Preferred Location for A Coffee Shop in Bandung, Indonesia

1. Introduction

1.1. Background

Coffee is an important part in modern lifestyle. In many big cities, a coffee shop is an important place not only for getting a cup of coffee but also for social interaction. This phenomenon has interacted many businessmen to run a coffee shop. They believe that a successful coffee shop will create a good return on investment.

Bandung, one of major city in Indonesia, has almost one hundred coffee shops. With the population of 2.3 million people, it seems a potential for coffee shop business. In fact, some coffee shop is growing rapidly while the others are facing difficulties to survive. This situation shows that there is opportunity to be success and the risk to fail. There must be a reason why some of the are success while the others are failed.

According to a coffee expert (Michael, 2015) in his website (https://coffees.mobi/coffee-shops), beside the quality of the coffee, location is the key success factor for a coffee shop. A good place is near business areas, school, residential neighborhoods or the place where many people gathers. Hence, to minimize the risk in running a coffee shop, the correct location should be determined first.

1.2. Problem Definition

With the huge population and modern lifestyle, the city of Bandung offers good opportunity in coffee shop business. This city lies on the elevation of 768 meters above sea level, which offers various type of local coffee bean with good quality. However, since it consists of 30 districts that divided into 151 neighborhoods, it is not easy to find the proper location to run a coffee shop. Determining the proper location is the first and might be the biggest challenge to start the coffee shop business in this city.

1.3. Interest

This project will be interested to the businessmen who want to run a coffee shop in Bandung since they need to figure out the characteristics of each neighborhood. Moreover, this project might be interesting

for the person who have attention to the characteristic of a neighborhood in Bandung such as the culinary businessman, travel agent, and so on.

2. Data Requirement

This project is purposed to find a good location for a Coffee Shop in Bandung Indonesia to meet the need of stakeholders who have interest. In this project, the term good location for a Coffee Shop is interpreted as areas where people are gathered but with no coffee shops around. The area where people are gathered in this project is represented by the area that have a lot of venues.

To answer the challenge, first we need the appropriate data. This data consists of:

1. Bandung with district and neighborhood's data. This data should consist of all district in Bandung city. Each district should consist with all neighborhood with postcode and geocode data.
2. Bandung venue data. This data should consist of the venue in each neighborhood. This data can be generated by exploring each neighborhood using Foursquare API.

3. Methodology

3.1. Tasks in Solution Development

Solution for the problem of finding preferred location is developed through these following tasks:

1. Data Acquisition
2. Location Map Plotting
3. Venue Exploration
4. Counting the number of venues in each neighborhood
5. Discarding the neighborhood that has less than 5 venues
6. Counting the frequency of occurrence of a venue in each neighborhood
7. Discarding the neighborhood that has either coffee shop or café
8. Employ k-mean clustering to group the neighborhood based on its similarity
9. Set priority of each cluster based on the number of existing venues
10. Plot the cluster in the map

These tasks are explained in more detail in the following section.

3.2. Data Acquisition

The first data, Bandung neighborhood data is previously owned in .csv file. To put it as a data frame, method of read csv is used. As the result, a data frame consists of 151 neighborhoods in Bandung with their geocodes is acquired as illustrated in the Figure 1 below.

(151, 5)

	Post_Code	District	Neighborhood	Latitude	Longitude
0	40111	Sumur Bandung	Braga	-6.9176	107.6094
1	40112	Sumur Bandung	Kebon Pisang	-6.9189	107.6171
2	40113	Sumur Bandung	Merdeka	-6.9137	107.6201
3	40114	Bandung Wetan	Cihapit	-6.9083	107.6260
4	40115	Bandung Wetan	Citarum	-6.9035	107.6171

Figure 1. Data frame of Bandung's Neighborhood Geocode

3.3. Location Map Plotting

Data frame of Bandung's neighborhood is used as a reference data for constructing a map and as the initial location to be explore. From the data, it is found 151 neighborhoods in Bandung, which can be plotted as shown in following Figure 2.

