

Capstone Project: The Battle of Neighborhood

CHEWY WARS: THE RISE OF BOBA

1. Introduction

1.1 Background

Originating in Taiwan, bubble milk tea features chewy tapioca balls and is known by various names such as pearl milk tea, boba juice, boba tea or simply bubble tea. Bubble milk tea first became trendy over a decade ago in Thailand. The product became popular again in last two years because of social media posts, marketing gimmicks and attractive store decorations. Options have better quality, fresh milk, freshly-made boba and fresh-brewed tea. The return of bubble milk tea has been influential not only in Thailand but also a few other countries especially in Asia such as Japan and Korea.

Thailand's market for bubble milk tea is estimated at 2.5 billion baht (~ 75 million USD). The market comprises more than 30 bubble milk tea brands, both local and international. Bubble milk tea shops, kiosks and trolleys are at every corner of retail shopping complexes, office buildings, train stations, hospitals, universities and business areas. For example, one of the famous brand in Thailand is Taiwan-based bubble tea chain called 'The Alley'. The company currently operates 12 branches in Thailand and reports selling 100,000 drinks a month.

According to Dataspring.com at least six bubble teas per person are consumed in Thailand in a month. It is clear the bubble tea business is truly bubbling over in Thailand. In the last year, there has been a sudden boom in the market for bubble tea franchises and Bangkok seems to be a city that is leading in a race to open as many bubble tea shops and stands as possible. The bubble tea trend is not going to fade fast. On the contrary, these tea stalls are very popular for entrepreneurs wanting to get into the business.

1.2 Challenges

At the very beginning, one of the important key factor to consider before starting new business is the location. Finding a great location is crucial for attracting customers when open a bubble tea store. If you are franchising or buying an existing business, the location is preselected, but you should still do your research and decide whether the existing or selected location is a good one. Accordingly, we will explore and find a location good enough to start open new bubble tea store.

Another important factors is the competitor. Because no matter how excellent your proposition is, you may find it difficult to do business if the closest 50 businesses are also bubble tea shops. Finding a balance between the number of competitors and the number of potential customers can be tricky. We will use data science to segment and specify a set of area suitable for the bubble tea business.

1.3 Objective

Find suitable location for open new bubble tea store.

1.4 How to solve the problem and making a decision

- Find suitable districts by K-mean clustering.
- Using data of bubble tea shops and population density in each district to determine the district having fewer competitors.

2. Data collection and preparation

In this project, two data sets will be used.

- Data of districts in Bangkok: name, location and population
- Foursquare API

2.1 Import data of districts in Bangkok

Bangkok is divided into 50 districts. Districts name, population, and location were scraped from a wikipedia page using the Beautiful Soup library in python (Fig.1).

	District	Thai	Population	Latitude	Longitude
0	Bang Bon	เขตบางบอน	105161	13.659200	100.399100
1	Bang Kapi	เขตบางกะปิ	148465	13.765833	100.647778
2	Bang Khae	เขตบางแค	191781	13.696111	100.409444
3	Bang Khen	เขตบางเขน	189539	13.873889	100.596389
4	Bang Kho Laem	เขตบางกอกแหลม	94956	13.693333	100.502500

Fig. 1 Data from Wikipedia showing district name, population, and location of example 5 districts in Bangkok.

Calculate population density

Data set of area of each district was imported (.csv file) and merged with the table in Fig.1. Then add column shows population density of each district (Fig. 2).

	District	Thai	Population	Latitude	Longitude	Area (sq km)	Pop Density
0	Bang Bon	เขตบางบอน	105161	13.659200	100.399100	34.74	3027.086931
1	Bang Kapi	เขตบางกะปิ	148465	13.765833	100.647778	28.52	5205.645161
2	Bang Khae	เขตบางแค	191781	13.696111	100.409444	44.46	4313.562753
3	Bang Khen	เขตบางเขน	189539	13.873889	100.596389	42.12	4499.976258
4	Bang Kho Laem	เขตบางกอกแหลม	94956	13.693333	100.502500	10.92	8695.604396

Fig. 2 List of district in Bangkok and other information of example 5 districts in Bangkok.

2.2 Explore districts in Bangkok using Foursquare API

Popular venues

Foursquare API was used to call up to 100 popular venues in each district (in radius 1 km). This was done using /explore request. The category of venues was extracted from Foursquare data and structured into dataframe (Fig. 3). There are 230 unique venue categories. This data was for K-mean analysis to group districts based on similarity.

	District	Latitude	Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Bang Bon	13.659200	100.399100	ชาหมูบางหัว	13.657136	100.395230	Thai Restaurant
1	Bang Bon	13.659200	100.399100	Irashaimase Japanese Restaurant	13.658358	100.401403	Japanese Restaurant
2	Bang Bon	13.659200	100.399100	ร้านต้นไม้ ริมถนนกาญจนวนกิจेक	13.654098	100.405054	Garden Center
3	Bang Bon	13.659200	100.399100	ส.สุขโภชนา	13.660358	100.404866	Chinese Restaurant
4	Bang Bon	13.659200	100.399100	เจ๊ไน ก๋วยเตี๋ยวเป็ดตุ๋น	13.654137	100.405323	Noodle House
5	Bang Bon	13.659200	100.399100	Lotus Express (โลตัส อี็กซ์เพรส)	13.657839	100.397243	Convenience Store
6	Bang Bon	13.659200	100.399100	ลานรั้วยอร์ด เสือเคหะ ที่ใหม่	13.656436	100.404455	Thai Restaurant
7	Bang Bon	13.659200	100.399100	Bussabar Steak House	13.656856	100.404690	Bar
8	Bang Bon	13.659200	100.399100	7-Eleven (เซเว่น อีเลฟเว่น)	13.656440	100.394178	Convenience Store
9	Bang Bon	13.659200	100.399100	พิพารณ์โภชนา ก๋วยเตี๋ยวเนื้อตุ๋น	13.654004	100.405454	Noodle House

Fig. 3 The first 10 rows of the dataframe showing up to 100 popular venues in each district (in radius 1 km).

