

ANALYZING NEIGHBOURHOODS OF KUALA LUMPUR FOR STARTING A NEW BAKERY

IBM APPLIED DATA SCIENCE CAPSTONE PROJECT

BY

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INTRODUCTION

Kuala Lumpur, or KL, is the federal capital and most populous city of Malaysia. Kuala Lumpur is the fastest growing metropolitan area of the country. It's the economic, financial and cultural city of the country and one of three Malaysian Federal Territories. Greater Kuala Lumpur, or the Klang Valley, is a fundamental urban aggregation with an approximation population of 7.2 million in 2016 with a population density that is nearly equal to that of the city proper. It's 2020 population is now estimated at 7,996,830.

The city is mainly a mix of Malays, Chinese, and Indians, although there are many cultures in the city such as Eurasians, Kadazans, Ibans and indigenous peoples from East Malaysia and Peninsular Malaysia. The diversity among the population create a path for variety of foods. A report notes that the Malaysian market has seen positive growth of baked goods as more products are consumed at meal times in place of rice and noodles. So, in this project, we will study the neighbourhood and make recommendation accordingly.

BUSINESS PROBLEM.

The main objective of this project is to analyze the neighbourhood of Kuala Lumpur to select a best location for a opening of bakery. Bakeries can categorize as conventional stand-alone bakeries, commercial bakeries , bakery counters, and home-based bakers providing a handmade breads and cakes. So, we would like to extract and analyse a various data about neighbourhood of Kuala Lumpur using data science methodology and machine learning techniques such as clustering to provide a right solution.

DESCRIPTION OF DATA

To solve the problem, we will need the following data:

- List of Kuala Lumpur neighbourhood
- Geographical coordinates of neighbourhood
- Venue data from Foursquare

Neighbourhood data

The data extracted from Wikipedia page using web scrapping with BeautifulSoup library in Python.

[illegible]

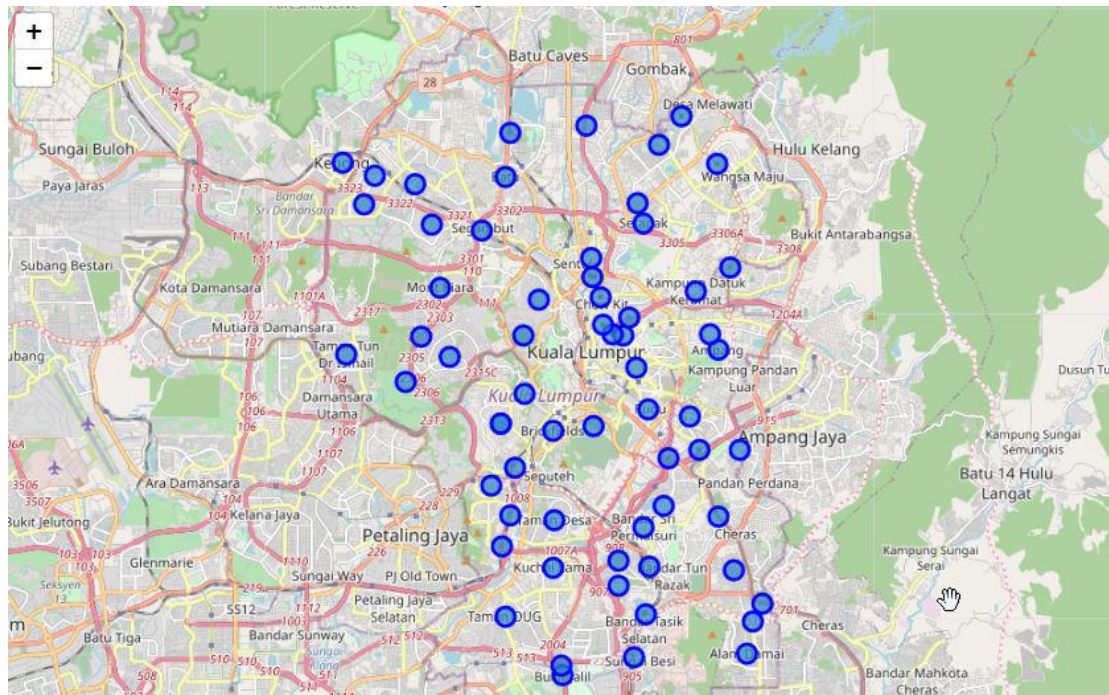
Geographical coordinates of neighbourhood