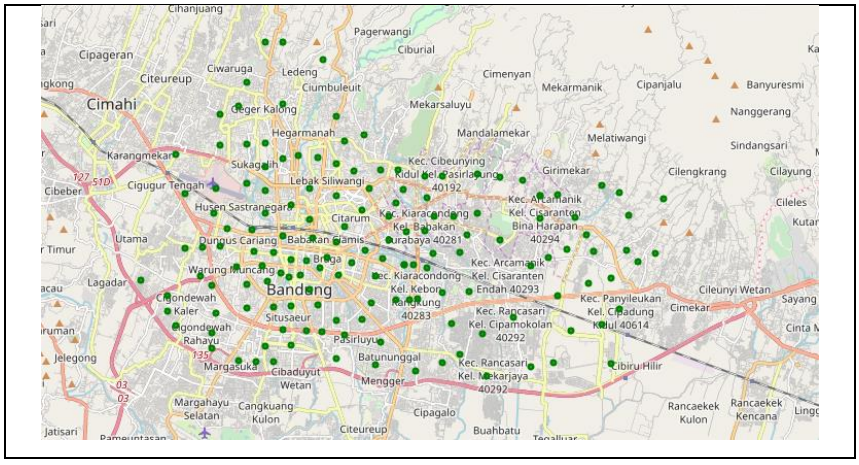

Figure 2. Bandung's Neighborhood Location on Map

3.4. Venue Exploration

In doing this task, first the data of each neighborhood location is obtained. Then using Foursquare API, the exploration function is performed. In this task every location will be explored and the venue within 500 m radius from the given location will be taken. As the result, a data frame with 2080 rows and 7 columns is acquired as illustrated in the Figure 3 below.

(2080, 7)

	Neighborhood	Neighborhood Latitude	Neighborhood Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Braga	-6.9176	107.6094	éL Royale Hotel Bandung	-6.9161	107.6106	Hotel
1	Braga	-6.9176	107.6094	Starbucks	-6.9170	107.6091	Coffee Shop
2	Braga	-6.9176	107.6094	Braga Permai - Maison Bogerijen	-6.9174	107.6094	Eastern European Restaurant
3	Braga	-6.9176	107.6094	Braga Punya Cerita	-6.9172	107.6093	Café
4	Braga	-6.9176	107.6094	Hangover	-6.9186	107.6097	Bar

Figure 3. Data frame of Bandung's Venues

As all the neighborhood has been explored, the venue is then categorized to find the number of unique categories as illustrated in Figure 4.

(2080, 216)

	Neighborhood	ATM	Accessories Store	Acehnese Restaurant	African Restaurant	Airport	Airport Lounge	American Restaurant	Aquarium	Arcade	Art Gallery	Art Museum	Arts & Crafts Store	Asia Restaurar
0	Braga	0	0	0	0	0	0	0	0	0	0	0	0	0
1	Braga	0	0	0	0	0	0	0	0	0	0	0	0	0
2	Braga	0	0	0	0	0	0	0	0	0	0	0	0	0
3	Braga	0	0	0	0	0	0	0	0	0	0	0	0	0
4	Braga	0	0	0	0	0	0	0	0	0	0	0	0	0

Figure 4. Data frame of Bandung's Venues Order by Categories

From the data frame in Figure 4, it is counted that there are 215 categories in Bandung area. The venue data is then grouped by venue category to figure out how many café and coffee shop in Bandung. The result of venue group is illustrated in Figure 5 below.

(215, 2)

	Venue Category	Venue
113	Indonesian Restaurant	123
40	Café	121
109	Hotel	108
49	Coffee Shop	99
44	Chinese Restaurant	78

Figure 5. Number of Venues Based on its Categories

3.5. Number of Venues in Each Neighborhood

In Bandung, each neighborhood has various number of venues. The number of venues indicates the crowd in each neighborhood. To figure out the crowd in each neighborhood, the calculation of number of venues is performed. Part of the result is shown in Figure 6.

	Neighborhood	Venue
16	Braga	94
139	Tamansari	76
75	Kebon Jeruk	74
7	Babakan Ciamis	68
87	Malabar	62

Figure 6. Number of Venues in Each Neighborhood

Some of neighborhood might be a quiet neighborhood, not too many people gather. The number of venues can be used to represent the crowd. In this project, the neighborhood with less than 5 venues is discarded. The number of neighborhoods that has less than 5 venues is then counted. The result shows, there are 66 neighborhoods have less than 5 venues.

