



Segmenting and Clustering Neighbourhoods in Singapore to Provide Recommendations for Visitors

Providing recommendations for visitors

- Where to eat?
- Where to stay?
- Where to explore?



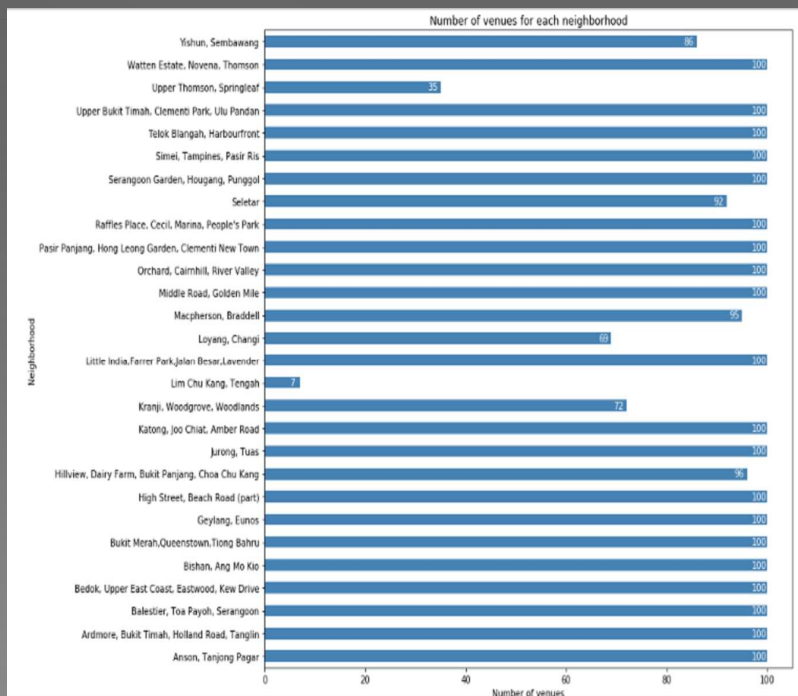
Data Acquisition and Cleaning

- ◉ Wikipedia page with all postal districts
- ◉ Website to find latitude and longitude
- ◉ Website that publishes the median rents for each district
- ◉ Foursquare API to provide venue info

Exploratory Data Analysis

Descriptive Statistics

- > Number of venues for each neighbourhood
- > Frequency of occurrence for each venue type
- > Top 10 venues for each neighbourhood



Launcher

Segmenting and Clustering

Python

[18]:

