Analyzing public perceptions of street food in Ho Chi Minh City from a management perspective using data analytics and netnography approaches

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ABSTRACT

Street food plays a pivotal role in tourism development, and effective management is crucial for optimizing its impact. This study explores public perceptions of street food in Ho Chi Minh City from a management perspective, utilizing data analytics and netnography approaches. By analyzing viewer comments on street food videos, the research aims to understand public sentiment and its influence on local tourism. Data analytics methods employed include toxicity analysis, sentiment analysis, and 3D semantic clustering to group comments based on thematic relevance and sentiment. The findings reveal that the majority of feedback is positive, driven by factors such as affordability, cultural diversity, and the aesthetic appeal of food streets. Despite this, negative comments, while in the minority, often stem from cultural misunderstandings, preconceived biases regarding Vietnamese cuisine, or, in some cases, unfair competition in the tourism sector. To improve street food tourism and counter these misconceptions, several strategies are recommended. These include government-led initiatives promoting Vietnamese culinary culture globally, vendor training in business management and cross-cultural communication, and collaborations among local governments, tourism agencies, and the private sector. Additionally, establishing an official tourism blog for Ho Chi Minh City is proposed, allowing for authentic storytelling and data-driven analysis of tourist feedback to inform future marketing and service improvements.

1. Introduction

In recent years, Vietnam's tourism industry has witnessed remarkable growth, significantly contributing to the national economy. Ho Chi Minh City (HCMC), as the economic and cultural hub of the country, has become an attractive destination for both domestic and international tourists. According to data from the Vietnam National Administration of Tourism, in 2023, Vietnam welcomed 12.6 million international visitors, 3.5 times higher than in 2022 (TITC, 2024). HCMC, with its cultural and culinary diversity, plays a crucial role in attracting tourists. Cuisine, especially street food, is not only an integral part of the travel experience but also a key factor contributing to the destination's appeal. The proliferation of private street food stalls in Vietnam has accelerated significantly since the liberalization of trade in 1986 (Hiemstra et al., 2006). The street food sector encompasses stalls offering ready-to-eat foods and beverages, which are prepared and/or sold in open-air settings on streets and other public spaces. Typically, these street food

operations are organized as household enterprises. Historically, cuisine has been influenced by neighboring countries such as China, India, and particularly France. These cultures have contributed to the development and diversification of Vietnamese cuisine, resulting in iconic dishes. Vietnamese street food is renowned for its richness and variety, ranging from traditional dishes to modern offerings, catering to the needs of all types of tourists. According to Pai et al. (2024), tourists typically spend an average of over 23.75% of their travel budget on food; this figure is even higher for some nationalities, such as Thai and South Korean tourists, who allocate 25.81% and 25.23% of their budgets, respectively. This highlights the importance of cuisine in enhancing the travel experience and promoting the development of the tourism industry. Therefore, street food plays a crucial role in enhancing Vietnam's competitiveness in the tourism sector, as it not only attracts a specific number of tourists but also provides them with unique and diverse experiences, creating an advantage over other destinations (Pham et al., 2023).

Research on tourist behavior and sentiments provides essential data for improving services, meeting tourist needs, and promoting sustainable tourism development. These insights not only help managers identify the strengths and weaknesses of current services but also support the formulation of appropriate policies to attract more visitors and ensure and enhance the overall quality of the tourist experience. Consequently, studying tourist behavior plays a crucial role in guiding and developing street food tourism. Recognizing this urgency, there have been several studies on public perceptions of street food in Vietnam, particularly in HCMC. However, these studies often rely on small sample surveys. In the digital age, social media platforms have become powerful tools for marketing and influencing consumer behavior, particularly in the tourism and hospitality sectors. Social media marketing allows businesses to reach a global audience, engage with potential customers, and create personalized experiences. For tourists, social media serves as a platform to share their experiences, provide feedback, and influence the decisions of future travelers. Platforms like YouTube, Instagram, and Facebook are increasingly used to showcase culinary experiences, with videos and posts about street food becoming particularly popular. This not only amplifies the reach of street food vendors but also shapes the perceptions and expectations of tourists. Understanding and analyzing the data generated from these platforms is crucial for gaining insights into tourists' preferences, experiences, and satisfaction levels. For these reasons, this research aims to explore tourists' perceptions and evaluations of street food in HCMC through the lens of social media data. The goal is to provide recommendations for addressing issues related to street food tourism and enhancing the overall tourist experience in this domain. By doing so, it contributes to the development of tourism in HCMC specifically, and Vietnam as a whole, enhancing the overall travel experience and fostering a deeper connection between tourists and the destination. To achieve the research objectives, we employ big data analytics using Communalytics to collect and analyze tourist feedback through various quantitative methods, collectively referred to as data analytics, combined with the qualitative netnography approach. Notably, this research context and methodology have not been previously applied to related topics, making it expected to provide an accurate understanding of the current state of street food in HCMC.

