Data science study on popular food venues in Singapore

Determining the best location to open a food venue and the type of cuisine to be offered

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1.   Introduction

1.1   Food is the lifeblood of Singapore. As a cosmopolitan city with a strong local cuisine, Singaporeans have always been eager and willing to try new cuisines and spend on food experiences. Opening a restaurant or food venue in Singapore is thus a strong business prospect. However, the food and beverage scene is also extremely competitive and many businesses compete for custom. A keen understanding and appreciation of the industry, especially acute knowledge of the type of cuisines that are popular and their geographical spread, is essential to creating and maintaining a thriving business in this industry.

1.2   This data science study maps out popular food venues in Singapore based around the train stations in Singapore. Food venues around such transport hubs tend to be favoured for its accessibility. It uses k-means clustering to search for patterns in popularity of cuisines and types of food venues across various neighbourhoods in Singapore, determining the best location to open a food venue and the type of cuisine that should be offered to maximise custom and thus profitability.

1.3   The study reaches the following conclusions:

1.3.1   Chinese food is extremely popular across the nation, especially in the suburbs, and a Chinese food venue is likely to do well.

1.3.2   Indian food tends to be concentrated in and around Little India in Singapore but are also moderately successful in the suburbs.

1.3.3   Japanese food and cafes are very popular in downtown Singapore and affluent

neighbourhoods.

1.3.4   Food courts are popular almost everywhere and any new food venue should be concerned with distinguishing itself from such venues, which prize affordability and variety over quality and focus.

2.   Data

2.1   The data involved in this project comprised:

2.1.1   Locations of all the subway train stations in Singapore (i.e. Mass Rapid Transit or MRT systems, hereinafter referred to as "train station(s)" or "area(s)"), with their longitude and latitude. This was taken from a Kaggle dataset and includes all train stations built and operating in 2019.[1] Train stations in Singapore are a good representation of the various neighbourhoods in the country because:

(A)   they are located all around the country;

(B)   food venues near train stations tend to be more popular as they are more easily accessible; and

(C)   there are more train stations in more densely populated areas in the country, which is also where food venues would be more popular.

2.1.2   Types of the top food venues within a 500m radius of each train station. This was obtained from the Foursquare API.

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[1]   Available from https://www.kaggle.com/yxlee245/singapore-train-station-coordinates (accessed 20 March 2020).

3.   Methodology

3.1   The study took the following approach.

3.2   **Obtaining train station locations**

3.3   First, the locations of all the train stations in Singapore were ascertained through the Kaggle dataset. LRTs (or Light Rapid Transit stations) were removed from the dataset as they were intended to serve residents in the specific area of the main train station and thus were already accounted for by the inclusion of the main train station e.g. Punggol.

3.4   **Obtaining top food recommendations**

3.5   Second, the Foursquare API was used to obtain the top food recommendations within a 500m radius of each station. This is on the assumption 500m is a reasonable maximum distance that a customer would walk from the train station to a specific food venue. The dataset was then explored by

3.6   **Searching for patterns from the dataset**

3.7   Third, K-means clustering was used to group the data into six clusters and each group was then evaluated based on their top cuisines and food venues.
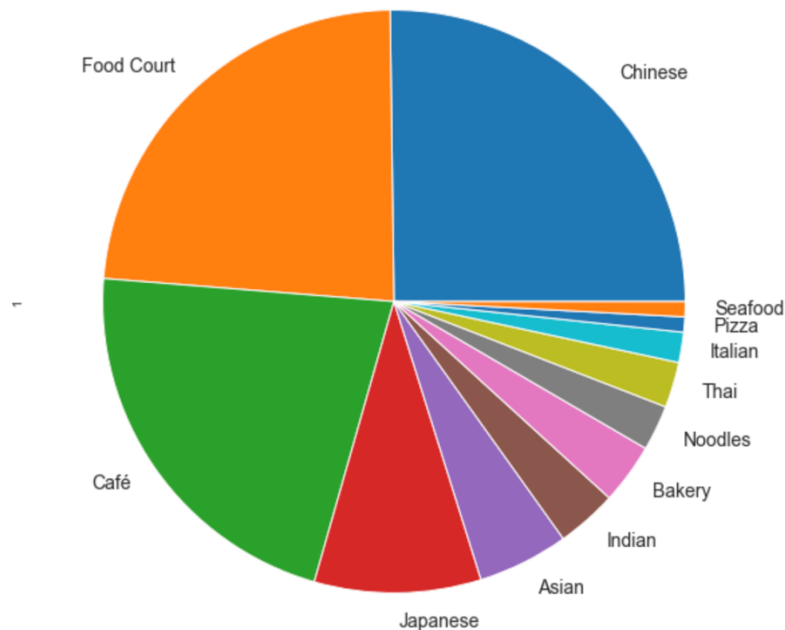
4.   Results