Using Geopy geocoders, the geographical coordinates of various suburbs in Kuala Lumpur were extracted. Additionally, two columns were included into data frame for latitude and longitude.

| | Neighborhood | Longitude | Latitude |
|-----|-----------------------|------------|----------|
| 0 | Alam Damai | 101.740735 | 3.064708 |
| 1 | Ampang, Kuala Lumpur | 101.732250 | 3.152135 |
| 2 | Bandar Menjalara | 101.630030 | 3.193954 |
| 3 | Bandar Sri Permaisuri | 101.710872 | 3.101158 |
| 4 | Bandar Tasik Selatan | 101.711447 | 3.076097 |
| ... | ... | ... | ... |
| 65 | Taman Tun Dr Ismail | 101.624919 | 3.150808 |
| 66 | Taman U-Thant | 101.729820 | 3.156499 |
| 67 | Taman Wahyu | 101.672211 | 3.214504 |
| 68 | Titivangsa | 101.695933 | 3.173145 |
| 69 | Wangsa Maju | 101.731908 | 3.205667 |

70 rows × 3 columns

Using the folium package and my data frame, I then created a map of neighbourhood.



Venue data from Foursquare

Foursquare is a database of more than 105 million places worldwide and an API that enables location data for Apple, Samsung, Microsoft, Tencent, Snapchat, Twitter, Uber, and others. The venue data extracted using Foursquare API to study the various neighbourhood in Kuala Lumpur. The Data provides various locations of existing bakeries around the neighbourhood and its vital to analyse and draw conclusion of this project.

METHODOLOGY

At data description, I explained about the neighbourhood web scrapping, geographical coordinates and venue data from Foursquare. In this section, I'm going to elaborate about method and techniques which are use to extract and analysis data.

Firstly, the data for venues retrieved from Foursquare within 2000 meter by limit to 50. The result was a list of 3378 venues all over Kuala Lumpur neighbourhood.

| | Neighbourhood | Latitude | Longitude | Name | Latitude | Longitude | Category |
|---|---------------|----------|------------|---|----------|------------|-------------------------|
| 0 | Alam Damai | 3.064708 | 101.740735 | Pengedar Shaklee Kuala Lumpur | 3.061235 | 101.740696 | Supplement Shop |
| 1 | Alam Damai | 3.064708 | 101.740735 | Alam Damai Recreational Park | 3.066424 | 101.740265 | Other Great Outdoors |
| 2 | Alam Damai | 3.064708 | 101.740735 | Ivy Sekinchan Seafood Noodle House 远桥廷海味丸海鲜面 | 3.065749 | 101.748718 | Noodle House |
| 3 | Alam Damai | 3.064708 | 101.740735 | Jc Deli 壹喜食坊 | 3.058397 | 101.748560 | Food & Drink Shop |
| 4 | Alam Damai | 3.064708 | 101.740735 | Alam Damai, Damai Jasa | 3.069329 | 101.744512 | Park |
| 5 | Alam Damai | 3.064708 | 101.740735 | Machi Noodle 妈子面 | 3.057695 | 101.746635 | Noodle House |
| 6 | Alam Damai | 3.064708 | 101.740735 | Bukit Besi Hiking Trail | 3.073725 | 101.733300 | Trail |
| 7 | Alam Damai | 3.064708 | 101.740735 | Big Tree Lin Kee Chan Sow Lin Steam Fish Head ... | 3.077381 | 101.739140 | Chinese Restaurant |
| 8 | Alam Damai | 3.064708 | 101.740735 | Tealive | 3.070599 | 101.749615 | Bubble Tea Shop |
| 9 | Alam Damai | 3.064708 | 101.740735 | 【Lensen 点心】茶餐厅 | 3.074036 | 101.745661 | Chinese Breakfast Place |

To find clusters of bakeries at various neighbourhood, the data frame was transformed with the venues, associated to neighbourhood, by one-hot encoding (0/1), as seen in the picture below.

| Neighbourhood | Accessories Store | African Restaurant | American Restaurant | Arcade | Art Gallery | Art Museum | Arts & Crafts Store | Asian Restaurant | Athletics & Sports | Vietnamese Restaurant | Volleyball Court | Warehouse Store | Whisky Bar | Wine Bar | Wings Joint | Women's Store | Yakitori Restaurant | Yoga Studio | Zoo |
|---------------|-------------------|--------------------|---------------------|--------|-------------|------------|---------------------|------------------|--------------------|-----------------------|------------------|-----------------|------------|----------|-------------|---------------|---------------------|-------------|-----|
| 0 Alam Damai | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 Alam Damai | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2 Alam Damai | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 3 Alam Damai | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 4 Alam Damai | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