2. Literature review

In research on the development of street food tourism in Vietnam, Pham et al. (2023) argue that understanding consumer emotions is crucial for comprehending tourist behavior, especially in the context of local food experiences such as street food in Vietnam. The findings

indicate that tourists' emotions towards street food are diverse and reflect specific and ephemeral aspects of their experience. Local food experiences encompass more than just tasting or satisfying hunger; they involve a multisensory and multidimensional experience. Therefore, research on the development of street food tourism, specifically in HCMC, is essential. Specifically, to elaborate on the above statement, Tran et al. (2018) studied factors affecting international tourists' satisfaction with street food in HCMC, which surveyed 203 international tourists; their result emphasizes the importance of enhancing the quality and diversity of street food offerings to meet modern consumer demands and improve tourist satisfaction. Strategies such as standardizing inputs, investing in chef training, and diversifying menus are crucial for attracting international visitors. Additionally, the implementation of competitive pricing and promotional programs plays a significant role in building customer loyalty, particularly during peak tourist seasons. Concerns about food safety and hygiene standards are also highlighted as critical factors influencing tourists' perceptions and satisfaction; Furthermore, the economic impact of street food tourism is underscored by its contribution to the local economy and its potential for international expansion through partnerships, franchising, and licensing. The organization of street food festivals and participation in culinary events are suggested as effective means to promote the rich culinary heritage of HCMC, enhancing tourist engagement and awareness. Several perspectives align with a study by Pham and Bui (2019), which suggests that strategies to improve food safety standards and invest in staff training to enhance culinary and service skills have a positive impact on street food tourism. However, Pham and Bui (2019) emphasize the need for a thorough investigation to plan and establish a long-term strategy for street food in conjunction with tourism activities, while also proposing stricter management measures from local authorities. Another observation made by Henderson (2019) suggests that the positioning of street food within destination marketing efforts and the implementation of regulations to protect both vendors and customers should be emphasized. The development of street food varies across countries, making it reasonable to conduct localized studies for specific regions. In his comparative analysis of street food in Singapore and HCMC from a Southeast Asian tourism perspective, Henderson (2019) suggests that, for example, although Singapore and HCMC are both situated in Southeast Asia, their approaches to developing street food tourism differ significantly, with each city presenting contrasting conditions and strategies. These studies propose there is a need for a long-term strategy based on an evaluation of the current situation of the street food tourism sector in HCMC, as prior research has primarily focused on small-scale surveys. To the best of our knowledge, there has been no prior research utilizing big data analytics to evaluate street food in HCMC. Thus, there is a need to explore different perspectives and conduct larger-scale studies.

The application of big data analytics has been widely adopted in evaluating and addressing a variety of complex issues through diverse methodologies. These methodologies range from traditional techniques such as descriptive statistics, linear regression, and cluster analysis to more advanced approaches like Artificial Intelligence (AI), machine learning, and deep learning. In today's context, where data is increasingly voluminous and complex, selecting the appropriate data mining method is crucial for producing accurate and meaningful analyses. It is important to note that focusing solely on conventional methods and AI provides only a partial view of the overall landscape. In reality, big data analytics encompasses a vast array of methods and tools, including natural language processing, sentiment analysis, predictive modeling, and social network analysis. Each method and tool has its own strengths, and effectively integrating them can significantly save time and effort.