Bubble tea shop in each district

For further analysis and final decision making. Foursquare API /explore request specific on bubble tea shops was used (Fig. 4). Total 246 bubble tea shops was observed.

	District	Latitude	Longitude	Venue	Venue Latitude	Venue Longitude
0	Bang Bon	13.659200	100.399100	Marucha ชานมไข่มุก สาขา 89 บางบอนวิลล์	13.664305	100.405140
1	Bang Kapi	13.765833	100.647778	OCHAYA (โอชายะ)	13.767824	100.643893
2	Bang Kapi	13.765833	100.647778	Chewing Tea	13.768491	100.643907
3	Bang Kapi	13.765833	100.647778	OCHAYA (โอชายะ)	13.765437	100.642609
4	Bang Kapi	13.765833	100.647778	Coco Fresh Tea & Juice	13.766131	100.642504
5	Bang Kapi	13.765833	100.647778	Ochaya (OCHAYA Tea For Health)	13.767356	100.642714
6	Bang Kapi	13.765833	100.647778	Mr.CupT (มิสเตอร์คัพที)	13.766620	100.642293

Fig. 4 The first 10 rows of bubble tea shops in each district in radius 1 km.

3. Data analysis

3.1 Exploratory data analysis

Fig.5 shows number of bubble tea shops in each district which 43 out of 50 districts have at least 1 bubble tea shop in the observed area (radius 1 km around coordinate of each district showed in Fig. 1).

District	Count
0	Bang Bon
1	Bang Kapi
2	Bang Khae
3	Bang Khen
4	Bang Kho Laem
5	Bang Khun Thian
6	Bang Na
7	Bang Phlat
8	Bang Rak
9	Bang Sue
10	Bangkok Noi
11	Bangkok Yai
12	Chatuchak
13	Chom Thong
14	Din Daeng
15	Don Mueang
16	Dusit
17	Huai Khwang
18	Khan Na Yao
19	Khlong San
20	Khlong Toei
21	Lak Si
22	Lat Krabang
23	Lat Phrao
24	Nong Chok
25	Nong Khaem
26	Pathum Wan
27	Phasi Charoen
28	Phaya Thai
29	Phra Khanong
30	Phra Nakhon
31	Pom Prap Sattru Phai
32	Rat Burana
33	Ratchathewi
34	Samphanthawong
35	Sathon
36	Suan Luang
37	Taling Chan
38	Thawi Watthana
39	Thon Buri
40	Thung Khru
41	Wang Thonglang
42	Watthana
43	Yan Nawa

Fig. 5 Number of bubble tea shops in each district.

Location of each district are visualized on a map using folium on python (Fig. 6).The map is create using coordinate from Table scraped from Wikipedia page to get an overview of districts location in Bangkok (Fig.6). Population density of each district was visualized on a choropleth map using folium on python (Fig. 7). Initial analysis indicated that central area of Bangkok have higher population density.

Next step, the population data will be combined with other parameter to decide which district is suitable for open new bubble tea shop.