4 rows x 20 columns

Next, I group rows by neighbourhood and by taking the mean of the frequency of occurrence of each category.

| Neighbourhood | Accessories Store | African Restaurant | American Restaurant | Arcade | Art Gallery | Art Museum | Arts & Crafts Store | Asian Restaurant | Athletics & Sports | Vietnamese Restaurant | Volleyball Court | Warehouse Store | Whisky Bar | Wine Bar | Wings Joint | Women's Store | Yakitori Restaurant | Yoga Studio | Zoo |
|-------------------------|-------------------|--------------------|---------------------|--------|-------------|------------|---------------------|------------------|--------------------|-----------------------|------------------|-----------------|------------|----------|-------------|---------------|---------------------|-------------|-----|
| 0 Alam Damai | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 1 Ampang, Kuala Lumpur | 0.0 | 0.0 | 0.0 | 0.0 | 0.04 | 0.00 | 0.00 | 0.06 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 Bandar Menjalara | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0.06 | 0.0 | 0.0 | 0.00 | 0.00 | 0.0 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 Bandar Sri Permaisuri | 0.0 | 0.0 | 0.0 | 0.0 | 0.02 | 0.00 | 0.00 | 0.10 | 0.0 | 0.0 | 0.0 | 0.00 | 0.0 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 Bandar Tasik Selatan | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 0.12 | 0.0 | 0.0 | 0.00 | 0.00 | 0.0 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 |
| ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| 64 Taman Tun Dr Ismail | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0.02 | 0.00 | 0.0 | 0.0 | 0.00 | 0.00 | 0.0 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 |
| 65 Taman U-Thant | 0.0 | 0.0 | 0.0 | 0.0 | 0.02 | 0.00 | 0.00 | 0.02 | 0.0 | 0.0 | 0.00 | 0.00 | 0.0 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 |
| 66 Taman Wahyu | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 0.14 | 0.0 | 0.0 | 0.00 | 0.00 | 0.0 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 |
| 67 Titiwangsa | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.00 | 0.00 | 0.06 | 0.0 | 0.0 | 0.02 | 0.02 | 0.0 | 0.0 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 |
| 68 Wangsa Maju | 0.0 | 0.0 | 0.0 | 0.0 | 0.00 | 0.02 | 0.00 | 0.02 | 0.0 | 0.0 | 0.00 | 0.00 | 0.0 | 0.0 | 0.02 | 0.0 | 0.0 | 0.0 | 0.0 |

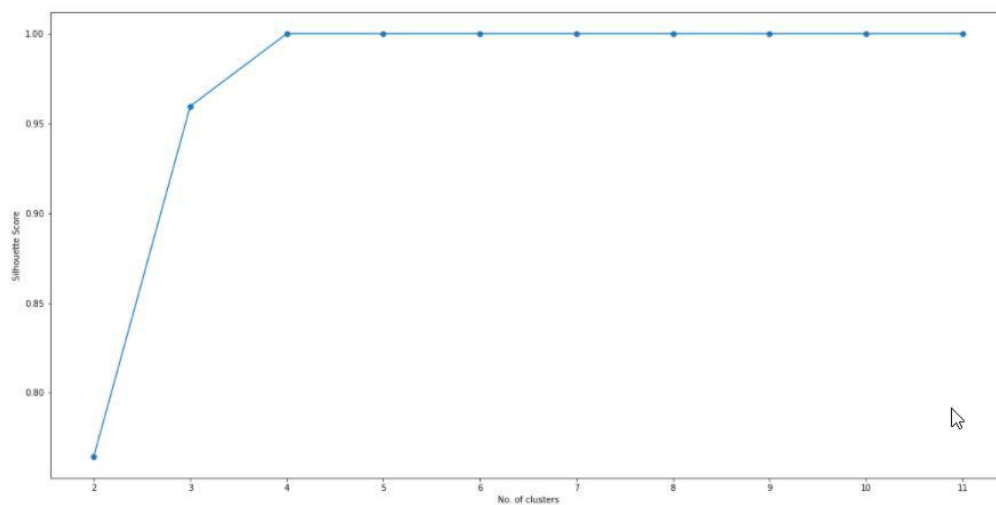
69 rows x 20 columns

I used this information to create a data frame in which you can see the top 10 most common venue types for each neighbourhood.