When surveying data mining methods applied to social media platforms like YouTube, techniques such as classification, association, and clustering have been employed to uncover relationships between variables within a dataset (Aji et al., 2023). Another study utilized sentiment analysis to analyze Italian YouTube videos concerning vaccination (Porreca et al., 2020), while machine learning was used to examine consumer responses on YouTube (Feng et al., 2019). In the broader context of diverse analytical methods, if the dataset is moderate in size and the research objective focuses on overall sentiment analysis and cultural context, sentiment analysis is often applied. Unlike previous studies, this research proposes using the Communalytic tool for data analysis. Communalytic, developed by the Social Media Lab at Ryerson University, is a robust quantitative data analysis tool widely recognized in the scientific community (Aji et al., 2023; Gruzd et al., 2023; Gruzd & Mai, 2024). It supports sentiment analysis and machine learning techniques, enabling the processing of large volumes of data from social media platforms, specifically YouTube, in this study. The tool can help identify problems, groups, or patterns in the data, but additional methods are typically required to interpret the specific insights or to delve into the nuances of these groups. When combined with the qualitative method of netnography, this method facilitates a deeper understanding of the context, motivations, and personal experiences of tourists by analyzing interactions and user-generated content on social media and online communities (Tiberius et al., 2024), wherein assessing the tourism experience becomes feasible (Vo-Thanh & Kirova, 2018). Pham et al. (2023) indicate that studying tourists' emotional responses can elucidate ambiguous behaviors related to the consumption of local food. Nevertheless, this combination allows for a more objective and systematic analysis of trends, patterns, and sentiments from tourist feedback, offering a comprehensive view of tourists' thoughts and behaviors. Consequently, this integrated approach enables the development of specific and practical solutions to improve the quality of street food services. Notably, some researchers argue that netnography can even surpass traditional questionnaires in certain aspects (Demuth & Mey, 2015; Kozinets, 2002) and involves analyzing online tourist reviews and discussions to understand how tourists perceive and interpret their culinary experiences (Atsız et al., 2021; Lee & Ko, 2022; Mkono, 2011).

3. Methodology

The research begins with the identification of relevant data sources for the topic under investigation. The search yielded a video titled "Vietnam $100 Street Food Challenge!! Best Street Food in Saigon!!!". As of 10:14 AM on September 03, 2024, the video had accumulated over 12 million views and 5,947 comments. Figure 1 - The video was subsequently analyzed using various text mining techniques, including sentiment analysis, and clustering, among others. The data analytics were conducted with the premium version of Communalytics, a robust quantitative data analysis tool that enhances the accuracy and depth of the findings.

Specifically, Google API is utilized to enable the Communalytics software to extract all comments. Communalytics employs two APIs, Detoxify and Perspective, to analyze toxicity levels and inappropriate behaviors in machine learning training texts sourced from typical social media platforms such as Reddit and Twitter, assessing the probability of harmful content (Gruzd & Mai, 2024). For sentiment analysis, VADER is used for the rapid and accurate processing of concise English texts, while TextBlob offers multilingual sentiment analysis capabilities, broadening the tool's applicability to various communities using different languages. This tool assists researchers in evaluating online user sentiments and identifying emotional trends in digital communication. Furthermore, clustering analysis is conducted using the HDBScan algorithm (Hierarchical Density-Based Spatial Clustering of Applications with

Noise), which is an advanced clustering method particularly suited for analyzing complex digital content. Unlike traditional clustering techniques, HDBScan groups text data based on how similar the meanings of different sentences or comments are (using a natural language processing library), and converts sentences into numerical representations called embedding, which capture the meaning of the text. Once the sentences are transformed into these numerical forms, the algorithm can analyze the data. It looks for clusters of sentences that are close together in this numerical space, indicating that they have similar meanings. By effectively managing noise and outliers (in YouTube comments), HDBScan improves the accuracy of topic detection, enabling a more nuanced exploration of thematic structures within datasets. This approach reveals both dominant and subtle patterns, offering comprehensive insights into the dynamics of digital interactions. While the analysis system categorizes comments into two groups, positive and negative, neutral comments are often not displayed or classified. An example of how classification occurs is as follows.