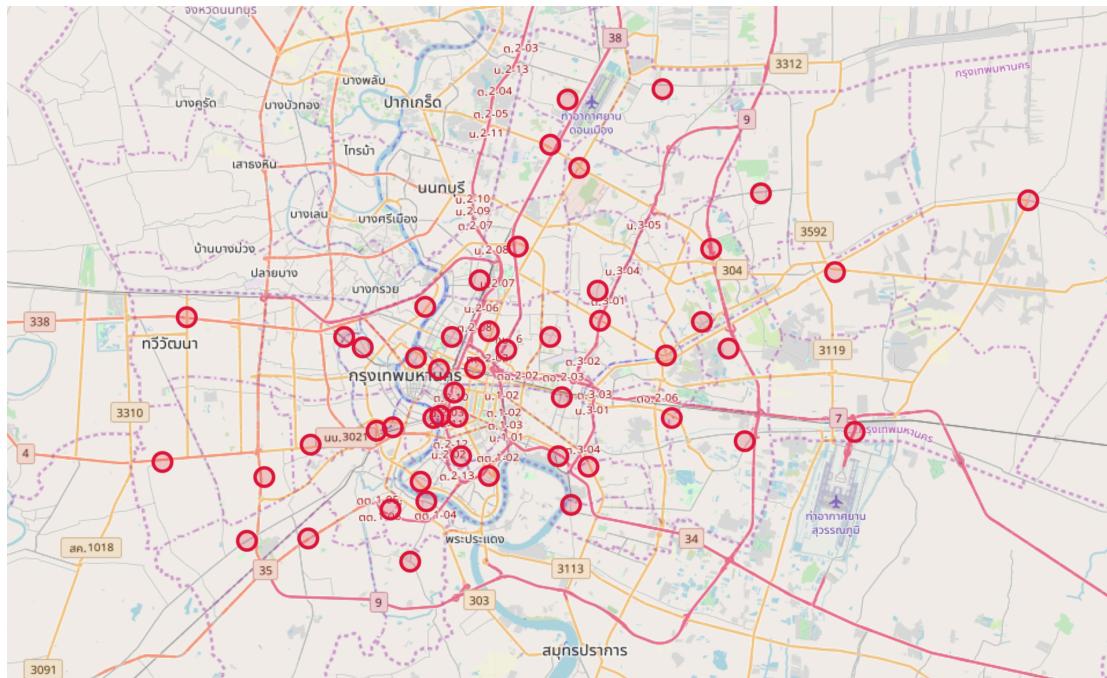


Fig. 6 Overview of 50 districts in Bangkok

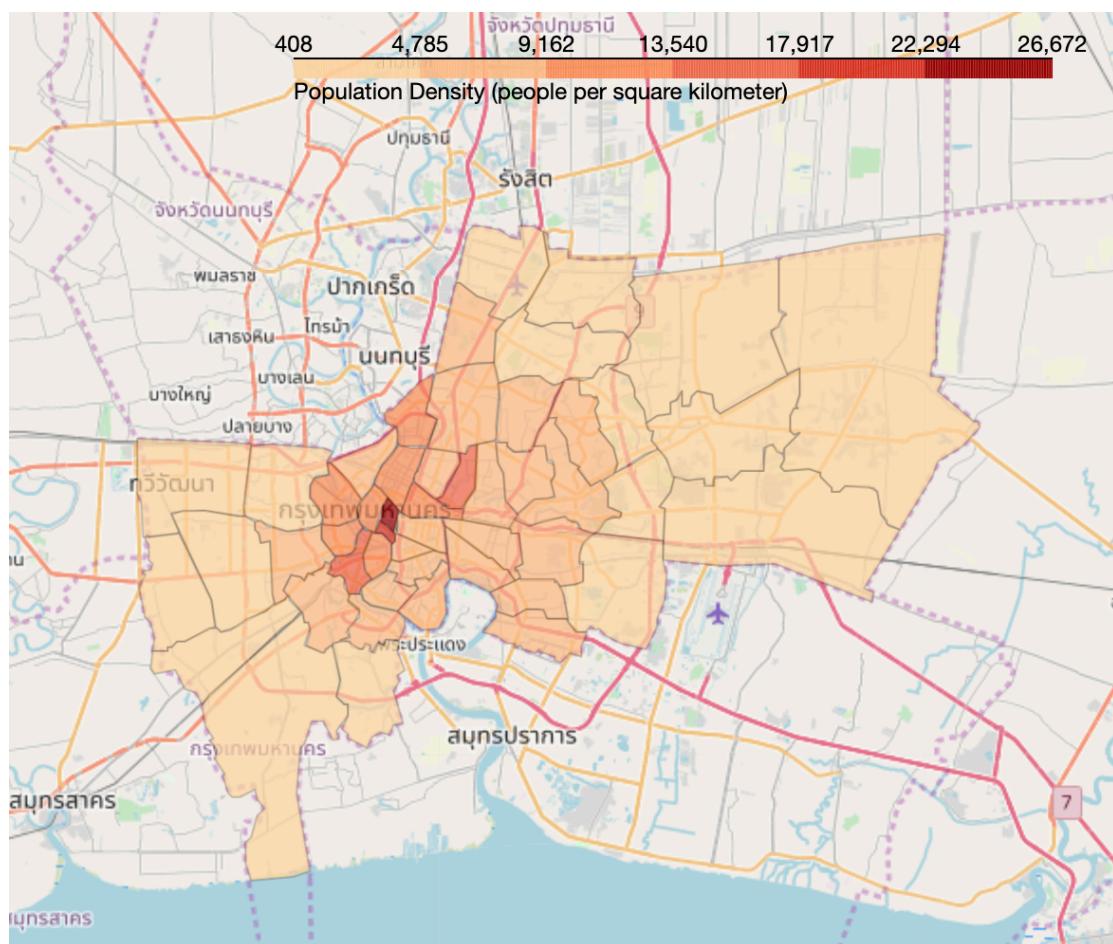


Fig. 6 Choropleth map showing population density of each district

3.2 Cluster analysis

K-means clustering was conducted to group districts according to their popular venues using Foursquare data (Fig.3). Firstly, one hot encoding was conducted to give binary values to each venue categories (Fig. 7).

	District	Accessories Store	Afghan Restaurant	Airport Service	Airport Terminal	American Restaurant	Arcade	Art Gallery	Art Museum	Arts & Crafts Store	...	Udon Restaurant
0	Bang Bon	0	0	0	0	0	0	0	0	0	0	0
1	Bang Bon	0	0	0	0	0	0	0	0	0	0	0
2	Bang Bon	0	0	0	0	0	0	0	0	0	0	0
3	Bang Bon	0	0	0	0	0	0	0	0	0	0	0
4	Bang Bon	0	0	0	0	0	0	0	0	0	0	0

Fig. 7 Result of one hot encoding

Next, data was grouped by district names to summarize the number of venues of each category found in each district. Instead of directly count the category, the frequency of the category appears among others was calculated (Fig. 8). This is because some district have less than 100 venues due to insufficient Foursquare data.