	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 Most Common Venue	9th Most Common Venue	10th Most Common Venue
0	Anson, Tanjong Pagar	Hotel	Japanese Restaurant	Food Court	Cafe	Coffee Shop	Korean Restaurant	Tapas Restaurant	Cocktail Bar	Spanish Restaurant	Mexican Restaurant
1	Ardmore, Bukit Timah, Holland Road, Tanglin	Chinese Restaurant	Ice Cream Shop	Garden	Bakery	Desert Shop	Asian Restaurant	French Restaurant	Indian Restaurant	Pizza Place	Performing Arts Venue
2	Balestier, Toa Payoh, Serangoon	Indian Restaurant	Chinese Restaurant	Hotel	Coffee Shop	Bakery	Cafe	Food Court	Hostel	Thai Restaurant	Desert Shop
3	Bedok, Upper East Coast, Eastwood, Kew Drive	Coffee Shop	Food Court	Cafe	Japanese Restaurant	Asian Restaurant	Noodle House	Chinese Restaurant	Fast Food Restaurant	Seafood Restaurant	Desert Shop
4	Bishan, Ang Mo Kio	Chinese Restaurant	Food Court	Coffee Shop	Cafe	Japanese Restaurant	Park	Thai Restaurant	Ice Cream Shop	Spa	Supermarket
5	Bukit Merah, Queenstown, Tiong Bahru	Cafe	Park	Food Court	Japanese Restaurant	Coffee Shop	Chinese Restaurant	Hotel	Indian Restaurant	Seafood Restaurant	Bakery
6	Geylang, Eunos	Chinese Restaurant	BBQ Joint	Cafe	Thai Restaurant	Supermarket	Hostel	Coffee Shop	Food Court	Soup Place	Restaurant
7	High Street, Beach Road (part)	Hotel	Japanese Restaurant	Waterfront	Wine Bar	Cocktail Bar	French Restaurant	Italian Restaurant	Lounge	Shopping Mall	Spanish Restaurant
8	Hillview, Dairy Farm, Bukit Panjang, Choa Chu Kang	Trail	Coffee Shop	Nature Preserve	Fast Food Restaurant	Cafe	Shopping Mall	Italian Restaurant	Sushi Restaurant	Food Court	Park
9	Jurong, Tuas	Fast Food Restaurant	Food Court	Asian Restaurant	Coffee Shop	Japanese Restaurant	Desert Shop	Chinese Restaurant	Supermarket	Cafe	Seafood Restaurant
10	Katong, Joo Chiat, Amber Road	Chinese Restaurant	Hotel	Bar	Coffee Shop	Multiplex	BBQ Joint	Bakery	Cafe	Desert Shop	Dim Sum Restaurant
11	Kranji, Woodgrove, Woodlands	Food Court	Coffee Shop	Asian Restaurant	Japanese Restaurant	Park	Cafe	Clothing Store	Indian Restaurant	Racetrack	Fast Food Restaurant
12	Lim Chu Kang, Tengah	Farm	Bus Station	Cafe	Outdoor & Recreation	Wings Joint	Fish & Chips Shop	Flea Market	Flower Shop	Food	Food & Drink Shop
13	Little India, Ferrer Park, Jalan Besar, Lavender	Indian Restaurant	Hotel	Chinese Restaurant	Cafe	Coffee Shop	Vegetarian / Vegan Restaurant	Thai Restaurant	Cocktail Bar	Italian Restaurant	Movie Theater
14	Loyang, Changi	Coffee Shop	Fast Food Restaurant	Gym	Supermarket	Resort	Thai Restaurant	Food Court	Cafe	Chinese Restaurant	Karaoke Bar
15	Macpherson, Braddell	Food Court	Chinese Restaurant	Coffee Shop	Asian Restaurant	Noodle House	Cafe	Convenience Store	Seafood Restaurant	Hotel	Indian Restaurant
16	Middle Road, Golden Mile	Hotel	Indian Restaurant	Cocktail Bar	Cafe	Japanese Restaurant	Shopping Mall	Performing Arts Venue	French Restaurant	Italian Restaurant	Buffet
17	Orchard, Cairnhill, River Valley	Hotel	Japanese Restaurant	Shopping Mall	Department Store	Coffee Shop	Clothing Store	Boutique	Bakery	Chinese Restaurant	Cosmetics Shop
18	Pasir Panjang, Hong Leong Garden, Clementi New Town	Coffee Shop	Sandwich Place	Cafe	Japanese Restaurant	Supermarket	Italian Restaurant	Chinese Restaurant	Indian Restaurant	Food Court	Breakfast Spot
19	Raffles Place, Cecil Marina, People's Park	Hotel	Waterfront	Coffee Shop	Italian Restaurant	Spanish Restaurant	Sandwich Place	Pizza	Performing Arts Venue	Shopping Mall	Lounge
20	Serangoon Garden, Hougang, Punggol	Food Court	Coffee Shop	Cafe	Supermarket	Fast Food Restaurant	Cafe	Chinese Restaurant	Sandwich Place	Supermarket	Asian Restaurant
21	Serangoon Garden, Hougang, Punggol	Food Court	Coffee Shop	Fast Food Restaurant	Cafe	Chinese Restaurant	Sandwich Place	Supermarket	Asian Restaurant	Shopping Mall	Trail