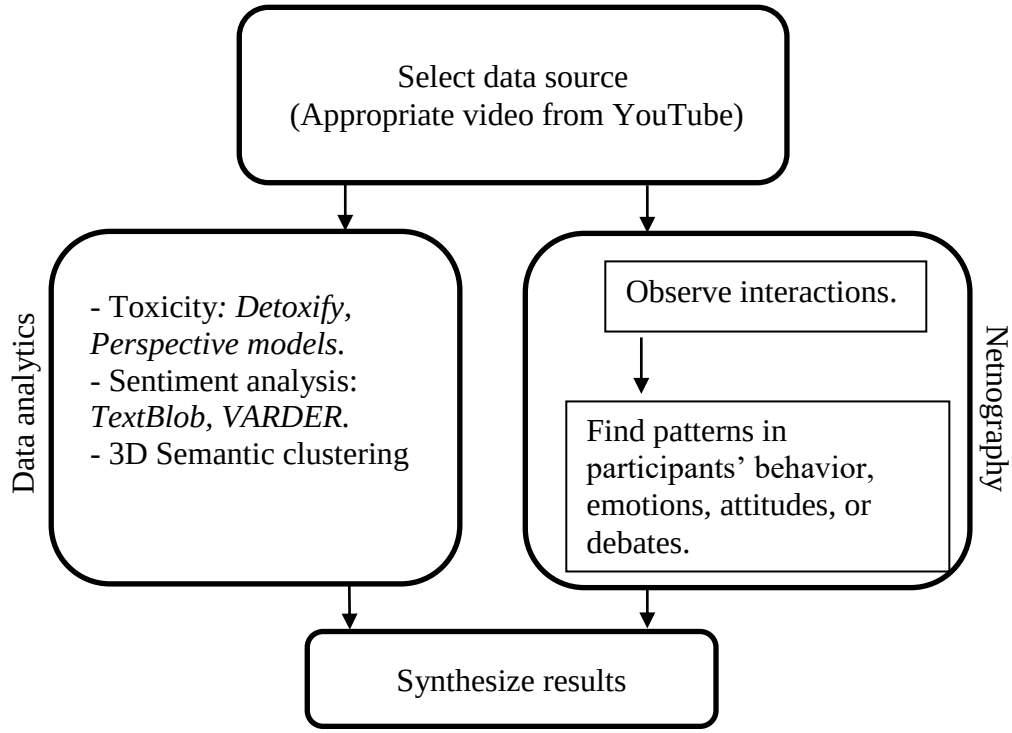
- Group 1 (Positive): "The beef noodle soup here is very delicious"; "The sticky rice is excellent, made with fresh ingredients".

- Group 2 (Neutral): "The geographical location of the food street is acceptable"; "The sticky rice is good, but it does not suit my taste".

- Group 3 (Negative): "The service is slow"; "I am not satisfied with the way it is provided".

Figure 1

Flow of Research



Source. The author's

Following this, a deeper analysis was conducted through the lens of netnography. This approach treats the evaluations as "thick descriptions" which means they provide detailed and profound insights into tourist experiences (Hinkin, 1998). Furthermore, Wang (2019) suggests

examining how users respond, interact, and express their views in conversations. This involves observing and documenting recurring themes, distinctive language, and the ways in which users create and share community cultural values through their interactions in comments. The integration of data analytics and netnography enhances the research by providing a comprehensive view that combines the precision of quantitative analysis with the contextual depth of qualitative insights. Data analytics quantifies clear metrics and visual patterns, while netnography adds depth by capturing the social and cultural nuances behind these metrics. This combination allows for a more robust interpretation, ensuring that findings are not only data-driven but also contextually relevant, leading to richer and more actionable insights.