3.6. Frequency of Occurrence of a Venue in Each Neighborhood

Number of venues and its type can be varied in different neighborhood. Some dominant venue might be existed in a neighborhood. To figure it out, the frequency of a venue in each neighborhood is counted, and the result is illustrated in Figure 7.

	Neighborhood	ATM	Accessories Store	Acehnese Restaurant	African Restaurant	Airport	Airport Lounge	American Restaurant	Aquarium	Arcade	Art Gallery	Art Museum	Arts & Crafts Store	A: Restau
0	Ancol	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
1	Antapani Kidul	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.2500	0.0000	0.0000	0.0000
2	Antapani Kulon	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	Antapani Tengah	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	Arjuna	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0870

Figure 7. Frequencies of occurrence of a venue in each category in each neighborhood

Based on calculation, it is found that there are 71 neighborhoods has coffee shop or café. These neighborhoods should be discarded from data frame since it is not a feasible location to run coffee shop. As the result, 21 feasible neighborhoods are selected. The part of this data frame is shown in Figure 8.

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(21, 217)
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	Neighborhood	Venue	ATM	Accessories Store	Acehnese Restaurant	African Restaurant	Airport	Airport Lounge	American Restaurant	Aquarium	Arcade	Art Gallery	Art Museum	Arts & Crafts Store
3	Antapani Tengah	13	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
4	Arjuna	23	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
19	Caringin	8	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
24	Cibaduyut Wetan	6	0.1667	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
26	Cibuntu	7	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Figure 8. Feasible Location for Coffee Shops

3.7. K-mean Clustering

There are 21 feasible neighborhoods with their own characteristics. To group them based on their similarity, k-mean clustering is employed. As the result, there are 4 cluster with the member of each cluster is shown in Figure 9, Figure 10, Figure 11 and Figure 12 respectively.

Post_Code	District	Neighborhood	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	Venue
40124	Cibeunying Kidul	Cikutra	-6.9016	107.6394	0	Hotel	Indonesian Restaurant	Soccer Stadium	Yoga Studio	Dim Sum Restaurant	5
40286	Buahbatu	Jatisari	-6.9353	107.6615	0	Food & Drink Shop	Hotel	Fast Food Restaurant	Convenience Store	Japanese Restaurant	5
40275	Batununggal	Gumuruh	-6.9381	107.6371	0	Hobby Shop	Spa	Boutique	Bakery	Department Store	5
40255	Regol	Ciseureuh	-6.9486	107.6124	0	Restaurant	Arcade	Building	Music Venue	Karaoke Bar	5
40243	Astana Anyar	Pelindung Hewan	-6.9401	107.6023	0	Pet Store	Museum	Bakery	Dessert Shop	Diner	5
40238	Bojongloa Kidul	Cibaduyut Wetan	-6.9583	107.5964	0	ATM	Restaurant	Fried Chicken Joint	Shoe Store	Asian Restaurant	6
40235	Bojongloa Kidul	Kebon Lega	-6.9479	107.5993	0	Indonesian Restaurant	Department Store	Car Wash	Asian Restaurant	Monument / Landmark	6
40227	Babakan Ciparay	Cirangrang	-6.9580	107.5847	0	Steakhouse	Food Court	Multiplex	Bubble Tea Shop	Chinese Restaurant	6
40294	Cinambo	Pakemitan	-6.9211	107.6940	0	Asian Restaurant	Food Court	Indonesian Restaurant	Grocery Store	Diner	5

Figure 9. Clustering Result – Cluster 0

40231	Bojongloa Kaler	Jamika	-6.9219	107.5897	1	Indonesian Restaurant	Snack Place	Noodle House	Fast Food Restaurant	Cosmetics Shop	12
40173	Cicendo	Pajajaran	-6.8995	107.5875	1	Indonesian Restaurant	Asian Restaurant	Department Store	High School	Hotel	12
40143	Cidadap	Ledeng	-6.8527	107.5993	1	Hotel	Chinese Restaurant	Pool	Theme Park	Art Museum	14
40133	Coblong	Sadang Serang	-6.8955	107.6230	1	Indonesian Restaurant	Convenience Store	Noodle House	Asian Restaurant	Food Truck	12
40291	Antapani	Antapani Tengah	-6.9166	107.6607	1	Noodle House	Field	Supermarket	Spa	Salon / Barbershop	13

