

Use Online Data to Explore the Factors That Influence Foodie Tourists' Dining

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Abstract—Food, as part of tourism, attracts a large number of foodie tourists. Tourism researchers analyzed the factors influencing tourists' dining choices by studying the spatial distribution characteristics and emotional characteristics of tourists. This can provide a planning basis for the development of food and beverage in tourist destinations. This paper uses Qunar's tourist restaurant review data and food travel diaries, HDBSCAN algorithm, TF-IDF algorithm and Baidu AI open platform to obtain the dining space characteristics and emotional expression of food tourists, and obtains the following conclusions: (1) Food tourists prefer to eat nearby during travel, and the restaurants they choose are mostly concentrated in the main urban area; (2) Tourists will reduce their demand for the restaurant environment due to travel behavior, and the overall evaluation of the restaurant will be more affected by the taste of the dishes and the service of the restaurant; (3) Foodie tourists who come to Chongqing not only pay attention to the food and drink of Chongqing, but also pay attention to the local traditional culture. This has led Chongqing's tourism management department to formulate its own representative food tourism publicity according to the characteristics of the city.

Keywords-foodie tourists; travels; comments; clustering; emotion

1 Introduction

As one of the necessary conditions for basic needs, diet is located in the second place of "clothing, food, housing and transportation", which shows that its status should not be underestimated, so the research on catering also needs to receive more attention. With the development of the economy, tourism has also been developed to a certain extent, and people relax and experience different customs through tourism. As an important part of tourism, food and beverage account for a quarter or more of tourists' journey^[1]. As a way to express local culture, catering creates local customs and attracts more tourists to experience the characteristics of the tourist destination. Depending on the current VR technology support, people can use video, pictures and so on to get more intuitive visual feelings. With the help of technology, you can achieve an immersive effect and experience different scenery. But the experience of loving food cannot be satisfied only through visual experience. Compared with the depth of personal experience, tourists' perception of food is more multi-dimensional compared with scenery. Therefore, more and more people choose to travel to experience food as a starting point.

The researchers proposed the concept of food tourism^[2], acknowledging that food tourism has become a major theme in recent tourism research. In the future, more attention needs to be paid

to the research of tourism catering. The movement trajectory of tourists has always been a concern of tourism researchers. Through the analysis of tourists' travel trajectories, the spatial distribution and behavior patterns of tourists in destinations are explored^[3]. With the development of food tourism, the spatial distribution characteristics of food tourists need to be explored urgently. This is used as a guide for the development of food tourism in tourist destinations. At the same time, the expression of consumers' dining sentiment has become an important evaluation factor to measure the quality of a restaurant^[4], and to a certain extent, it represents the spending tendency of tourists^[5]. With the continuous development and improvement of tourism-related social platforms, tourists can directly evaluate dining restaurants on the platform. Analyzing the evaluation of the restaurant from the perspective of tourists based on their dining reviews is helpful for the restaurant itself to set up corresponding dining recommendations for foreign tourists. It will bring new measures for the development of Chongqing's food tourism.

2 Methodology

2.1 Case study region: Chongqing, China

Chongqing is located in the southwest of China, the upper reaches of the Yangtze River, Chongqing has Daba Mountain in the north, Wushan Mountain in the east, Wuling Mountain in the southeast, and Da Lou Mountain in the south. The altitude of the main urban area of Chongqing is mostly between 168~400 meters, known as the "mountain city". The total area is 82,400 square kilometers, and the permanent population is 32,054,200. Chongqing's hot and humid climate conditions have formed a spicy food taste. The dishes attract the attention of tourists from all over the world with their bright colors and spicy tastes.

2.2 Data Collection

The travelogue texts and restaurant review data used in this study are all from Qunar (<https://www.qunar.com/>), and this article selects the data of 424 restaurants and 13,816 reviews of restaurants involved in Qunar's 831 food-themed online travel diaries from 2012 to 2020 as the initial data. The details of the collected travel data and restaurant review data are shown in Tables 1 and 2, respectively:

Table1. Example of network travel diaries data

User ID	Diary ID	Departure date	The sequence of the POIs visited
186091972@qunar	5530681	2014/10/1	3396999; 3396427...
160294179@qunar	7438399	2018/10/1	9024968; 14476019...

Table 2. Sample restaurant review data

restaurant's POI	Name of the restaurant	comment content
11603640	Bayihaochijie	There are many snacks here, but the key is ...
6342062	Chenjianping's Fried Dough Twists	Ok, but I don't know if it's crisply...