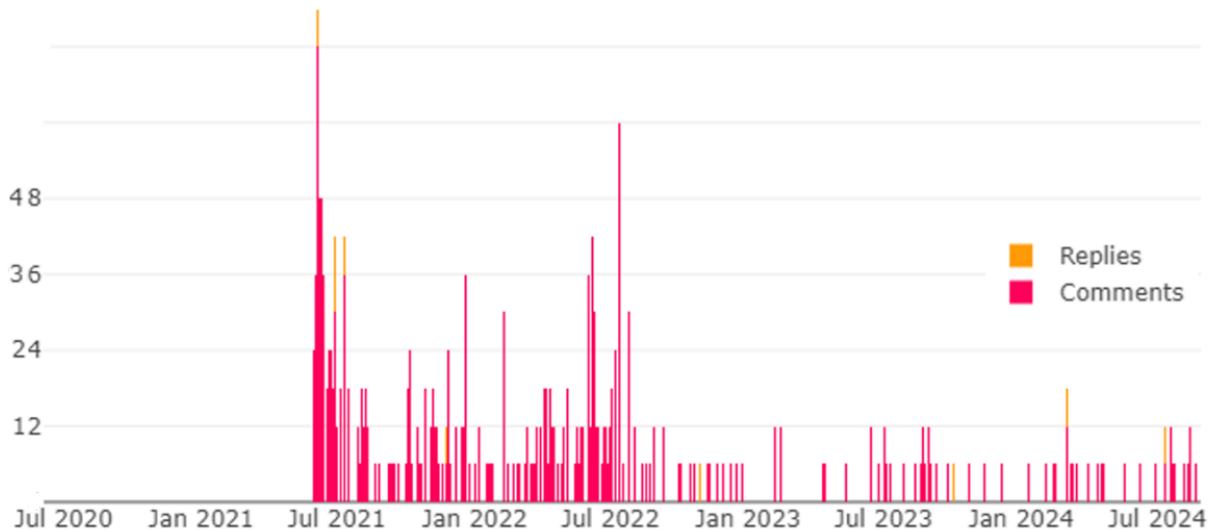
4. Result and discussion

The data source is a video titled "Vietnam Street Food Guide: Best Street Food in Saigon" created by the Best Ever Food Review Show, a YouTube food and travel channel managed by American Filmmaker Will Sonbuchner. The channel has nearly 11 million followers on this platform. The video, with a duration of approximately 19 minutes, showcases various street foods in HCMC, including Baozi (Bánh bao), Sticky rice (Xôi), Papaya salad (Gỏi đu đủ), Crab soup (Súp cua), Crispy rice (Cơm cháy), Steamed snails (Ốc hấp), and Beef noodle soup (Phở bò). Following the analysis of all comments, the results were as follows:

Figure 2 - The video consistently attracted comments, and during the initial period following its release in 2021, there were instances where the number of discussions (replies) even surpassed the number of comments.