4.1   Exploring the top food venues in Singapore

4.2   The top food venues around each train station obtained from the Foursquare API were compiled. As seen in the table below, the top cuisine was Chinese, followed closely by food courts (which offer a variety of local and foreign cuisines).
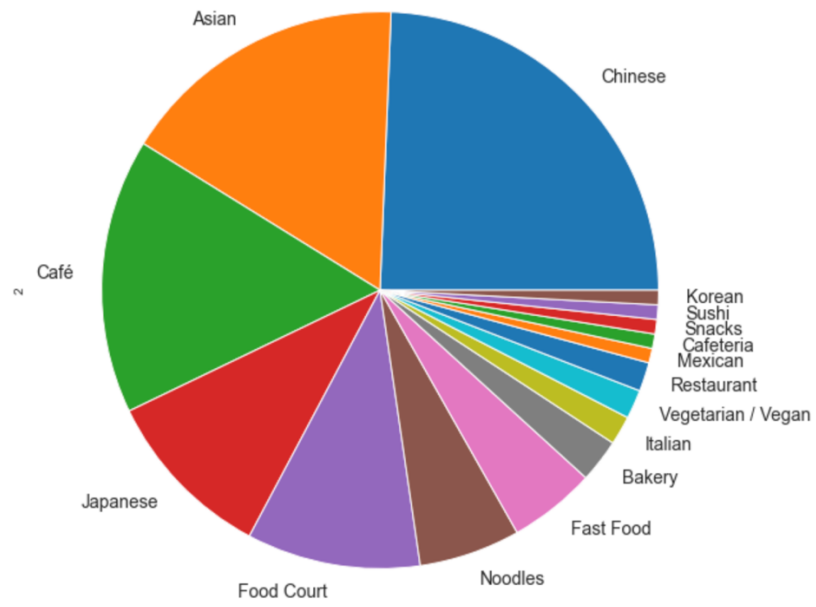
    4.2.1   Out of 118 train stations, Chinese food was in the top three most popular food venues in 71 of them (i.e. around 60% of all areas).

    4.2.2   Other popular cuisines include Asian food (Japanese, Korean, Thai) and Italian food. Cafes (cuisine indeterminate) were also very popular.
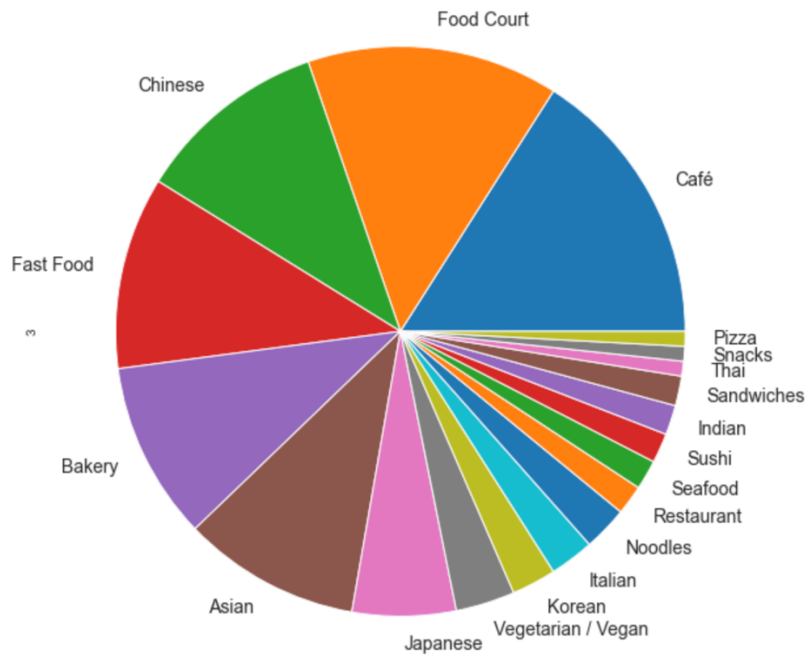
Most popular food venue across all areas

