

Capstone Project: The Battle of Neighborhoods

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1. Introduction

After the 2008 Olympic Beijing Games, Qingdao-the host of sailing competition-has rapid grown in tourism and has become one of the most popular coastal tourism cities in China, with more than 42 millions visitors in the first half of 2019. Hotel business has boomed followed. Grown up in Qingdao, I am delighted to have people from all over the world to have a happy vacation here. Meanwhile, I am curious about how local hotels fit with visitor performance. I will acquire location data from Foursquare open source API and try to analysis various hotel information to explore the perfect hotel for different travelers. Hope it can provide some references for the people who are interested in Qingdao to make their travel plans, or for traveling agencies to formulate better trips.

2. Data

The location data acquired from Foursquare open API, with up to 37 Qingdao local hotel and their nearby venues information. The location data will be leveraged to explore or compare hotel around Qingdao, identifying which hotel to choose for travelers.

3. Methodology

In order to optimize tourist selection of hotel in Qingdao. I will clean and prepare the data for modelling, use K-means to generate hotel cluster for tourists particular needs, and visualise the model results.

3.1 Data Preparation

First of all, using explore API from Foursquare to get hotel list in Qingdao, and the the latitude and longitude for each . Second, keep using explore API to find venues near the hotel. We also need venue category, and coordinate. Then we create a function to get nearby venues for each hotel. After data cleaning, we get hotel name, hotel coordinate, venues nearby each hotel, venues coordinate, and venue category. The head of the table is as follow:

	Hotel	Hotel Latitude	Hotel Longitude	Venue	Venue Latitude	Venue Longitude	Venue Category
0	Shangri-La Hotel, Qingdao (Shangri-la Hotel)	36.064059	120.373486	Shangri-La Hotel, Qingdao (Shangri-la Hotel)	36.064059	120.373486	Hotel
1	Shangri-La Hotel, Qingdao (Shangri-la Hotel)	36.064059	120.373486	Café Yum	36.064554	120.372957	Café
2	Shangri-La Hotel, Qingdao (Shangri-la Hotel)	36.064059	120.373486	the mixC (万象城)	36.066887	120.373610	Shopping Mall
3	Shangri-La Hotel, Qingdao (Shangri-la Hotel)	36.064059	120.373486	Q Bar	36.063915	120.373882	Bar
4	Shangri-La Hotel, Qingdao (Shangri-la Hotel)	36.064059	120.373486	Starbucks (星巴克)	36.064684	120.376046	Coffee Shop

Figure 1: Data structure of hotel and venue information

To prepare for K-means model, we need to generate 5 top venues around each hotel, and return their venue category. Figure 2 gives us a bigpicture that what kinds of venue for each hotel.

	Hotel	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Best Western Premier Qingdao Kilin Crown Hotel...	Arcade	Beach	Shopping Mall	Zhejiang Restaurant	Clothing Store
1	Café Yum	Zhejiang Restaurant	Coffee Shop	Bar	Fast Food Restaurant	Shopping Mall
2	China Community Art and Culture Hotel	Italian Restaurant	Dumpling Restaurant	Seafood Restaurant	Café	Coffee Shop
3	Copthorne Hotel Qingdao (青岛国颐大酒店)	Korean Restaurant	Beach	Chinese Restaurant	Zhejiang Restaurant	Coffee Shop
4	Crowne Plaza Qingdao (青岛颐中皇冠假日酒店)	Coffee Shop	Italian Restaurant	American Restaurant	Thai Restaurant	Turkish Restaurant

Figure 2: Top venue category for hotels

3.2 Modelling

After the data preparation, we run k-means to cluster the hotels into 4 clusters and create a new dataframe that includes the cluster labels. Therefore, we generate figure 3 that clusters hotel into 4 groups with different nearby venue features.