Figure 2

Frequency Distribution of Comment Occurrences

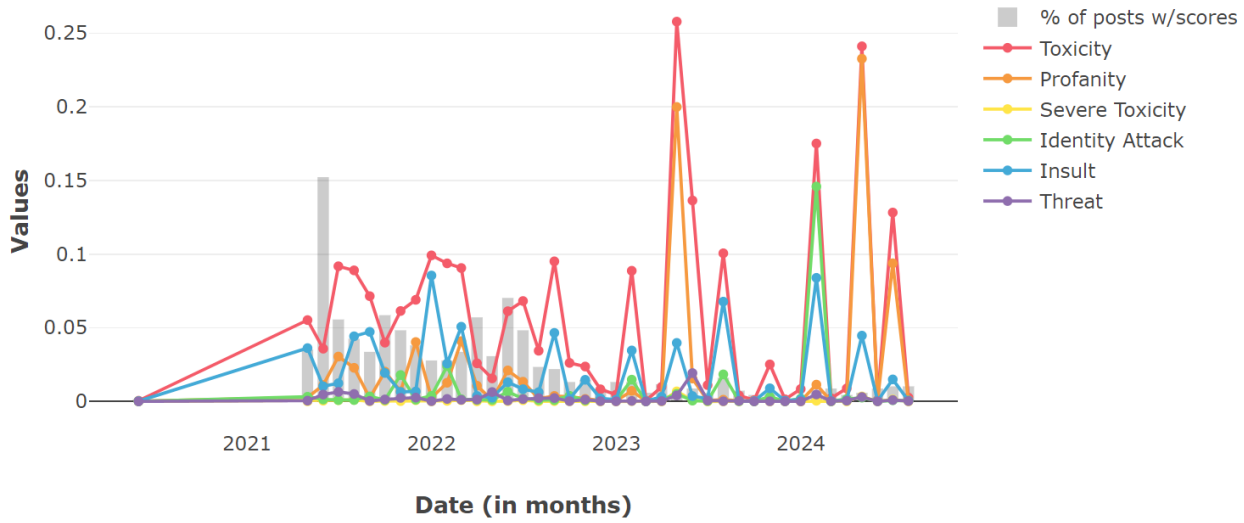


Source. The researcher's data analysis

Analysis of comments on YouTube videos about street food in HCMC indicates a rising trend in negative factors. This reflects the increasing community interest in street food in HCMC, a popular tourist destination. The rise in negative comments may signify lively debates and strong interactions between tourists and locals regarding the quality and experience of the food. Notably, the video showcasing the cuisine also received negative comments categorized as identity attacks or severe toxicity (see Figure 3).

Figure 3

Average Toxicity Scores Per Month



Source. The researcher's data analysis

The analysis of average toxicity scores reveals not only the presence of harmful language but also highlights the complexity of user feedback related to street food experiences in HCMC. While the average toxicity level of 0.05826 suggests a generally positive reception, the peak score of 0.98818 indicates that certain comments may stem from factors beyond food quality, such as cultural expectations or environmental influences. This wide range between the average and the maximum value could point to occasional spikes in negative or harmful interactions, which may require attention depending on the context of the study. If these high toxicity instances are frequent enough or concentrated in certain areas, they could significantly impact the overall sentiment or perception associated with the content being analyzed.

Table 1

Sentiment Analysis

	Nev. Sentiment	**Neu. sentiment**	**Pos. sentiment**
VARDER	514 (12.83%)	1114 (27.82%)	2377 (59.35%)
TextBob	467 (11.98%)	1461 (37.48%)	1970 (50.54%)

Source. The researcher's data analysis

The results from VARDER and TextBob (Table 1) provide additional insights into the distribution of negative, neutral, and positive comments regarding street food experiences in HCMC. While the prior toxicity analysis revealed an average toxicity level of 0.05826, indicating generally positive feedback, the sentiment analysis results show that negative comments persist, with 12.83% from VARDER and 11.98% from TextBob. The combination of sentiment and toxicity analyses underscores that, although the majority of comments are positive, a small portion of negative feedback still exists. The observed discrepancy in feedback indicates that negative comments are not solely about the food but also influenced by environmental factors or cultural context because tourists' experiences with street food are shaped by various elements, including the surrounding environment, vendor interactions, and the

overall atmosphere (Weiermair, 2000). For instance, a tourist might find the food delicious but could still leave a negative comment if the cleanliness of the stall or the behavior of the vendor does not meet their expectations. Additionally, cultural differences play a significant role; what is considered acceptable or appealing in one culture may not be viewed the same way in another. Tourists from different backgrounds may have varying standards for service, hygiene, and presentation, which can affect their overall perception of the experience.

Utilizing a 3D Semantic Similarity map can provide a deeper understanding of the underlying issues by mapping out patterns and relationships between different types of feedback. The 3D Semantic Similarity map (Figure 4), created using Communalytics software through HDBScan clustering, grouped the data into distinct clusters. Once the sentences are transformed into these numerical forms, HDBScan can analyze the data. It looks for clusters of sentences that are close together in this numerical space, indicating that they have similar meanings. This way, HDBScan helps to group comments or sentences that express similar sentiments or ideas, even if the words used are different. Figure 4 illustrates the potential themes and topics within the dataset. Each cluster on the map is marked with a unique color, representing the semantic similarity between data points within the same cluster. This result demonstrates the content diversity within the dataset, with spatially proximate clusters indicating a close semantic relationship among data points. These clusters provide a basis for exploring and identifying key topics being discussed in the data, facilitating a deeper analysis of trends and language patterns in the study. The use of the HDBScan algorithm in this data analytics successfully highlighted the semantic relationships between different factors, contributing to a better understanding of the content structure of the dataset.