Second most popular food venue across all areas

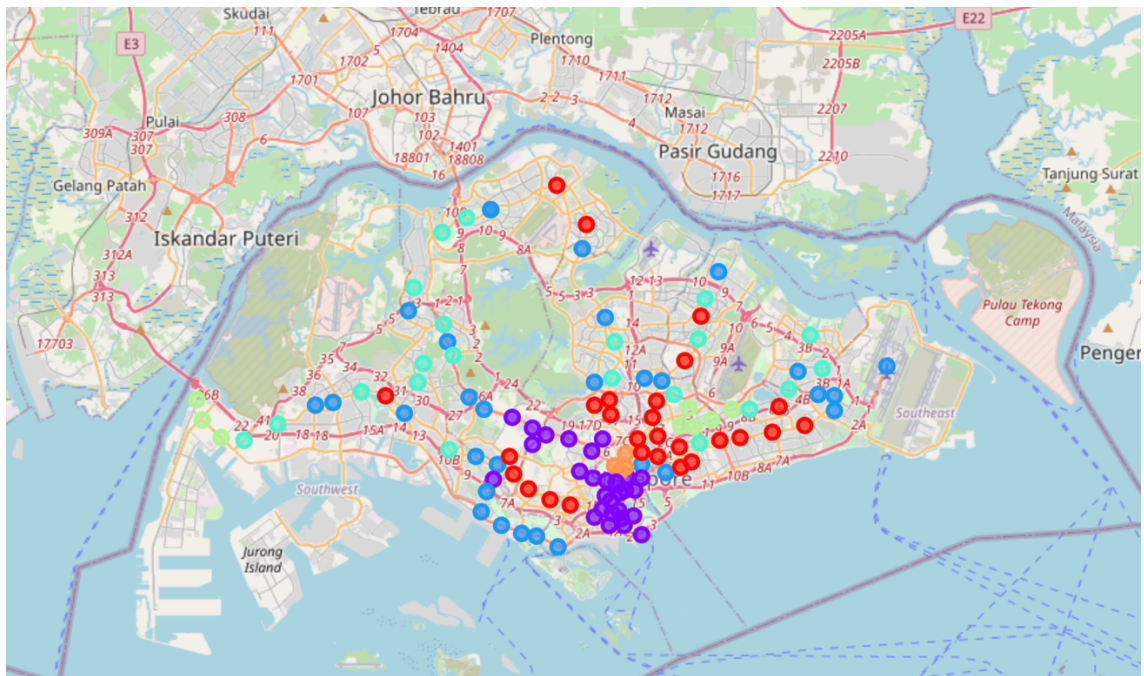Third most popular food venue across all areas

4.3   **Observing patterns between areas in Singapore**

4.4   Next, k-means clustering was used to group various areas together depending on the popular cuisines and food venues in that area. Six clusters were obtained.

4.5   As shown in the map below, there were three clusters that were also geographically clustered (reflected in orange, green and purple), around central and central-east Singapore, whereas the other three were spread out across the suburbs in Singapore outside the central area.

<u>Clusters spread geographically across Singapore</u>

4.6   The top cuisines for each cluster were identified and are summarised in the table below (food venues in each field sorted from most to least popular):

Most popular food venues in each cluster

Cluster	Areas	Most popular food venue	2nd most popular food venue	3rd most popular food venue
0	Jurong East, Novena, Newton, Dhoby Ghaut, Marina Bay, Dover, Expo, Changi Airport, Lorong Chuan, Botanic Gardens, one-north, Kent Ridge, Haw Par Villa, Pasir Panjang, Bayfront, Beauty World, Downtown, Bencoolen, Upper Changi	Café, Japanese, Chinese	Chinese, Japanese, Asian, Café, Sushi, Mexican	Chinese, Japanese, Food Court, Fast Food, Bakery, Sandwiches, Asian, Restaurant, Korean
1	Braddell, Chinese Garden, Commonwealth, Redhill, Tiong Bahru, Aljunied, Eunos, Kembangan, Tanah Merah, Boon Keng, Potong Pasir, Woodleigh, Mountbatten, Dakota, Bendemeer, Geylang Bahru, Mattar, Bedok Reservoir	Chinese, Noodles, Food Court	Asian, Food Court, Noodles, Chinese, Vegetarian/Vegan, Café	Food Court, Asian, Café, Vegetarian/Vegan, Noodles, Indian, Chinese, Bakery
2	Bukit Batok, Choa Chu Kang, Sembawang, Yishun, Khatib, Bishan, Toa Payoh, Pioneer, Boon Lay, Queenstown, Lavender, Kallang, Paya Lebar, Bedok, Simei, Tampines, Pasir Ris, HarbourFront, Serangoon, Kovan, Hougang, Sengkang, Punggol, Stadium, Marymount, Caldecott, Holland Village, Labrador Park, Telok Blangah, Cashew, King Albert Park, Tampines East	Chinese, Food Court, Café, Asian, Thai, Bakery, Noodles, Japanese, Pizza	Chinese, Food Court, Café, Noodles, Japanese, Bakery, Snacks, Asian, Fast Food, Restaurant, Korean	Fast Food, Food Court, Bakery, Café, Asian, Snacks, Chinese, Seafood, Noodles, Japanese, Indian, Sandwiches