	Hotel	Hotel Latitude	Hotel Longitude	Venue	ClusterLabels	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Best Western Premier Qingdao Kilin Crown Hotel...	36.097424	120.464783	Lion Mall (金狮广场),青岛国际啤酒城 Qingdao International...	1	Arcade	Beach	Shopping Mall	Zhejiang Restaurant	Clothing Store
1	Café Yum	36.064554	120.372957	the mixC (万象城),Q Bar,Starbucks (星巴克),Pizza Hut...	1	Zhejiang Restaurant	Coffee Shop	Bar	Fast Food Restaurant	Shopping Mall
2	China Community Art and Culture Hotel	36.072380	120.390326	船歌鱼水饺,Kona Coffee,Blue Harbor Seafood (蓝港海鲜厨房)...	0	Italian Restaurant	Dumpling Restaurant	Seafood Restaurant	Café	Coffee Shop
3	Copthorne Hotel Qingdao (青岛国颐大酒店)	36.054153	120.361848	第三海水浴场 No.3 Bathing Beach,景福宫,开海红岛海鲜水饺	1	Korean Restaurant	Beach	Chinese Restaurant	Zhejiang Restaurant	Coffee Shop
4	Crowne Plaza Qingdao (青岛颐中皇冠假日酒店)	36.064119	120.394305	istanbul (土耳其烤肉),Coffee Hunter,Kona Coffee,Sta...	0	Coffee Shop	Italian Restaurant	American Restaurant	Thai Restaurant	Turkish Restaurant

Figure 3: Clustered hotels

3.3 Visualisation

We will use folium library to visualize hotel cluster in Qingdao. Each clustered hotel is similar with nearby venues inside cluster and dissimilar with other cluster. As shown on figure 4, there are 4 clusters in total and most of hotels are in red and purple identifications.



Figure 4: Cluster visualization

4. Discussion

Based on the model, we can examine each cluster and determine the discriminating venue categories that distinguish each cluster. We will examine each cluster one by one, discussing what features they have and which kind of visitors are suitable for the clusters.

4.1 Cluster 1

In cluster 1, the most common venues shown are coffee shop, shopping mall, and restaurants (especially seafood restaurant). These hotels may be located in a business center, with a large number of shopping malls and cafes for leisure. A business center can also be assumed with convenient transportation. Most of the hotels are accompanied by seafood restaurants, a coastal city's special treat. These kinds of hotels may be suitable for people who are in need of shopping or want to experience local special food, but the location may need a higher rent requirement.

	Hotel	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
2	China Community Art and Culture Hotel	Italian Restaurant	Dumpling Restaurant	Seafood Restaurant	Café	Coffee Shop
4	Crowne Plaza Qingdao (青岛颐中皇冠假日酒店)	Coffee Shop	Italian Restaurant	American Restaurant	Thai Restaurant	Turkish Restaurant
5	Four Points by Sheraton Qingdao, Jiaonan	Coffee Shop	Hotel Bar	Shopping Mall	Seafood Restaurant	Restaurant
6	Grand Regency Hotel (麗晶大酒店)	Japanese Restaurant	Nightclub	Coffee Shop	Zhejiang Restaurant	Clothing Store
8	Himalayas Qingdao Hotel	Shopping Mall	Market	Sandwich Place	Coffee Shop	Zhejiang Restaurant
9	Holiday Inn	Fast Food Restaurant	Electronics Store	Shopping Mall	Seafood Restaurant	Diner
15	InterContinental Qingdao (青岛海尔洲际酒店)	Shopping Mall	Coffee Shop	Szechuan Restaurant	Men's Store	Diner
16	Le Meridien Qingdao Le Ballroom 3	Coffee Shop	Hotel Bar	Supermarket	Shopping Mall	Seafood Restaurant
17	Le Méridien Qingdao (青岛万达艾美酒店)	Coffee Shop	Hotel Bar	Supermarket	Shopping Mall	Seafood Restaurant
18	Le Méridien Qingdao West Coast Resort	Shopping Mall	Coffee Shop	Chinese Restaurant	Japanese Restaurant	Restaurant
23	Sunny World Hotel	Bar	Bookstore	Coffee Shop	Zhejiang Restaurant	Clothing Store
25	中航翔通游艇会	Coffee Shop	Shopping Mall	Harbor / Marina	Szechuan Restaurant	Fast Food Restaurant
35	青岛奥林匹克帆船中心1号门	Coffee Shop	Shopping Mall	Clothing Store	Supermarket	Fast Food Restaurant
36	青岛饭店 Qingdao Hotel	Coffee Shop	Shopping Mall	Italian Restaurant	Bar	Fast Food Restaurant

Figure 5: Cluster 1 hotel data information

4.2 Cluster 2

The most common venues in cluster 2 are restaurants, bar, park, café, etc. Hotels in cluster 2 are close to numbers of gourmet restaurants, especially Chinese restaurants. There are also plenty of bars, spas and cafes where you can probably taste the authentic tsingtao beer and experience tsingtao beer atmosphere. I would recommend these hotels to foreign tourists for better experience Chinese characteristics as well as Qingdao.