Exploratory Data Analysis

Machine Learning

- > K-Means Clustering
- > Simple, quick and unsupervised
- > k=5 at elbow

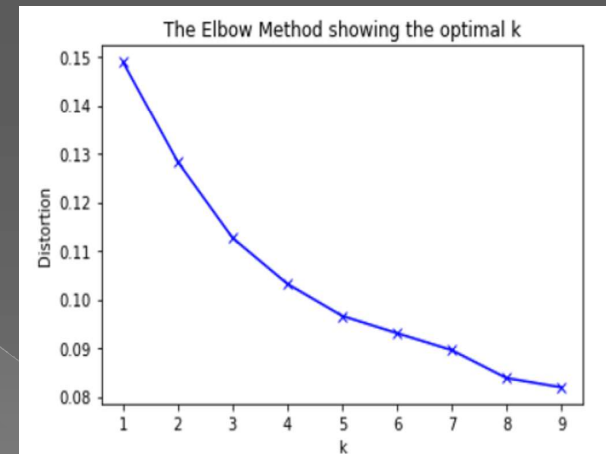
Run k-means to cluster the neighborhood into 5 clusters

```
# set number of clusters
kclusters = 5

# run k-means clustering
kmeans = KMeans(n_clusters=kclusters, random_state=0).fit(singapore_grouped_clustering)

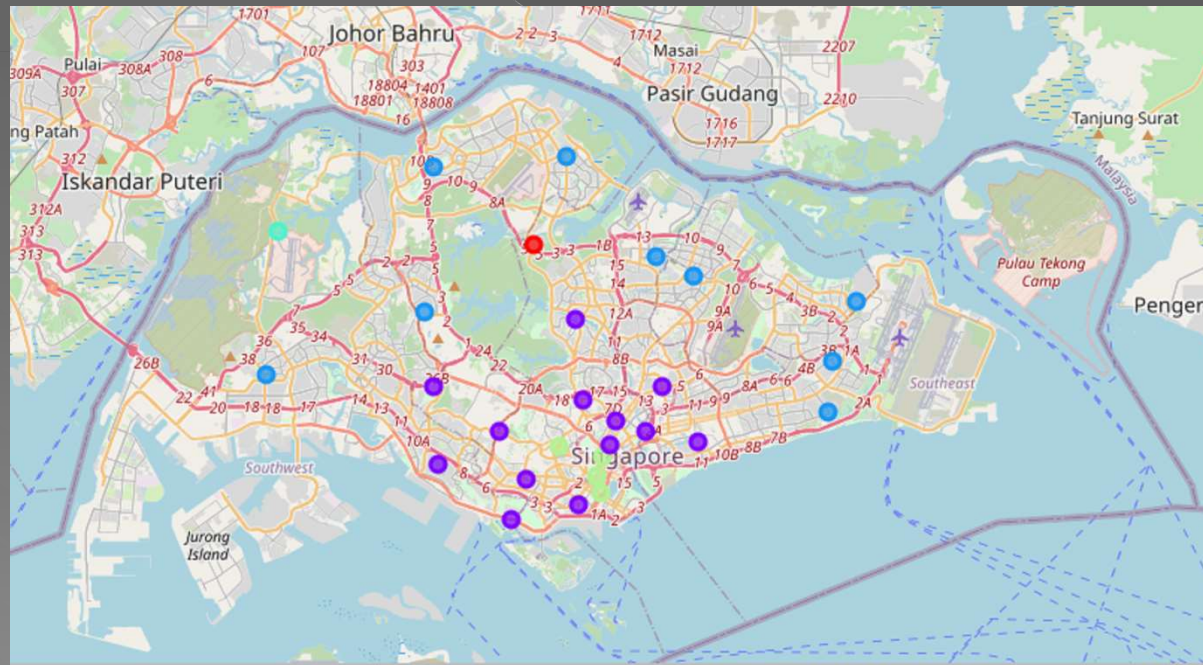
# check cluster labels generated for each row in the dataframe
print(kmeans.labels_)

[1 1 1 2 1 1 1 4 2 2 1 2 3 1 2 1 4 4 1 4 2 2 2 1 1 0 1 2]
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Visualization of Clusters

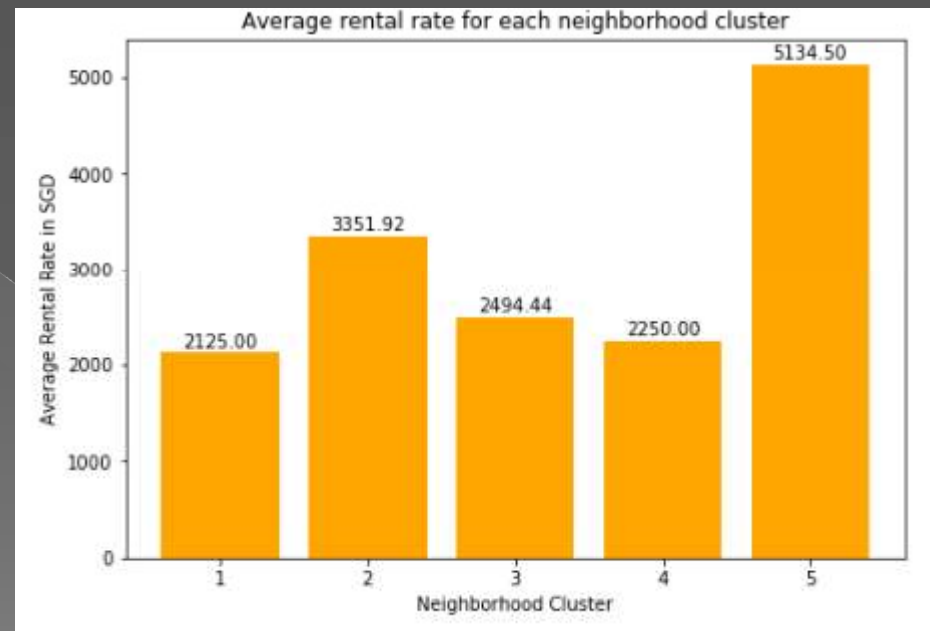
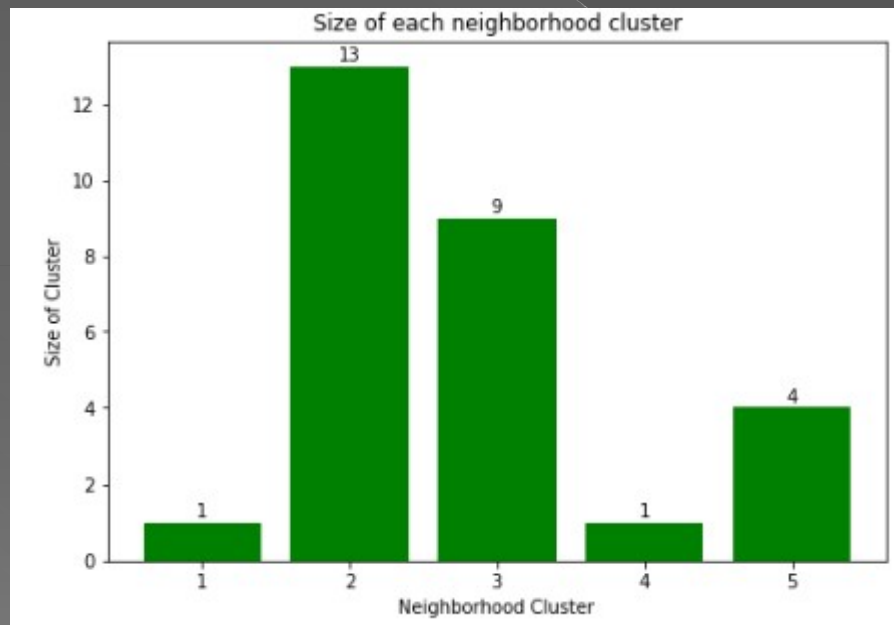
- Folium Python library
- Leaflet map of Singapore
- Five distinct clusters seen



Examine the Clusters

- ◉ Cluster 1: A neighbourhood with a golf course and lake-view that is reasonably priced
- ◉ Cluster 2: Upmarket neighbourhoods with multiple eateries serving a wide range of cuisines
- ◉ Cluster 3: Suburban neighbourhoods with many coffee shops and food courts
- ◉ Cluster 4: A neighbourhood surrounded by farmland
- ◉ Cluster 5: Neighbourhoods near the city centre where high-end hotels and shopping malls are located

Size and average rental rates of each cluster



Observations

● Cluster 2

- > Biggest cluster
- > 13 matured estates with multiple eateries serving a wide range of cuisines