| Neighbourhood | 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 Aiam Damai | Chinese Restaurant | Malay Restaurant | Cafe | Noodle House | Coffee Shop | Restaurant | Indian Restaurant | Cantonese Restaurant | Convenience Store | Breakfast Spot |
| 1 Ampang Kuala Lumpur | Hotel | Malay Restaurant | Asian Restaurant | Breakfast Spot | Juice Bar | Coffee Shop | Indian Restaurant | Golf Course | Air Gallery | Razon |
| 2 Bandar Merapong | Chinese Restaurant | Coffee Shop | Japanese Restaurant | Asian Restaurant | Vegetarian / Vegan Restaurant | Park | Middle Eastern Restaurant | Restaurant | Grocery Store | Monsoon |
| 3 Bandar Sri Permaisuri | Chinese Restaurant | Asian Restaurant | Indonesian Restaurant | Noodle House | Gas Station | Seafood Restaurant | Pizza Place | Fast Food Restaurant | Bakery | Lake |
| 4 Bandar Tasik Selatan | Asian Restaurant | Burger Joint | Chinese Restaurant | Malay Restaurant | Ice Cream Shop | Convenience Store | Sandwich Place | Cantonese Restaurant | Gym Pool | Comfort Food Restaurant |
| 5 Bandar Tun Razak | Chinese Restaurant | Indonesian Restaurant | Asian Restaurant | Flea Market | Bakery | Malay Restaurant | Burger Joint | Gas Station | Lake | Market |
| 6 Bangsar | Indian Restaurant | Bar | Ice Cream Shop | Burger Joint | Clothing Store | Spa | Shopping Mall | Coffee Shop | Seafood | Boutique |
| 7 Bangsar Park | Indian Restaurant | Bar | Ice Cream Shop | Burger Joint | Clothing Store | Spa | Shopping Mall | Coffee Shop | Seafood | Boutique |
| 8 Bangsar South | Japanese Restaurant | Hotel | Restaurant | Coffee Shop | Malay Restaurant | Movie Theater | Clothing Store | Shopping Mall | Chinese Restaurant | Juice Bar |
| 9 Batu 11 Cheras | Chinese Restaurant | Asian Restaurant | Malay Restaurant | Coffee Shop | Food Truck | Lake | Dim Sum Restaurant | Seafood | Cafe | Cantonese Restaurant |
| 10 Batu, Kuala Lumpur | Chinese Restaurant | Malay Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Flea Market | Noodle House | Spa |
| 11 Brickfields | Hotel | Indian Restaurant | Clothing Store | French Restaurant | Cafe | Shopping Mall | Coffee Shop | Cocktail Bar | Hotel Bar | South Indian Restaurant |
| 12 Bukit Bintang | Hotel | Cafe | Spa | Asian Restaurant | Shopping Mall | Boutique | Japanese Restaurant | Clothing Store | Harbin Restaurant | Science Museum |
| 13 Bukit Jalil | Coffee Shop | Cafe | Japanese Restaurant | Spa | Asian Restaurant | Massage Studio | Middle Eastern Restaurant | Ice Cream Shop | Vegetarian / Vegan Restaurant | Restaurant |
| 14 Bukit Kariak | State Park | Asian Restaurant | Indian Restaurant | Ice Cream Shop | Food Truck | Malay Restaurant | Lounge | Japanese Restaurant | Golf Course | Bakery |
| 15 Bukit Nanas | Hotel | Cocktail Bar | Bar | Cosmetics Shop | Building | Boutique | Monument / Landmark | Breakfast Spot | Sushi Restaurant | Dance Studio |
| 16 Bukit Petaling | Hotel | Cafe | Hotel Bar | Indian Restaurant | Juice Bar | South Indian Restaurant | Coffee Shop | Convenience Store | Buncho Place | Performing Arts Venue |
| 17 Bukit Tunksu | Japanese Restaurant | Coffee Shop | Pool | Cafe | Art Gallery | Restaurant | Bar | Noodle House | Spa | Hotel |
| 18 Cheras, Kuala Lumpur | Chinese Restaurant | Malay Restaurant | Asian Restaurant | Indonesian Restaurant | Seafood Restaurant | Food Truck | Asian Restaurant | Pizza Place | Market | Nightclub |
| 19 Chow Kit | Hotel | Malay Restaurant | Coffee Shop | Clothing Store | Asian Restaurant | Seafood Restaurant | Thai Restaurant | Theater | Chinese Restaurant | IT Services |
| 20 Damansara Heights | Japanese Restaurant | Cafe | Italian Restaurant | Ice Cream Shop | Indian Restaurant | Korean Restaurant | Asian Restaurant | Grocery Store | Yoga Studio | Bakery |
| 21 Damansara Town Centre | Seafood Restaurant | Chinese Restaurant | Racetrack | Coffee Shop | Malay Restaurant | Shopping Mall | BBQ Joint | Convenience Store | Roof Deck | Electronics Store |
| 22 Dang Wangi | Hotel | Bar | Cocktail Bar | Chinese Restaurant | Sushi Restaurant | Breakfast Spot | Monument / Landmark | Building | Multiplex | Gym |
| 23 Desa Petaling | Chinese Restaurant | Asian Restaurant | Burger Joint | Hospital Restaurant | Japanese Restaurant | Gym | Bakery | Malay Restaurant | Coffee Shop | Cafe |
| 24 Federal Hill, Kuala Lumpur | Hotel | Boutique | French Restaurant | Seafood | Ice Cream Shop | Art & Crafts Store | Cafe | Spa | Shopping Mall | Hotel Bar |
| 25 Happy Garden | Asian Restaurant | Outdoor & Recreation | Chinese Restaurant | Border Crossing | Day Bar | Furniture / Home Store | Garden | Garden Center | Gas Station | Zoo |
| 26 Jalan Cochrane, Kuala Lumpur | Asian Restaurant | Nightclub | Furniture / Home Store | Burger Joint | Cafe | Korean Restaurant | Chinese Restaurant | Shopping Mall | Coffee Shop | Noodle House |
| 27 KL Eco City | Cosmetics Shop | Ice Cream Shop | Department Store | Bakery | Clothing Store | Juice Bar | Movie Theater | Shopping Mall | Coffee Shop | Japanese Restaurant |