3	Little India, Farrer Park, Rochor, Jalan Besar	Indian	Chinese, Vegetarian/Vegan, Café	Café, Vegetarian/Vegan
4	Orchard, Somerset, City Hall, Raffles Place, Marina South Pier, Buona Vista, Outram Park, Tanjong Pagar, Bugis, Chinatown, Clarke Quay, Bras Basah, Esplanade, Promenade, Nicoll Highway, Farrer Road, Sixth Avenue, Tan Kah Kee, Stevens, Telok Ayer, Fort Canning	Japanese, Café, Italian, Bakery, Seafood, Chinese, Thai	Café, Japanese, Chinese, Italian, Restaurant, Bakery	Chinese, Italian, Japanese, Bakery, Café, Korean, Vegetarian/Vegan, Food Court
5	Bukit Gombak, Yew Tee, Kranji, Marsiling, Woodlands, Admiralty, Yio Chu Kang, Ang Mo Kio, Tuas Link, Tuas West Road, Tuas Crescent, Gul Circle, Joo Koon, Lakeside, Clementi, Buangkok, MacPherson, Tai Seng, Bartley, Bukit Panjang, Hillview, Ubi, Kaki Bukit, Bedok North, Tampines West	Food Court, Asian	Asian, Chinese, Fast Food, Noodles, Food Court, Café, Cafeteria	Café, Asian, Fast Food, Sushi, Chinese, Vegetarian/Vegan, Noodles, Pizza, Bakery, Seafood, Restaurant, Food Court, Thai

5. Discussion

5.1   Four salient patterns can be identified for further exploration and analysis.

5.2   Popularity of Chinese food: First, Chinese food is extremely popular across all areas in the country. As mentioned above, in 60% of Singapore, Chinese food falls within the top three most popular food venues and cuisines. This suggests that a Chinese food venue would attract significant custom in most parts of Singapore. This is not surprising given Singapore's demographics – Chinese Singaporeans make up 76.2% of the population.

5.3   More specifically, Chinese food is most popular in the suburbs (see Clusters 1 and 2) and less popular in the central area (Cluster 4). This is unsurprising given that there tends to be more variety in cuisine in the central area given the foot traffic and the business crowd.

5.4   Indian food is concentrated around Little India and the suburbs: Cluster 3 identifies four train stations where Indian food is most popular. Geographically, this tracks four contiguous areas in and around Little India in Singapore, which one might expect. Outside of this area, Indian food is also popular (within the top 5) in suburban areas such as Tampines West, Clementi, Kovan, Buangkok, Bedok, Holland Village, Kent Ridge, and Ang Mo Kio. This suggests that outside of Little India, if a restaurateur intends to open an Indian food venue, large towns in the suburbs would be promising candidates.

5.5   Japanese restaurants are extremely popular in the downtown and affluent areas: Japanese food venues are very popular in Cluster 4 (and to a smaller extent Cluster 0). Cluster 4 (marked in purple in the map above) represents downtown Singapore and the affluent neighourhood of Bukit TImah. Cafes are also very well-represented in these two clusters. This suggests that a Japanese-themed café would do very well in areas in this cluster and perhaps in other affluent neighbourhoods.

5.6   Out of the areas in this cluster, there are four areas in which Japanese food venues are not as well-represented (namely not in the top 3 food venues). Given their similarity to other areas in this cluster, it stands to reason that opening a restaurant in these areas might fill a gap in the market and attract custom. The four areas are Buona Vista, Farrer Road, Nicoll Highway, and Outram Park. Their top 7 venues are shown below:

station_name	1	2	3	4	5	6	7
Buona Vista	Café	Bakery	Food Court	Chinese	Japanese	Indian	Noodles
Outram Park	Italian	Chinese	Korean	Food Court	Tapas	Seafood	Japanese
Nicoll Highway	Thai	Restaurant	Café	Italian	Vietnamese	Bakery	Steakhouse
Farrer Road	Bakery	Café	Chinese	Italian	Noodles	Japanese	Indian

5.7 <u>Food courts are popular in almost every cluster</u>. Food courts offer a variety of cuisines at affordable prices and tend to be well-located near transport hubs. Any new venue ought to be aware of the presence of food courts in the neighbourhood and take care to distinguish itself from such establishments. This means that food venues that rely on budget eats or affordability should carefully evaluate their offering to gauge whether they are sufficiently different as a value proposition to food courts.

6. Conclusion

6.1 Singaporeans love food. But especially some types of food. This study has evaluated the patterns and trends of food venues in Singapore and concluded that:

6.1.1 Chinese food is extremely popular across the nation, especially in the suburbs, and a Chinese food venue is likely to do well.

6.1.2 Indian food tends to be concentrated in and around Little India in Singapore but are also moderately successful in the suburbs.

6.1.3 Japanese food and cafes are very popular in downtown Singapore and affluent neighbourhoods.

6.1.4 Food courts are popular almost everywhere and any new food venue should be concerned with distinguishing itself from such venues, which prize affordability and variety over quality and focus.