	District	Accessories Store	Airport Service	American Restaurant	Arcade	Art Gallery	Art Museum	Asian Restaurant	Athletics & Sports	Auto Garage	...	Udon Restaurant
0	Bang Bon	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.052632	0.000000	0.000000	...	0.000000
1	Bang Kapi	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.010000	0.000000	0.000000	...	0.000000
2	Bang Khae	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.076923	0.000000	0.000000	...	0.000000
3	Bang Khen	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.047619	0.000000	0.000000	...	0.000000
4	Bang Kho Laem	0.00	0.000000	0.000000	0.018868	0.000000	0.00	0.018868	0.000000	0.000000	...	0.000000
5	Bang Khun Thian	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.025974	0.000000	0.000000	...	0.000000
6	Bang Na	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.086957	0.000000	0.000000	...	0.000000
7	Bang Phlat	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.030303	...	0.000000
8	Bang Rak	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.000000	0.000000	0.000000	...	0.000000
9	Bang Sue	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.032258	0.000000	0.000000	...	0.000000
10	Bangkok Noi	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.076923	0.000000	0.000000	...	0.000000
11	Bangkok Yai	0.00	0.000000	0.000000	0.000000	0.000000	0.00	0.104167	0.000000	0.000000	...	0.000000

Fig. 8 Frequency of the category

Then, the top 5 most common venue category in each district was summarized as shown in Fig. 9.

District	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Bang Bon	Noodle House	Thai Restaurant	Garden Center	Coffee Shop
1	Bang Kapi	Coffee Shop	Thai Restaurant	Japanese Restaurant	Fast Food Restaurant
2	Bang Khae	Convenience Store	Noodle House	Japanese Restaurant	Café
3	Bang Khen	Convenience Store	Fast Food Restaurant	Coffee Shop	Noodle House
4	Bang Kho Laem	Thai Restaurant	Noodle House	Coffee Shop	Convenience Store
5	Bang Khun Thian	Thai Restaurant	Ice Cream Shop	Japanese Restaurant	Coffee Shop
6	Bang Na	Thai Restaurant	Noodle House	Café	Coffee Shop
7	Bang Phlat	Convenience Store	Café	Fast Food Restaurant	Bakery
8	Bang Rak	Noodle House	Chinese Restaurant	Hotel	Coffee Shop
9	Bang Sue	Noodle House	Thai Restaurant	Convenience Store	Coffee Shop
10	Bangkok Noi	Noodle House	Convenience Store	Som Tum Restaurant	Asian Restaurant
11	Bangkok Yai	Noodle House	Asian Restaurant	Dessert Shop	Farmers Market
12	Bueng Kum	Coffee Shop	Convenience Store	Café	Bakery
13	Chatuchak	Thai Restaurant	Coffee Shop	Noodle House	Fast Food Restaurant
14	Chom Thong	Convenience Store	Thai Restaurant	Pet Store	Coffee Shop
15	Din Daeng	Convenience Store	Thai Restaurant	Noodle House	Restaurant
16	Don Mueang	Hotel	Convenience Store	Airport Service	Rest Area
17	Dusit	Noodle House	Thai Restaurant	Convenience Store	Asian Restaurant
18	Huai Khwang	Thai Restaurant	Noodle House	Convenience Store	Japanese Restaurant
19	Khan Na Yao	Coffee Shop	Japanese Restaurant	Noodle House	Thai Restaurant
20	Khlong Sam Wa	Thai Restaurant	Exhibit	Japanese Restaurant	Restaurant
21	Khlong San	Chinese Restaurant	Dessert Shop	Noodle House	Café
22	Khlong Toei	Convenience Store	Coffee Shop	Residential Building (Apartment / Condo)	Track
23	Lak Si	Thai Restaurant	Coffee Shop	Convenience Store	Fast Food Restaurant
24	Lat Krabang	Thai Restaurant	Hotel	Café	Convenience Store
25	Lat Phrao	Noodle House	Coffee Shop	Café	Convenience Store
26	Min Buri	Intersection	Coffee Shop	Restaurant	Massage Studio
27	Nong Chok	Thai Restaurant	Dessert Shop	Shopping Mall	Coffee Shop
28	Nong Khaem	Convenience Store	Market	Thai Restaurant	Department Store
29	Pathum Wan	Noodle House	Asian Restaurant	Thai Restaurant	Chinese Restaurant
30	Phasi Charoen	Convenience Store	Thai Restaurant	Steakhouse	Japanese Restaurant
31	Phaya Thai	Thai Restaurant	Coffee Shop	Café	Bar
32	Phra Khanong	Convenience Store	Coffee Shop	Hotel	Noodle House
33	Phra Nakhon	Bar	Hotel	Thai Restaurant	Café
34	Pom Prap Sattru Phai	Noodle House	Café	Convenience Store	Thai Restaurant
35	Prawet	Convenience Store	Intersection	Noodle House	Soccer Field
36	Rat Burana	Coffee Shop	Thai Restaurant	Noodle House	Chinese Restaurant
37	Ratchathewi	Noodle House	Hotel	Steakhouse	Coffee Shop
38	Sai Mai	Thai Restaurant	Convenience Store	Café	Noodle House
39	Samphanthawong	Noodle House	Dessert Shop	Bar	Hotel
40	Saphan Sung	Thai Restaurant	Coffee Shop	Convenience Store	Japanese Restaurant
41	Sathon	Noodle House	Asian Restaurant	Chinese Restaurant	Convenience Store
42	Suan Luang	Noodle House	Coffee Shop	Asian Restaurant	Thai Restaurant
43	Taling Chan	Convenience Store	Noodle House	Restaurant	Coffee Shop
44	Thawi Watthana	Coffee Shop	Convenience Store	Noodle House	Furniture / Home Store
45	Thon Buri	Noodle House	Convenience Store	Thai Restaurant	Asian Restaurant
46	Thung Khru	Convenience Store	Thai Restaurant	Café	Som Tum Restaurant
47	Wang Thonglang	Noodle House	Coffee Shop	Asian Restaurant	Convenience Store
48	Watthana	Café	Coffee Shop	Noodle House	Thai Restaurant
49	Yan Nawa	Japanese Restaurant	Thai Restaurant	Coffee Shop	Café
					Hotpot Restaurant