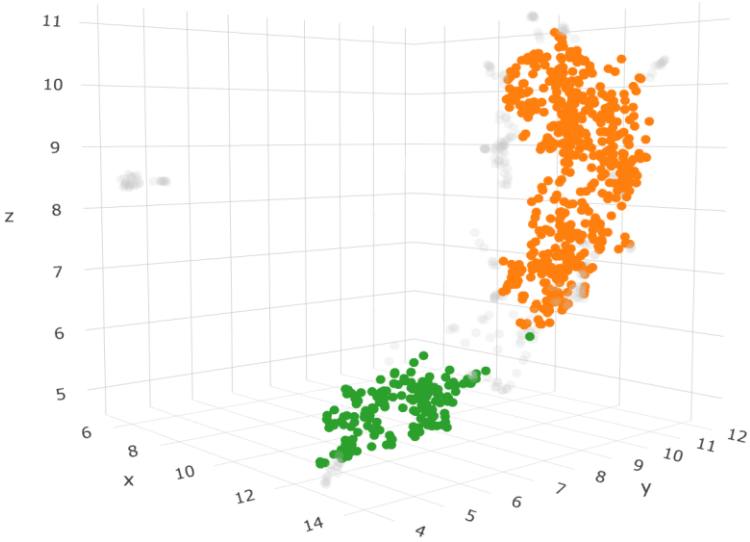
The orange region on the map represents intense emotions, with keywords such as “so delish”, “best food”, “food looks so good”, “cheap price”, “great show”, and “nice street” being prominent. These positive comments not only praise the food but also the video production and the street food environment. The green region reflects a neutral attitude, with comments like “thank you for the video”, “welcome to Vietnam”, and “so glad Vietnam is opening up to tourism again.” The dark region, which is distant from other clusters, indicates unrelated comments such as punctuation, link sharing, and other irrelevant remarks. A cluster of dark nodes near the orange and green regions contains negative comments such as “too much fire food” and “too sweet” with some comments expressing that the national cuisine of other countries is better. In the context of HDBSCAN, this cluster of dark nodes near the orange and green regions, despite containing negative comments could still be considered noise depending on the clustering algorithm’s density criteria.

The in-depth analysis of public opinions, netnography yields the following observations:

@lucas4587 commented, “… respects all the cultures he comes across ...”, which has garnered over 2,300 likes and 21 replies, with numerous supportive responses. This comment highlights the impact of the influencer and the role of cultural representation in shaping tourism imagery. This observation is corroborated by another viewer’s comment, @BloodDragon0907, which received 4,000 likes shortly thereafter: “love the awkward atmosphere that Sonny creates.” This suggests that the portrayal of diverse cultures and the unique atmosphere created by influencers significantly affect public perception.

Figure 4

3D Semantic Similarity Map



Source. The researcher's data analysis

@zzmcno1 remarked, "…smartest food combinations you will find anywhere in the world ..." which has received 889 likes. This implies that the intelligent combination of dishes not only enhances the culinary experience but also plays a crucial role in tourism development. Renowned culinary destinations often attract tourists through the uniqueness and creativity of their ingredient combinations.

Negative and conflicting reviews mainly revolve around personal perceptions, with approximately 35-50 likes. For instance, @pizzaapplepie1338 commented, "ban bao too fat" regarding the Vietnamese cooking style, while @MooXP2 noted, "…look down… fights against you with toxicity… commenting," which may refer to negative, biased comments about a particular culture or cuisine. In the context of tourism, such biases can occur when a culture, especially its culinary aspects, is not fully understood or accurately evaluated by individuals from different cultural backgrounds.