- > Average rental rate for a 1000-1100 sq ft apartment is around SGD 3351.92

● Cluster 3

- > Second biggest cluster
- > 9 suburban or less-matured neighbourhoods that have many coffee shops and food courts
- > Average rental rate for a 1000-1100 sq ft apartment is around SGD 2494.44

Observations

● Cluster 5

- > Third biggest cluster
- > 4 neighbourhoods that make up the city centre where most high-end hotels and shopping malls are located
- > Average rental rate for a 1000-1100 sq ft apartment is around SGD 5134.54

● Cluster 1 and 4

- > Single-neighbourhood clusters
- > Small number of venues
- > Top two venues are very different from the rest of the neighbourhoods

Recommendations

● Cluster 2

- > Visitors who are used to eating at restaurants
- > Can afford to spend more than SGD3000 per month on rental
- > Living at the city fringe

● Cluster 3

- > Visitors used to local food
- > Can afford to spend about SGD2500 per month on rental
- > Living in the suburbs

Recommendations

- Cluster 5
 - > Proximity to city centre is a priority
 - > Can afford to spend more than SGD5000 per month on rental
 - > Living in the city centre
- Cluster 1
 - > Golf course and lake
 - > Reasonably priced
- Cluster 4
 - > Farm visit or stay
 - > Reasonably priced

Conclusion and future directions

- Neighbourhoods successfully segmented and clustered
- Observations and recommendations made
- Potential business owners can also make use of the observations and recommendations