Measuring Digital Destination Imagery: The Role of Naïve Bayes Sentiment Modelling in Evaluating Visitor Satisfaction from Google Maps Reviews

Muhammad Ilham Nova Rizal[1], *Lintang* Muliawanti[1*], and *Miftakhul Wahyu Ragil* Praditya[1]

[1]Universitas Muhammadiyah Magelang, Magelang, Indonesia

Abstract. Hot springs in Tempuran District are an important regional tourist attraction. Therefore, this study aims to measure public perception of five hot spring destinations, namely Umbul Banyu Roso, Tirta Madu, Lintang Water Park, Ngasinan, and Tirta Sambara, as well as identify problems that affect the visitor experience. The approach used is sentiment analysis, with data collected in the form of reviews from Google Maps. The data is then analyzed using the Naive Bayes Classifier Algorithm through the RapidMiner application. The results of the analysis showed that Tirta Sambara Hot Springs dominated with perfect positive sentiment (1,000) and the model curation reached 100%, while Ngasinan Hot Springs was dominated by negative reviews (0.650), and Tirta Madu showed balanced sentiment (0.500 positive and 0.500 negative). The implications of these results are reinforced by Word Cloud visualizations, which show that although tourist attractions are rated as "Convenient" and "Cheap", negative sentiment is often driven by ethical issues such as "Illegal fees" and operational issues such as "Difficult access" and "Poor maintenance", implying the need for management interventions focused on improving the integrity of services and infrastructure.

1 Introduction

Tourist attractions serve as essential destinations for leisure and mental rejuvenation, often becoming focal points for social interaction during holiday periods [1]. Tempuran District, located in Magelang Regency, possesses significant tourism potential, particularly through its unique hot spring destinations spread across various locations [2,3]. As the area has grown, marked by an influx of workers from outside the region, there is a clear opportunity for local economic development. However, despite this potential, the management of these hot spring attractions by the Magelang Regency government remains suboptimal. This gap in management is reflected in the digital footprints left by visitors through platforms such as Google Maps.

*Corresponding author: lintang@unimma.ac.id

Public reviews on these platforms are a direct reflection of tourist satisfaction, which is formed by the alignment between a visitor's expectations and their actual experience [4]. Satisfaction levels are intricately linked to core destination issues, including facility quality, cleanliness, accessibility, and service standards. Consequently, digital reviews serve as critical indicators for evaluating destination management and identifying localized problems [5]. Google Maps, as a prominent location-based service, provides a rich repository of community-generated data. Analyzing these comments, specifically regarding the hot springs in Tempuran, allows for a systematic assessment of whether public perception is leaning toward positive or negative experiences.

The process of identifying these emotional tendencies in textual data is known as sentiment analysis. From a communication theory perspective, this approach aligns with the concept of Electronic Word of Mouth (e-WOM), which explains how digital testimonials influence the perceptions and decision-making processes of prospective visitors [6]. In the context of Sumberarum Village, Tempuran District, these reviews function as communication messages that collectively construct the destination's digital image. While positive sentiment reinforces the attraction's appeal, negative sentiment highlights specific service or facility failures that may deter future visits [7]. Thus, sentiment analysis transcends being a mere technical tool; it acts as a strategic communication instrument to understand public opinion dynamics and the effectiveness of tourism management [8].

Given the high volume of unstructured text data in digital reviews, a robust computational method is required. The Naïve Bayes Classifier, a probabilistic method based on Bayes' Theorem, is particularly suited for this task due to its efficiency in handling large datasets, its computational speed, and its simplicity in implementation [9]. This study applies the Naïve Bayes method to analyze visitor reviews of the rural hot spring destinations in Sumberarum Village.

The novelty of this research lies in its focus on community-based hot spring tourism, a niche that has received limited academic attention, and its integration of computational sentiment analysis with e-WOM communication theory [10]. Furthermore, this study positions sentiment results as a practical evaluative instrument for local stakeholders. By transforming raw Google Maps data into actionable insights, this research provides the Magelang Regency Culture and Tourism Office with a data-driven basis to improve service quality and foster sustainable destination management.

2 Method

The research design employs a quantitative content analysis approach, focusing on sentiment classification through the Naïve Bayes algorithm. From a communication science perspective, visitor reviews on digital platforms like Google Maps are conceptualized as communication messages transmitted by tourists to a global audience. The vocabulary used in these reviews serves as linguistic symbols representing the visitors' experiences, assessments, and emotional responses to a destination. In this study, sentiment analysis is not merely a technical text classification process but an interpretative effort to understand the construction of meaning within the Electronic

Word of Mouth (e-WOM) framework. This approach elucidates how messages and symbols interact to shape the digital image of tourist destinations.