Previously, Hiemstra et al. (2006) suggested that street vending in Vietnam is largely spontaneous, with most businesses operating illegally and subject to police harassment. Following this, Tran et al. (2018) argued that the primary concern is the quality of street food in HCMC, followed by diversity, service quality, and cultural aspects, as perceived by tourists. Our study offers an up-to-date perspective and thoroughly reviews a substantial amount of opinions. In the context of tourism, such biases can emerge when individuals from different cultural backgrounds evaluate culinary practices without fully understanding the cultural significance or diversity behind them. Negative comments not only affect the reputation of street food vendors but can also influence potential tourists' decisions, leading them to form prejudiced opinions before experiencing the cuisine firsthand. Tourists' expectations for service quality and culinary experiences are shaped by their own cultural backgrounds and prior socialization, leading to potential disappointments when these expectations are not met (Weiermair, 2000). Therefore, negative comments often stem from a lack of understanding of Vietnamese culinary practices and a tendency to compare them unfavorably with familiar cuisines. Additionally, in some cases, negative comments may not be a reflection of the actual food or service quality but could result from unfair competition in tourism between nations. Rival countries may attempt to discredit the

culinary appeal of Vietnam's street food scene through misleading or inaccurate reviews, further complicating the perception of street food among international tourists.

5. Conclusions & recommendations

This study highlights that the majority of sentiments expressed by tourists regarding street food in HCMC are positive, emphasizing factors such as affordability, effective way of marketing (host, method of introduction), the vibrant atmosphere of food streets in HCMC, and the cultural diversity of dishes. While negative sentiments do exist, they represent a minority and are often rooted in cultural misunderstandings and personal biases. Many tourists may come with the assumption that their home cuisine is the best, leading to a reluctance to embrace new flavors and styles. Additionally, preconceived notions, such as the belief that Vietnamese food is excessively oily or unhealthy, can color their perceptions and experiences. These biases may cause them to overlook the diversity and richness of Vietnamese street food, ultimately contributing to their negative feedback, such reactions can result in emotional responses such as disappointment, fear, and feelings of cultural disconnection, which may lead to conflicts.

When tourists hold misconceptions or biases about the food, such as believing it is excessively oily or unhealthy, it is essential to employ effective information management strategies to counteract these views. To enhance the overall experience of street food tourism in HCMC and address the misconceptions held by tourists, the following strategies are recommended:

- Government policies and cultural promotion: Establish government-led initiatives that promote Vietnamese culinary culture internationally. This could include cultural exchange programs, food festivals, and partnerships with tourism boards in other countries to create awareness and appreciation for Vietnamese street food.

- Training and development for vendors: Implement training programs for street food vendors focusing on business management, customer service, and cross-cultural communication. This will empower vendors to better engage with tourists and improve their overall service quality, fostering a positive dining experience.

- Collaboration with industry stakeholders: Encourage collaboration between local governments, tourism agencies, and the private sector to create a cohesive approach to street food tourism. This could involve joint marketing efforts, shared resources, and the establishment of quality standards for street food vendors.

- Establishment of tourism blog for HCMC: Create an official tourism blog dedicated to HCMC that features authentic stories, reviews, and experiences from both locals and tourists. Furthermore, the blog can be designed to include analytical tools that capture, manage, and analyze user feedback, enabling stakeholders to gain accurate insights into tourist preferences and sentiments. This data can inform decision-making processes related to marketing strategies, service improvements, and cultural education initiatives. Regular updates and interactive features will help keep the content fresh and relevant, making it a go-to resource for anyone planning to visit the city while also serving as a powerful tool for data-driven analysis.

The limitations of the current research include its reliance on snapshots of comments, which may not fully capture the dynamic nature of viewer reactions over time. Relying on data from a single source, such as YouTube, may limit the comprehensiveness of the analysis, as the comments and feedback gathered from this platform can be influenced by various external factors. For instance, the opinions expressed might reflect specific cultural biases, trends, or expectations prevalent among YouTube users rather than providing a representative view of all

tourists' experiences. To enhance the validity of sentiment analysis, it would be beneficial to consider comments from platforms that require user login or verification of past experiences, such as travel forums, review sites like TripAdvisor, or dedicated food blogs. These sources often feature more detailed feedback from users who have actually visited the locations, leading to richer and more nuanced insights. Finally, we concur with Favaretto et al. (2019) that algorithmic bias is a crucial aspect to consider in big data analysis. Therefore, we suggest that future evaluations should involve modifications in algorithms (for example, k-means clustering and Gaussian mixture models, etc.) to improve the comparison of results.

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