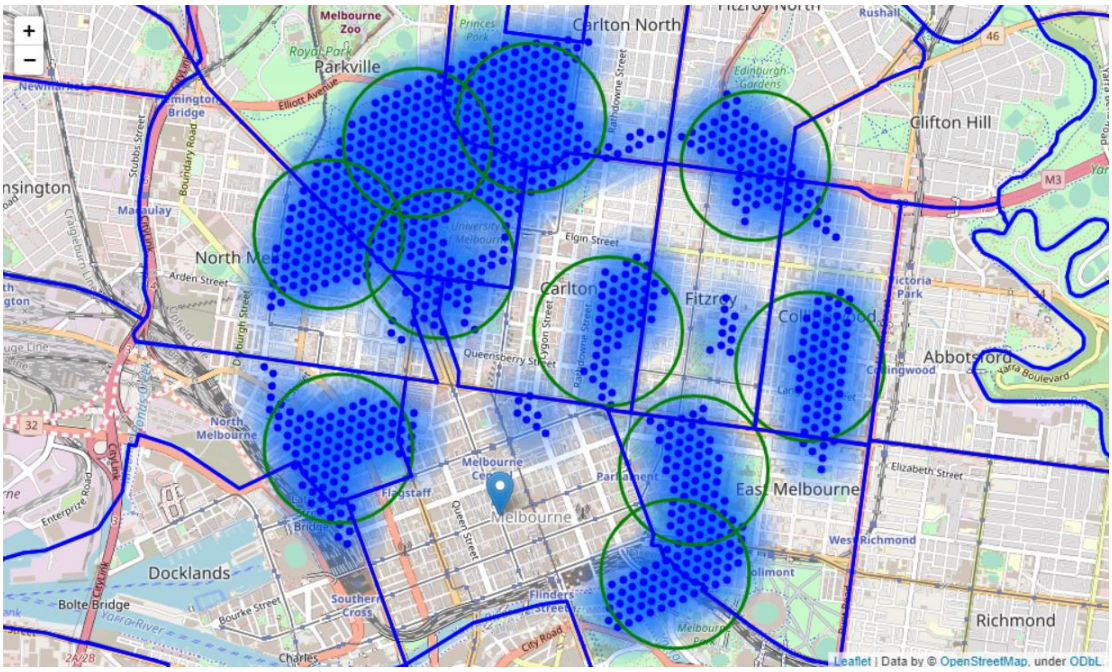

Figure 7 Clustering of Zones Containing Good Location

The clusters represent groupings of most of the candidate locations and cluster centres are placed nicely in the middle of the zones 'rich' with location candidates.

3.9. Addresses of Centres of Areas Recommended for Further Analysis

Addresses of those cluster centres will be a good starting point for exploring the neighbourhoods to find the best possible location based on neighbourhood specifics.

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Addresses of centres of areas recommended for further analysis
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Lansdowne Street, East Melbourne, Melbourne, City of Melbourne, Victoria, 3002, Australia	=>	1.7km from Melbourne
East West Link (Stage 1), Clifton Hill, Fitzroy, Melbourne, City of Yarra, Victoria, 3065, Australia	=>	3.2km from Melbourne
Flagstaff City Inn, 45, Dudley Street, West Melbourne, North Melbourne, Melbourne, City of Melbourne, Victoria, 3003, Australia	=>	1.5km from Melbourne
33 Cliveden Close, East Melbourne, Melbourne, City of Melbourne, Victoria, 3000, Australia	=>	1.6km from Melbourne
Center Avenue, Carlton North, Princes Hill, Melbourne, City of Melbourne, Victoria, 3054, Australia	=>	3.4km from Melbourne
MB Armistice, 163-165R, Alexandra Parade, Fitzroy North, Melbourne, City of Yarra, Victoria, 3068, Australia	=>	3.7km from Melbourne
Mercure North Melbourne, Harker Street, Hotham Hill, North Melbourne, Melbourne, City of Melbourne, Victoria, 3051, Australia	=>	2.8km from Melbourne
Melbourne Museum, 11, Nicholson Street, Melbourne Innovation District, Carlton, Fitzroy, Melbourne, City of Melbourne, Victoria, 3053, Australia	=>	1.8km from Melbourne
National Storage, 110, Wellington Street, Collingwood, Melbourne, City of Yarra, Victoria, 3066, Australia	=>	2.9km from Melbourne
University of Melbourne, Grattan Street, Melbourne Innovation District, Parkville, Carlton, Melbourne, City of Melbourne, Victoria, 3010, Australia	=>	2.2km from Melbourne

To represent locations that can be presented to interested stakeholders, reverse geocode those candidate area centres to get the addresses recommended for further in person analysis.