Now, with all this data, I could finally run an unsupervised machine learning algorithm, more specifically, a k-means clustering algorithm from the scikit-learn package.

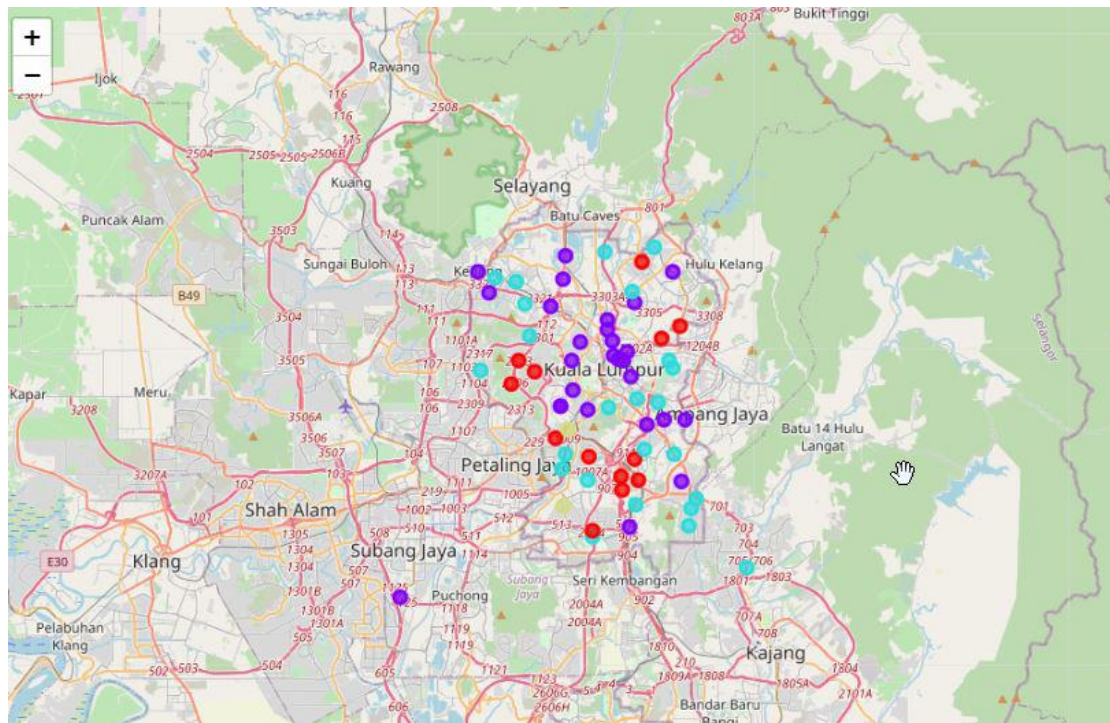
K means clustering algorithm was implemented in order to find out the similarities between found similarities between neighbourhood. Elbow method was use to identify optimal value of clusters. As result:



The plot show that the optimal number of clusters is 4. so, the final version of data frame containing the cluster labels as below:

| | Neighbourhood | Longitude | Latitude | Cluster Labels | 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 |
|----|-----------------------|------------|----------|----------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-------------------------------|-----------------------|-----------------------|-----------------------|------------------------|
| 8 | Asian Centre | 101.747138 | 3.024155 | 2 | Chinese Restaurant | Many Restaurant | Asian Restaurant | Cafe | Noodle House | Coffee Shop | Restaurant | Indian Restaurant | Convenience Store | Breakfast Spot |
| 9 | Amang, Kuala Lumpur | 101.732252 | 3.101131 | 3 | Chinese Restaurant | Many Restaurant | Asian Restaurant | Breakfast Spot | Java Bar | Coffee Shop | Restaurant | Indian Restaurant | Convenience Store | Breakfast Spot |
| 10 | Bandar Sri Permaisuri | 101.719372 | 3.011055 | 0 | Chinese Restaurant | Many Restaurant | Asian Restaurant | Coffee Shop | Asian Restaurant | Vegetarian / Vegan Restaurant | Park | Restaurant | Grocery Store | Market |
| 11 | Bandar Tun Razak | 101.714467 | 3.070907 | 2 | Asian Restaurant | Burger Joint | Chinese Restaurant | Noodle House | Gas Station | Seafood Restaurant | Pizza Place | Fast Food Restaurant | Bakery | Lake |
| 12 | Bandar Tun Razak | 101.712467 | 3.058655 | 0 | Chinese Restaurant | Indonesian Restaurant | Asian Restaurant | Fast Market | Ice Cream Shop | Bakery | Many Restaurant | Burger Joint | Gas Station | Market |
| 13 | Bangar | 101.858440 | 3.133530 | 1 | Indian Restaurant | Bar | Ice Cream Shop | Burger Joint | Clothing Store | Clothing Store | Sea | Shopping Mall | Coffee Shop | Seafood |
| 14 | Bangar Park | 101.858440 | 3.133530 | 1 | Indian Restaurant | Bar | Ice Cream Shop | Burger Joint | Clothing Store | Clothing Store | Sea | Shopping Mall | Coffee Shop | Seafood |
| 15 | Bangar South | 101.888739 | 3.113273 | 0 | Japanese Restaurant | Hotel | Restaurant | Coffee Shop | Many Restaurant | Movie Theater | Clothing Store | Shopping Mall | Chinese Restaurant | Java Bar |
| 16 | Batu 11 Cheras | 101.773269 | 3.041231 | 2 | Chinese Restaurant | Asian Restaurant | Many Restaurant | Coffee Shop | Food Truck | Dim Sum Restaurant | Seafood | Steakhouse | Cafe | Convenience Store |
| 17 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 18 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 19 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 20 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 21 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 22 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 23 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 24 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 25 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 26 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 27 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 28 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 29 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 30 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 31 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 32 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |
| 33 | Batu 11 Cheras | 101.871622 | 3.071553 | 1 | Chinese Restaurant | Many Restaurant | Seafood Restaurant | Asian Restaurant | Food Truck | Restaurant | Motorcycle Shop | Pizza Market | Noodle House | Sea |

The above table shows the most common venues which are assigned into 4 different cluster labels from 0 to 3. now use the cluster labels to show the neighbourhood marked with a cluster-specific color on a map, again using folium:



After examining the all 4 individual clusters, some important conclusion was derived. The neighbourhood that have most number of bakeries is Cluster 1.

DISCUSSION

As said earlier, the most suitable neighbourhood to start a bakery are present in Cluster 1. The places such as Bandar Sri Permaisuri, Taman Desa, Sri Hartamas, Desa Petaling, Damansara Heights and Bukit Kiara are most suitable with less competition. As per report, Kepong, Bukit Jalil and Desa Petaling are most affordable areas for low cost properties around Kuala Lumpur neighbourhood. Since the Desa Petaling present in Cluster 1, so it will be more suitable location to start 'Cloud Bakery' or bakery without dining area. The decision do not depend on other factors such as availability and legal requirements that are out of scope of this project.

CONCLUSION

Data science and machine learning techniques used in this project were very helpful to derived the results. We achieved the goal presented and the entrepreneurs or business peoples can see in the results which neighbourhood best match for their bakeries.