Fig. 9 Top 5 most common venue category

K-mean clustering was conducted to grouped districts into 3 different clusters based on their similarity (Fig. 10). The different color in Fig. 11 indicates different clusters.

	District	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Bang Bon	13.659200	100.399100	1	Coffee Shop	Thai Restaurant	Chinese Restaurant	Convenience Store	Noodle House
1	Bang Kapi	13.765833	100.647778	2	Coffee Shop	Thai Restaurant	Japanese Restaurant	Fast Food Restaurant	Noodle House
2	Bang Khar	13.696111	100.409444	0	Noodle House	Convenience Store	Japanese Restaurant	Shopping Mall	Shop & Service
3	Bang Khen	13.873889	100.596389	2	Convenience Store	Fast Food Restaurant	Coffee Shop	Asian Restaurant	Noodle House
4	Bang Kho Laem	13.693333	100.502500	1	Coffee Shop	Thai Restaurant	Noodle House	Convenience Store	Chinese Restaurant
5	Bang Khun Thian	13.660833	100.435833	2	Thai Restaurant	Coffee Shop	Japanese Restaurant	Steakhouse	Hotpot Restaurant
6	Bang Na	13.680081	100.591800	0	Noodle House	Asian Restaurant	Pier	Convenience Store	Café
7	Bang Phlat	13.793889	100.505000	2	Convenience Store	Restaurant	Fast Food Restaurant	Café	Coffee Shop
8	Bang Rak	13.730833	100.524167	2	Noodle House	Hotel	Chinese Restaurant	Coffee Shop	Thai Restaurant
9	Bang Sue	13.809722	100.537222	0	Noodle House	Thai Restaurant	Convenience Store	Train Station	Coffee Shop
10	Bangkok Noi	13.770867	100.467933	0	Noodle House	Som Tum Restaurant	Steakhouse	Thai Restaurant	Convenience Store

Fig. 10 Districts grouped by K-mean clustering into three clusters based in similarity.

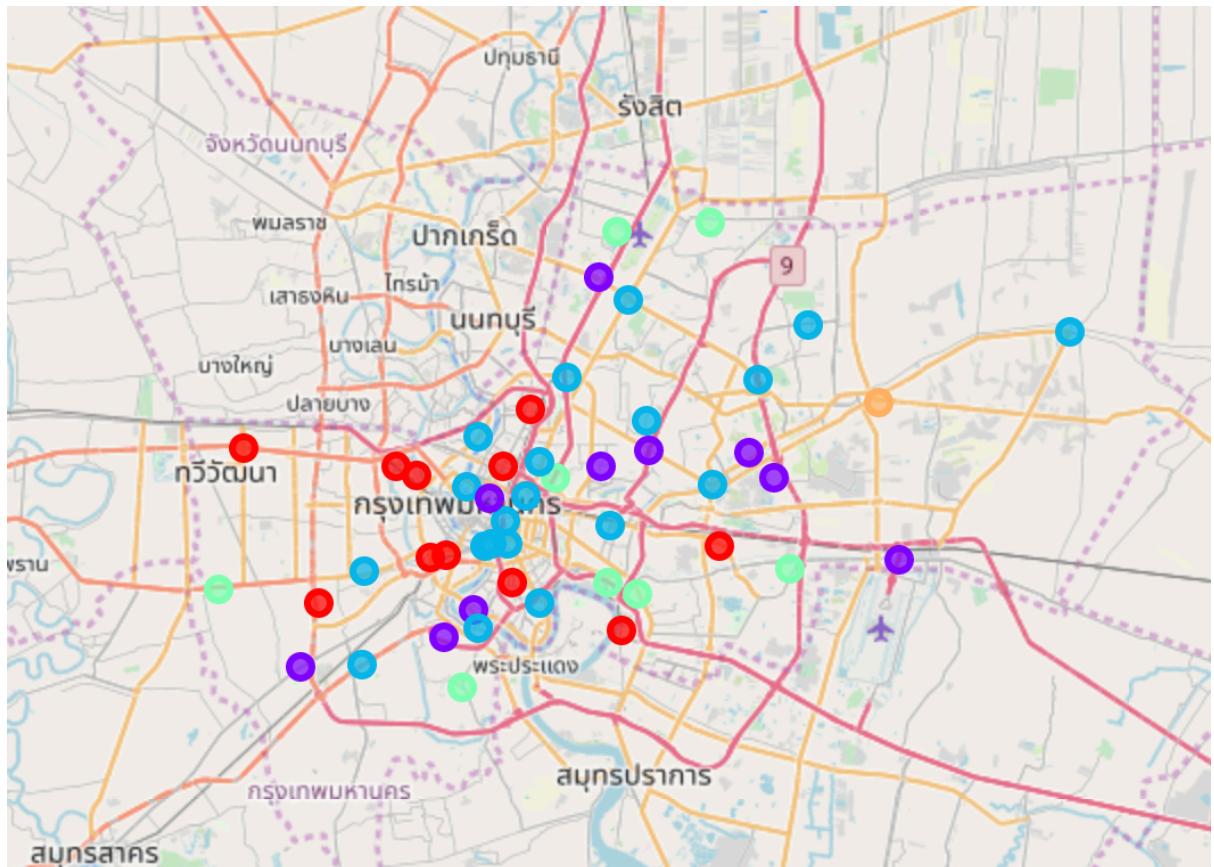


Fig. 11 Clustered districts

Then, characteristic of each cluster was observed.