The distribution of restaurants is shown in Fig. 1

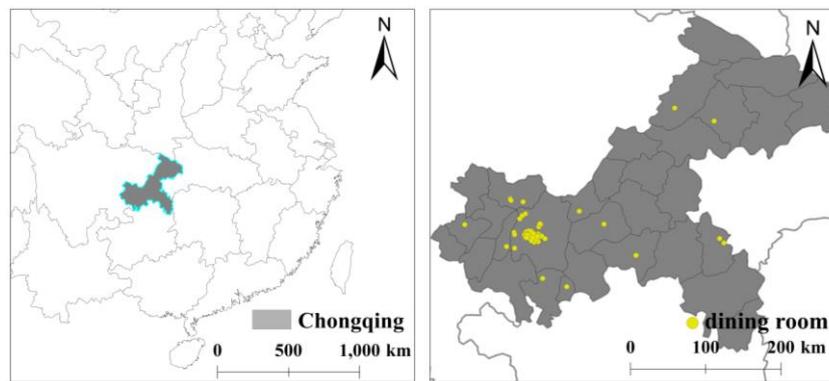


Fig. 1 Distribution of restaurants in Chongqing

2.3 Methods

This paper uses Baidu AI open platform, HDBSCAN algorithm, TF-IDF algorithm and Pearson coefficient, this paper explores the characteristics of food tourists' dining behavior from two perspectives of emotional perception and space

2.3.1 Dining emotions of foodie tourists

Researchers' research on tourists' dining emotions is helpful for tourism practitioners to rationally allocate the distribution of tourism market resources. In recent years, the research on sentiment analysis has received great attention, and the corresponding sentiment analysis platforms have emerged one after another. There are a large number of open source and commercial APIs for pre-trained sentiment analysis models available to the public, such as Baidu AI Open Platform, Stanford Sentiment Analysis, Rosette Text Analytics and SentiStrength. Since the text content processed this time is mainly Chinese, it chose to call the Baidu AI open platform to analyze the mood of tourists. The quality of a restaurant can be judged most truly according to the tourists' emotional expression of dining^[6].

TF-IDF is a statistical method used to assess the importance of a single word in a critical text, and the importance of a word is proportional to the number of times it appears in the text. TF (Term Frequency) is the word frequency, which represents the frequency at which a single word appears in the text. For words in fixed text, the formula for TF can be expressed as:

$$tf_{i,j} = \frac{n_{i,j}}{\sum_k n_{k,j}} \quad (1)$$

Where: n_{ij} represents the number of times a word appears in the specified text d_j , and $\sum_k n_{k,j}$ is the sum of all the occurrences of all words in file d_j .

IDF stands for Reverse File Frequency and is a measure of the universal importance of a word. We can use this formula to explore words that have significant meaning in text data. In this way, the subject of the text is analyzed. The IDF for a particular word can be obtained by dividing the total number of files by the number of files containing that word, and then taking the logarithm of the quotient obtained. The formula for IDF can be expressed as:

$$idf_i = \log \frac{|D|}{|\{j : t_i \in d_j\}|} \quad (2)$$

where $|D|$ is the total number of files in the corpus, and $|\{j : t_i \in d_j\}|$ is the number of files containing the word.

2.3.2 Spatial distribution characteristics of dining: cluster analysis

HDBSCAN^[7] algorithm is to transform DBSCAN into hierarchical clustering algorithm, and then use a stable clustering technique to extract a flat cluster to extend DBSCAN. Cluster irregular POI distributions based on distance. According to the clusters after clustering, the corresponding distribution law is analyzed. We can apply this algorithm to the planning of urban functional areas. Distance clustering based on POI type. Reasonably distinguish the internal functions of the city.

$$d_{mreach-k}(a,b) = \max \{core_k(a), core_k(b), d(a,b)\} \quad (3)$$

Where: $d(a,b)$ represents the original distance between a and b, under which the distance between density points, which have low core distances, remains constant. But the distance of sparse points from other points is pulled out to be calculated by core distance.

3 Results and Discussions

3.1 Spatial distribution characteristics of dining

The restaurants involved in the travel diaries were spatially clustered. Due to the dense distribution of restaurants in the main urban area, the value of the lowest minimum clustering element is set to five. The results are shown in Fig. 2.

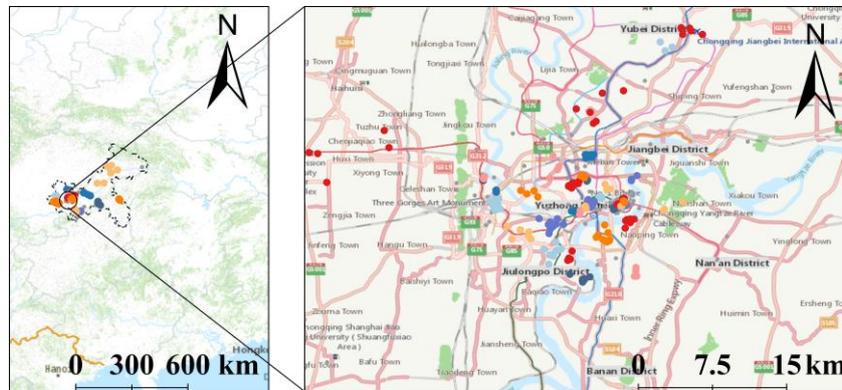


Fig. 2 Restaurant clustering results

We found that the clustering distribution of restaurants is concentrated in the main urban area, especially in Yuzhong District, Jiangbei District, Yubei District. Restaurants far from the main urban area are less distributed, which shows that tourists choose to eat nearby. After clustering, it is found that the clustering points are mostly distributed near the main road and public transport network, which shows that tourists are easily affected by traffic when choosing restaurants for dining. At the same time, we found that tourists were mostly concentrated near the Jiefangbei and Guanyin Bridge. Considering that these two areas have perfect infrastructure and service facilities^[8], they are located in the commercial and trade center area of Chongqing. Restaurants are densely distributed in this area, and tourists can not only obtain dining services here, but also more easily access to other infrastructure services.