Figure 10. Clustering Result – Cluster 1

40172	Cicendo	Arjuna	-6.9095	107.5934	2	Indonesian Restaurant	Asian Restaurant	Noodle House	Playground	Steakhouse	23

Figure 11. Clustering Result – Cluster 2

40212	Bandung Kulon	Caringin	-6.9303	107.5720	3	Indonesian Restaurant	Dessert Shop	Diner	Food Truck	Convenience Store	8
40212	Bandung Kulon	Cibuntu	-6.9206	107.5727	3	Pool	Food Court	Sundanese Restaurant	Gym / Fitness Center	Basketball Court	7
40293	Arcamanik	Sindang Jaya	-6.9035	107.6852	3	Seafood Restaurant	Food & Drink Shop	Noodle House	Yoga Studio	Dim Sum Restaurant	8
40162	Sukajadi	Sukabungah	-6.8941	107.5934	3	Indonesian Restaurant	Convenience Store	Farm	Indonesian Meatball Place	Diner	8
40253	Regol	Cigereleng	-6.9398	107.6112	3	Food Truck	Convenience Store	Supermarket	Medical Center	Insurance Office	7
40152	Sukasari	Sukarasa	-6.8738	107.5845	3	Hotel	Motorcycle Shop	Football Stadium	Cosmetics Shop	Korean Restaurant	7
40195	Mandalajati	Sindang Jaya	-6.9035	107.6852	3	Seafood Restaurant	Food & Drink Shop	Noodle House	Yoga Studio	Dim Sum Restaurant	8

Figure 12. Clustering Result – Cluster 3

4. Data Analysis

4.1. Neighborhood Analysis

Based on the data that consists of number of venues, and the frequency of a venue in each category in each neighborhood, simple analysis can be performed to find the feasible neighborhood for a coffee shop. As the purpose of this project is to find the neighborhood that have numerous venues, but no coffee shop included, the feasible location can be obtained by getting rid the neighborhood that have only a few venues and or have coffee shops or cafe around. In this case, the neighborhoods that have less than 5 venues or the neighborhoods with the frequency of coffee shops or café is more than 0 are deleted. As the result, 21 feasible neighborhoods are obtained as shown in Figure 8.

4.2.Cluster Analysis

So far, neighborhood analysis has obtained 21 feasible neighborhoods. Having these numbers of feasible neighborhood, it still hard to decide which neighborhood is the preferred location to run a coffee shop. K-mean clustering is then employed to group this neighborhood based on its similarity. The K-mean clustering produced 4 clusters as follows:

- Cluster 0: consists of 9 neighborhoods with number of venues are between 5 – 6.
- Cluster 1: consists of 5 neighborhoods with number of venues are between 12 - 14
- Cluster 2: consist of 1 neighborhood with number of venues is 23
- Cluster 3: consist of 7 neighborhoods with number of venues are between 7 – 8

To provide better view, this clustering result is also plotted into Bandung's map as shown in Figure 13.