Cluster 0

Noodle houses, Asian restaurants and Thai restaurants

District	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
2	Bang Khae	13.696111	100.409444	0	Noodle House	Convenience Store	Japanese Restaurant	Shopping Mall
6	Bang Na	13.680081	100.591800	0	Noodle House	Asian Restaurant	Pier	Convenience Store
9	Bang Sue	13.809722	100.537222	0	Noodle House	Thai Restaurant	Convenience Store	Train Station
10	Bangkok Noi	13.770867	100.467933	0	Noodle House	Som Tum Restaurant	Steakhouse	Thai Restaurant
11	Bangkok Yai	13.722778	100.476389	0	Noodle House	Convenience Store	Asian Restaurant	Dessert Shop
17	Dusit	13.776944	100.520556	0	Noodle House	Thai Restaurant	Convenience Store	Asian Restaurant
41	Sathon	13.708056	100.526389	0	Noodle House	Asian Restaurant	Convenience Store	Chinese Restaurant
42	Suan Luang	13.730278	100.651389	0	Noodle House	Coffee Shop	Asian Restaurant	Thai Restaurant
43	Taling Chan	13.776944	100.456667	0	Noodle House	Convenience Store	Coffee Shop	Seafood Restaurant
44	Thawi Watthana	13.787800	100.363800	0	Noodle House	Coffee Shop	Convenience Store	Furniture / Home Store
45	Thon Buri	13.725000	100.485833	0	Noodle House	Convenience Store	Asian Restaurant	Train Station
								Thai Restaurant

Cluster 1

Coffee shops, Asian restaurants and Thai restaurants

District	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Bang Bon	13.659200	100.399100	1	Coffee Shop	Thai Restaurant	Chinese Restaurant	Convenience Store
4	Bang Kho Laem	13.693333	100.502500	1	Coffee Shop	Thai Restaurant	Noodle House	Convenience Store
12	Buong Kum	13.785278	100.669167	1	Coffee Shop	Convenience Store	Café	Supermarket
14	Chom Thong	13.677222	100.484722	1	Thai Restaurant	Convenience Store	Asian Restaurant	Food Truck
18	Huai Khwang	13.776667	100.579444	1	Thai Restaurant	Noodle House	Convenience Store	Japanese Restaurant
23	Lak Si	13.887500	100.578889	1	Coffee Shop	Convenience Store	Thai Restaurant	Food Court
24	Lat Krabang	13.722317	100.759669	1	Thai Restaurant	Café	Hotel	Asian Restaurant
34	Pom Prap Sattru Phai	13.758056	100.513056	1	Noodle House	Café	Asian Restaurant	Thai Restaurant
40	Saphan Sung	13.770000	100.684722	1	Thai Restaurant	Coffee Shop	Japanese Restaurant	Café
47	Wang Thonglang	13.786400	100.608700	1	Café	Coffee Shop	Convenience Store	Noodle House
								Thai Restaurant

Cluster 2

Coffee shops, restaurants, bar

District	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
1	Bang Kapi	13.765833	100.647778	2	Coffee Shop	Thai Restaurant	Japanese Restaurant	Fast Food Restaurant
3	Bang Khen	13.873889	100.596389	2	Convenience Store	Fast Food Restaurant	Coffee Shop	Asian Restaurant
5	Bang Khun Thian	13.660833	100.435833	2	Thai Restaurant	Coffee Shop	Japanese Restaurant	Steakhouse
7	Bang Phlat	13.793889	100.505000	2	Convenience Store	Restaurant	Fast Food Restaurant	Café
8	Bang Rak	13.730833	100.524167	2	Noodle House	Hotel	Chinese Restaurant	Coffee Shop
13	Chatuchak	13.828611	100.559722	2	Coffee Shop	Thai Restaurant	Fast Food Restaurant	Japanese Restaurant
19	Khan Na Yao	13.827100	100.674300	2	Coffee Shop	Japanese Restaurant	Noodle House	Thai Restaurant
20	Khlong Sam Wa	13.859722	100.704167	2	Thai Restaurant	Exhibit	Noodle House	Zoo
21	Khlong San	13.730278	100.509722	2	Chinese Restaurant	Dessert Shop	Noodle House	Café
25	Lat Phrao	13.803611	100.607500	2	Coffee Shop	Noodle House	Som Tum Restaurant	Convenience Store
27	Nong Chok	13.855556	100.862500	2	Noodle House	Shopping Mall	Intersection	Thai Restaurant
29	Pathum Wan	13.744942	100.522200	2	Noodle House	Asian Restaurant	Chinese Restaurant	Thai Restaurant
30	Phasi Charoen	13.714722	100.437222	2	Thai Restaurant	Coffee Shop	Japanese Restaurant	Fast Food Restaurant
31	Phaya Thai	13.780000	100.542778	2	Thai Restaurant	Café	Coffee Shop	Bar
33	Phra Nakhon	13.764444	100.499167	2	Bar	Hotel	Thai Restaurant	Café
36	Rat Burana	13.682222	100.505556	2	Thai Restaurant	Coffee Shop	Noodle House	Asian Restaurant
37	Ratchathewi	13.758889	100.534444	2	Noodle House	Hotel	Café	Coffee Shop
39	Samphanthawong	13.731389	100.514167	2	Noodle House	Bar	Dessert Shop	Thai Restaurant
48	Watthana	13.742222	100.585833	2	Café	Coffee Shop	Noodle House	Thai Restaurant
49	Yan Nawa	13.696944	100.543056	2	Japanese Restaurant	Thai Restaurant	Coffee Shop	Café
								Hotpot Restaurant