3.10. Locations Representing Centres of Zones

In Figure 8, I have created 10 addresses representing centres of zones containing locations with low number of restaurants and no Italian restaurants nearby, all zones being fairly close to the city centre (all less than 4km from Melbourne city centre, and about half of those less than 2km from Melbourne city centre). Although zones are shown on the map with a radius of ~500 meters, their shape is actually very irregular and their centres/addresses should be considered only as a starting point for exploring area neighbourhoods in search for potential restaurant locations. Most of the zones are located in Docklands, and East Melbourne boroughs, which we have identified as interesting due to being popular with tourists and office workers, fairly close to the city centre and well connected by public transport.

Figure 8 Locations Representing Centres of Zones

4. Results

Our analysis shows that although there is a great number of restaurants in Melbourne (~1,000 in our initial area of interest which was 12x12km around Melbourne city centre), there are pockets of low restaurant density fairly close to city centre. Highest concentration of restaurants was detected in the city centre, north-east and south from Melbourne, so I focused my attention to areas north-west, north-east and south-east from the city centre, corresponding to boroughs Docklands, East Melbourne and north of central Melbourne. Another borough was identified as potentially interesting (Richmond, south-east from central Melbourne), but our attention was focused on Docklands and East Melbourne which offer a combination of popularity among tourists, closeness to city centre, strong socio-economic dynamics and several pockets of low restaurant density.

After directing our attention to this narrower area of interest (covering approx. 5x5km around central Melbourne) we first created a dense grid of location candidates (spaced 100m apart); those locations were then filtered so that those with more than two restaurants in radius of 250m and those with an Italian restaurant closer than 400m were removed.

Those location candidates were then clustered to create zones of interest which contain the greatest number of location candidates. Addresses of centres of those zones were also generated using reverse geocoding to be used as markers/starting points for more detailed local analysis based on other factors.

The result of all this is 10 zones containing the largest number of potential new restaurant locations based on number of and distance to existing venues - both restaurants in general and Italian restaurants particularly. This, of course, does not imply that those zones are actually optimal locations for a new restaurant. The purpose of this analysis was to only provide info on areas close to central Melbourne, but not crowded with existing restaurants (particularly Italian) - it is entirely possible that there is a very good reason for a small number of restaurants in any of those areas, reasons which would make them unsuitable for a new restaurant regardless of lack of competition in the area. Recommended zones should therefore be considered only as a starting point for more

detailed analysis which could eventually result in locations which have not only no nearby competition, but also other factors considered and all other relevant conditions met.

5. Discussion

Locations that were noted, but detailed analysis was considered, included:

- **Carlton** – With Carlton commonly regarded as Melbourne's version of Little Italy, this location and areas in close proximity were not considered as potential viable locations. This was as a result of there established Italian restaurants in this area. With established restaurants in this area, patrons would have already established restaurants that they have attended and enjoyed. This has the potential for any new restaurants entering that area being unable to attract sufficient patronage to make placing a restaurant in that location viable.
- **South-east from the city centre** – although there is a potential location identified in a south-east location from the city centre, this will be less interesting as a potential location. In this location is the Melbourne Sports and Entertainment Precinct. This is located in the suburbs of Melbourne and Jolimont, near East Melbourne and Richmond. As this area would have sporadic events occurring, it would be less attractive to potential stakeholders as visitors to this location would not be consistent throughout the week or at other times throughout the year.

6. Conclusion

The purpose of this analysis was to identify Melbourne areas close to the city centre with a low number of restaurants (particularly Italian restaurants) in order to aid stakeholders in narrowing down the search for optimal locations for a new Italian restaurant. By calculating restaurant density distribution from Foursquare data, I have first identified general boroughs that justify further analysis (Docklands and East Melbourne), and then generated extensive collection of locations which satisfy some basic requirements regarding existing nearby restaurants. Clustering of those locations was then performed to create major zones of interest (containing the greatest number of potential locations) and addresses of those zone centres were created to be used as starting points for final exploration by stakeholders.

The final decision on optimal restaurant location will be made by stakeholders based on specific characteristics of neighbourhoods and locations in every recommended zone, taking into consideration additional factors like attractiveness of each location (proximity to park or water), levels of noise / proximity to major roads, real estate availability, prices, social and economic dynamics of every neighbourhood etc.