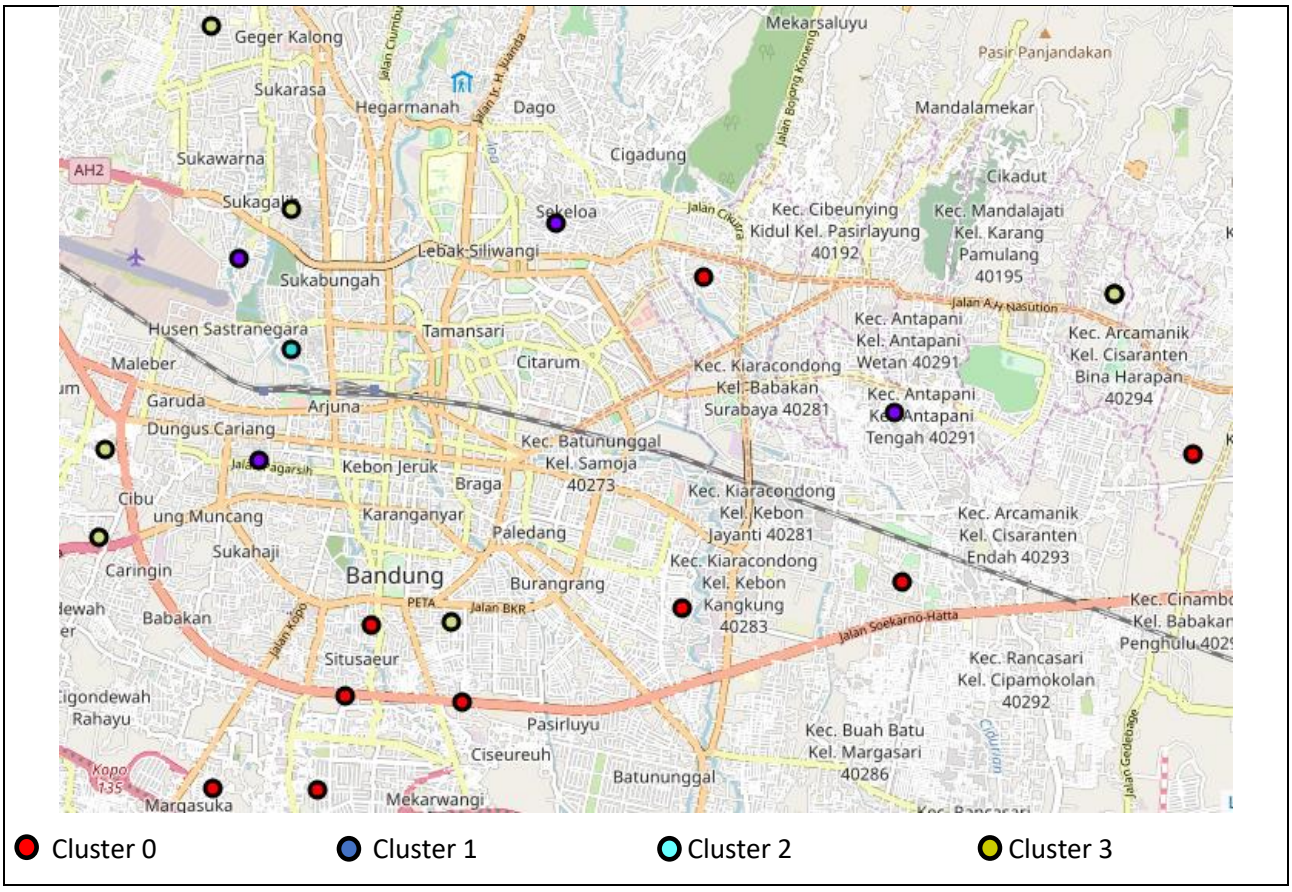

Figure 13. Clustering Result in Map of Bandung

5. Result and Discussion

Bandung, one of the biggest cities in Indonesia is divided into 151 neighborhoods. In term of the number and category of venues, each neighborhood has different characteristics. Some of them have a numerous of venue including many coffee shops and café. In order to find the preferred location to run a coffee shops, cluster analysis is performed to find out the neighborhood with a lot of venue but has no coffee shop or café around. The result shows that there are 18 feasible neighborhoods that can be divided into 4 clusters that indicate the preferred location. Based on the number of venues that represent the crowd, the priority of preferred location can be order as follows:

- Priority 1: Cluster 2. This cluster has the highest number of venues, 23 venues. Only one neighborhood belongs to this cluster. The dominant common venue in this cluster is Indonesian Restaurant.
- Priority 2: Cluster 1. This cluster has second highest number of venues, between 12 – 14 venues. Three neighborhoods belong to this cluster. Noodle house is the most common venue in every neighborhood.
- Priority 3: Cluster 3. The number of venues in this cluster is between 7 – 8 venues. Seven neighborhoods belong to this cluster. The most common venues in this cluster is Indonesian Restaurant.
- Priority 4: Cluster 0. The number of venues in this cluster is between 5 – 6. Eight neighborhoods belong to this cluster. Variety of venues is spread among the neighborhoods in this clusters.

6. Conclusion

In order to find out the most preferred location to run a coffee shop in Bandung, some analysis is performed. Four priorities of preferred locations are obtained. The first priority is represented the most preferred location. One neighborhood, Arjuna, which has 23 venues, is the most preferred location.

Notes:

For more detail calculation and process please refers to the notebook or blog.