3.2 Emotional characteristics

Sentiment analysis is conducted on the top 50 restaurant reviews mentioned in travel diaries, and the emotions are divided into three parts: "positive," "negative" and "neutral". Combined with the correlation between the score of Dianping and the level of review emotion, the impact of travel behavior on tourists' dining emotion is analyzed, and the results are shown in Fig. 3.

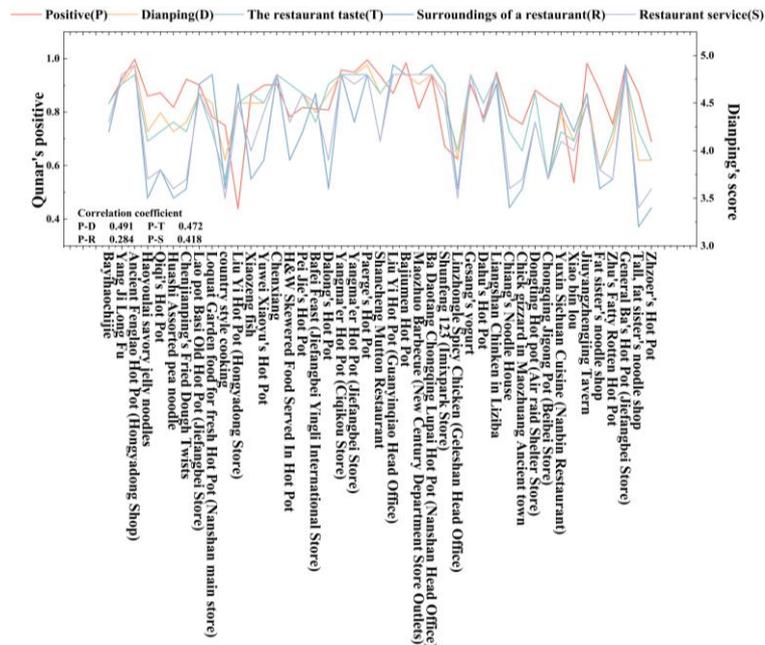


Fig.3 Correlation diagram of tourists' positive emotions and Dianping scores

The results show that the correlation between tourists' positive emotional expression and the score of Dianping is significantly 0.491, showing a positive correlation. We find that travel behavior does not affect how tourists rate restaurants. Since the restaurant does not change because the customers are tourists, tourists enjoy the dishes, service and environment of the restaurant just like ordinary customers, so the evaluation of the restaurant is objective. When judging the correlation with the restaurant's taste, environment and service, we find that the correlation between tourists' positive emotional expression and the environment score of Dianping is 0.284, and the performance is not correlated. It can be seen that during the long journey, tourists have lower requirements for external factors such as the environment of the restaurant, and more pursue the taste and service of the restaurant. However, tourists do not lower their standards of restaurant taste and service because of travel. Moreover, there are many "fly restaurants" in Chongqing that are popular with people. It can be seen that the more important factors affecting the evaluation of restaurants lie in the taste and service of restaurants.

By using the travel diaries of tourists, the focus of tourists in Chongqing is analyzed, and the relevant word cloud map is drawn, as shown in the Fig. 4.

was used to explore the factors influencing the development of food tourism in Chongqing and to conclude as follows:

- (1) Foodie tourists will not affect their evaluation of restaurants due to their travel behavior. However, in the tired travel process, tourists will give priority to reduce the demand for the restaurant environment, reasonably avoid adverse factors, and give priority to non-key elements.
- (2) Foodie tourists pay more attention to local specialties during travel, and also pay attention to local traditional culture. It is suggested that Chongqing develop other food business centers to dredge the flow of people.
- (3) During the travel, tourists prefer restaurants in the main urban area of Chongqing, and they are concentrated near the business and trade area.

To sum up, this paper explores the factors that affect the development of tourism through the emotional analysis of foodie tourists, and provides a basis for the future development of food tourism in Chongqing. As Chongqing has been rated as one of the "Top ten food Cities in China", it has attracted a large number of tourists in the name of food, while the distribution of local infrastructure has limited the travel of tourists and the development of destination tourism to a certain extent. Therefore, Chongqing should give priority to the influencing factors from the perspective of tourists in the future tourism development planning to meet the needs of tourists in a planned way.

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