	Hotel	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
0	Best Western Premier Qingdao Kilin Crown Hotel...	Arcade	Beach	Shopping Mall	Zhejiang Restaurant	Clothing Store
1	Café Yum	Zhejiang Restaurant	Coffee Shop	Bar	Fast Food Restaurant	Shopping Mall
3	Copthorne Hotel Qingdao (青岛国顿大酒店)	Korean Restaurant	Beach	Chinese Restaurant	Zhejiang Restaurant	Coffee Shop
7	Haiqing Hotel Qingdao	Chinese Restaurant	Italian Restaurant	Bar	Beach	Seafood Restaurant
10	Housing International Hotel	Chinese Restaurant	Fast Food Restaurant	Buffet	Electronics Store	Korean Restaurant
11	Huanghai Hotel	Beach	Metro Station	Café	Zhejiang Restaurant	Coffee Shop
12	Hyatt Regency Qingdao (青岛鲁商凯悦酒店)	Italian Restaurant	Spa	Korean Restaurant	Shandong Restaurant	Zhejiang Restaurant
13	Ibis Hotel 宜必思酒店- 青岛	Hotpot Restaurant	Spa	Church	Grocery Store	German Restaurant
14	Ibis hotel	Grocery Store	Fast Food Restaurant	Zhejiang Restaurant	Hotel Bar	German Restaurant
19	Qingdao Ocean Hotel 青岛远洋大酒店	Grocery Store	Arcade	Fast Food Restaurant	Shopping Mall	Metro Station
21	Shangri-La Hotel, Qingdao (Shangri-la Hotel)	Chinese Restaurant	Fast Food Restaurant	Bookstore	Korean Restaurant	Convenience Store
22	Sophia International Seaview Hotel Qingdao	Arcade	German Restaurant	Restaurant	Zhejiang Restaurant	Clothing Store
24	The Westin Qingdao (青岛威斯汀酒店)	Chinese Restaurant	Fast Food Restaurant	Buffet	Korean Restaurant	Diner
26	怡堡酒店 The Castle Hotel	German Restaurant	Café	Park	Zhejiang Restaurant	Clothing Store
30	湛山花园酒店 Zhanshan Garden Hotel	Garden	Chinese Restaurant	Zhejiang Restaurant	Clothing Store	Grocery Store
31	阿兹凯乐西餐厅 Rats Keller western restaurant	Fast Food Restaurant	Café	Park	Coffee Shop	Zhejiang Restaurant
32	青岛凯越青年旅社 Qingdao Kaiyue Youth Hostel	Church	BBQ Joint	Market	Café	Chinese Restaurant
33	青岛啤酒街 Beer Street	Beer Garden	Shopping Mall	Brewery	Museum	Zhejiang Restaurant

Figure 6: Cluster 2 hotel data information

4.3 Cluster 3

Hotels in cluster 3 has beach, restaurants, plaza, etc. These hotels are adjacent to the beach and probably have great ocean views. Perfect for those who need a holiday or leisure.

	Hotel	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
20	Sea View Garden Hotel Qingdao	Beach	Zhejiang Restaurant	Clothing Store	Grocery Store	German Restaurant
27	武胜关度假酒店	Plaza	Beach	Zhejiang Restaurant	Grocery Store	German Restaurant
28	汇泉国际大酒店 Huiquan Dynasty Hotel	Plaza	Beach	Zhejiang Restaurant	Grocery Store	German Restaurant
29	海景花园大酒店	Beach	Zhejiang Restaurant	Clothing Store	Grocery Store	German Restaurant

Figure 7: Cluster 3 hotel data information

4.4 Cluster 4

Cluster 4 has only one hotel, which surrendered by market, restaurants, and stores. This hotel is a youth hostel, may suitable for students or tourist who has limited budget.

	Hotel	1st Most Common Venue	2nd Most Common Venue	3rd Most Common Venue	4th Most Common Venue	5th Most Common Venue
34	青岛奥博维特国际青年旅舍 YHA Old Observatory, Qingdao	Market	Zhejiang Restaurant	Clothing Store	Grocery Store	German Restaurant

Figure 8: Cluster 4 hotel data information

5. Conclusion

Using the K-Means model, we processed and explored the foursquare data. We came up with a hotel choice that suits different travelers. For tourist who have shopping need and have budget sufficient budget, we recommend the first cluster of hotel; travelers who want to experience local life and taste authentic tsingtao beer can choose the second cluster; The third kind of hotel is recommended for leisure travelers; and the fourth type of hotel is recommended for young people who has limited budgets.