Cluster 3

Convenience store and noodle houses

	District	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
15	Din Daeng	13.769722	100.552778	3	Convenience Store	Noodle House	Thai Restaurant	Stadium	Satay Restaurant
16	Don Mueang	13.913611	100.589722	3	Convenience Store	Noodle House	Restaurant	Airport Terminal	Cafeteria
22	Khlong Toei	13.708056	100.583889	3	Convenience Store	Coffee Shop	Residential Building (Apartment / Condo)	Bakery	Café
28	Nong Khaem	13.704722	100.348889	3	Convenience Store	Market	Diner	Bar	Som Tum Restaurant
32	Phra Khanong	13.702222	100.601667	3	Convenience Store	Coffee Shop	Hotel	Noodle House	Fast Food Restaurant
35	Prawet	13.716944	100.694444	3	Convenience Store	Intersection	Soccer Field	Noodle House	Cosmetics Shop
38	Sai Mai	13.919167	100.645833	3	Convenience Store	Noodle House	Thai Restaurant	Market	Café
46	Thung Khru	13.647200	100.495800	3	Convenience Store	Coffee Shop	Thai Restaurant	Noodle House	Café

Cluster 4

Traffic

District	Latitude	Longitude	Cluster Labels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue	
26	Min Buri	13.813889	100.748056	4	Intersection	Coffee Shop	Restaurant	Bus Station	Noodle House

From clustering analysis, cluster 1 and 2 have similar characteristic. The most recommended venues for both cluster are coffee shops and restaurants which indicated that people in these area are likely to be target customer and probably suitable for open bubble tea shop.

3.3 Analysis of number of bubble tea shops in each district

To decide which cluster is more suitable, number of bubble tea shop in each cluster was analyzed (Fig. 12). Results indicated that more bubble tea shops are found for cluster 2. An average bubble tea shop per district for cluster 2 is 9, while for other clusters is approximately 2. Cluster 4 have no bubble tea shop.

I assume that more bubble tea shop indicating that there are more target customer in that area. Therefore, additional analysis of bubble tea shops data demonstrated that cluster 2 is more suitable than cluster 1.

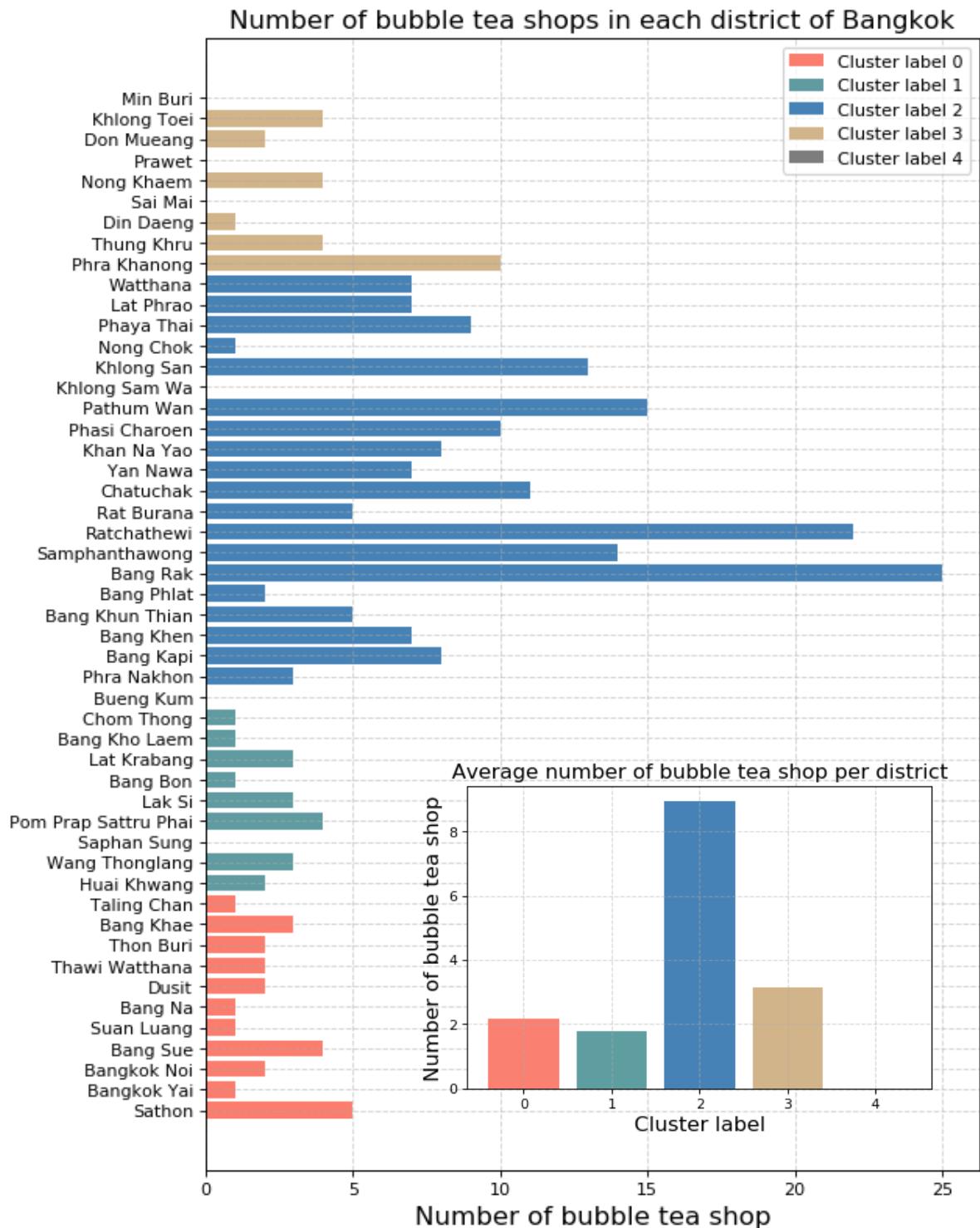


Fig. 12 Number of bubble tea shops in each district of Bangkok and average number of bubble tea shop per district of each cluster

3.4 Analysis of number of competitors

To narrow down the target districts, average population per one bubble tea shop was roughly calculated. Lower population per one bubble tea shop means that there are more competitors. Those district may already have saturated number of bubble tea shops. Therefore, five districts that have higher population per one bubble tea shop were selected (Fig. 13), including

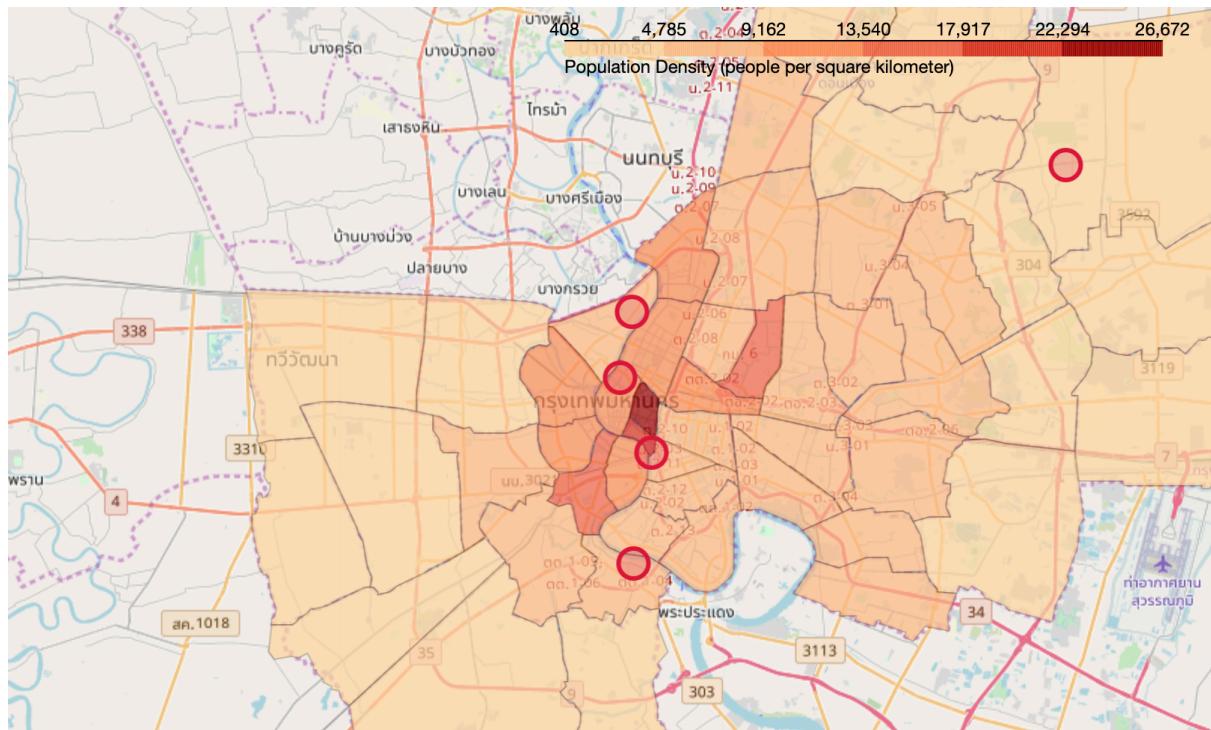


Fig. 13 Selected districts that suitable for open new bubble tea shop.

4. Conclusion

From cluster analysis (section 3.2), 2 out of 5 cluster are suitable for open bubble tea shop including cluster 1 and 2. Common venues found in these cluster, such as coffee shops, cafe, and restaurants, indicated high chance of more target customers. Further analysis demonstrated that more bubble tea shops were found in cluster 2 (section 3.3) which means higher target customers. Finally, five districts that have higher population per one bubble tea shop in cluster were selected, including Rat Burana, Samphanthawong, Phra Nakhon, Bang Phlat, and Khlong Sam Wa.