Sentiment analysis, or opinion mining, integrates fields such as Natural Language Processing (NLP) and computational linguistics to evaluate an individual's opinions, attitudes, and emotions. It identifies the polarity within a text, typically positive or negative, to determine a subject's satisfaction with a specific service or organization. Essentially, it is a language processing technique that transforms unstructured text into structured data to derive meaningful insights from public discourse. Data for this study were collected from public sentiment sentences on Google Maps reviews of five hot spring destinations: Ngasinan, Umbul Banyu Roso, Lintang Water Park, Tirta Sambara, and Tirta Madu. To ensure relevance, a minimum of 20 of the most recent reviews were extracted from each site.

The raw data underwent a rigorous preprocessing phase to ensure suitability for analysis. This process began with case folding to convert all text into lowercase, followed by normalization to replace slang or abbreviated words with standard language. Noise removal was then conducted to eliminate redundant characters, while stopword removal deleted common words that did not carry significant meaning. Finally, a stemming process was applied to reduce words to their base forms. Following preprocessing, the sentences were labeled into positive and negative sentiments. A review is categorized as positive if it contains linguistic symbols associated with satisfaction and favorable experiences. These labeled datasets then served as the basis for the Naïve Bayes classification, providing actionable insights for destination management.

3 Results and discussion

3.1 Results

The sentiment analysis was conducted using RapidMiner software to process reviews from five distinct hot spring destinations in Tempuran District. The distribution of sentiment polarity and the classification performance are summarized in the **Table 1**.

Table 1. Classification Performance of Hot Springs

Hot Springs	Positive	Negatives
Umbul Banyu Roso	0.850	0.150
Tirta Madu	0.500	0.500
Lintang Water Park	0.650	0.350
Ngasinan	0.350	0.650
Tirta Sambara	1.000	0.000

The sentiment analysis conducted via RapidMiner for Umbul Banyu Roso Hot Springs achieved an 85% accuracy rate, identifying 17 positive and 3 negative reviews. With a positive sentiment ratio of 0.850 compared to 0.150 for negative feedback, it is evident that visitors maintain a predominantly favorable perception of this destination.

In contrast, Tirta Madu Hot Springs exhibited a perfectly balanced sentiment distribution, yielding a 50% accuracy rate with 10 positive and 10 negative reviews. The

identical scores of 0.500 for both polarities indicate that visitor experiences are polarized, with positive and negative feedback being equally prevalent.

For Lintang Water Park Hot Springs, the analysis reached 65% accuracy, comprising 13 positive and 7 negative reviews. The positive sentiment score of 0.650 reflects a generally optimistic trend, suggesting that a significant majority of tourists who visited the site left with a positive impression.

Conversely, Ngasinan Hot Springs showed a trend toward dissatisfaction, with an accuracy of 65% based on 13 negative and 7 positive reviews. The dominance of negative sentiment (0.650) over positive sentiment (0.350) highlights a more critical public perception regarding this particular hot spring destination. Lastly, Tirta Sambara Hot Springs recorded an exceptional 100% accuracy rate, as all 20 reviews were classified as positive. With a perfect sentiment score of 1.000, the data confirms that visitor feedback for this attraction is exclusively positive, indicating a high level of consistent satisfaction.

To visualize these findings, a word cloud was generated to identify high-frequency linguistic symbols. **Table 2** highlights the relationship between specific feedback and the resulting sentiment categories.

Table 2. Sentiment Symbols and Keyword Categorization

Keyword	Category	Contextual Meaning
Clean / Comfortable	Positive	High satisfaction with facilities and hygiene.
Cheap / Affordable	Positive	Positive perception of value for money.
Pungli (Illegal Fees)	Negative	Ethical concerns and service integrity issues.
Dirty / Poor Maintenance	Negative	Dissatisfaction with physical upkeep.
Difficult Access	Negative	Logistical barriers to the destination.

The word cloud visualization reveals distinct destination images (**Fig. 1**). Tirta Sambara is perceived as “Clean” and “Comfortable,” whereas Tirta Madu and Lintang Water Park suffer from negative symbols such as “Dirty water” and “Pungli.” Even in destinations rated as “Cheap,” the presence of “Pungli” acts as a significant deterrent that diminishes the overall visitor experience.

Fig. 1. Wordcloud: (a) Umbul Banyu Roso, (b) Tirta Madu, (c) Ngasinan, (d) Lintang Water Park, and (e) Tirta Sambara

3.2 Discussion

The results of sentiment analysis using the Naive Bayes algorithm for five hot spring destinations in Tempuran District reveal a contrasting picture of digital destinations. The findings showed that Tirta Sambara led with a perfect positive sentiment score (1,000), driven by attributes such as "Clean", "Comfortable", and "Satisfied". This indicates that the management of Tirta Shara has succeeded in maintaining the quality of services and facilities that meet the expectations of visitors. In contrast, Ngasinan Hot Springs showed a dominance of negative sentiment (0.650), triggered by maintenance issues ("Poor maintenance") and visitor disappointment. This condition poses a risk of damaging the overall image of digital destinations if not addressed immediately [11]. From a communication perspective, traveler reviews on digital platforms serve as messages that shape the trust and credibility of destinations. The consistency of positive sentiment, such as at the Tirta Sambra Hot Springs, strengthens the digital reputation because the experiences shared by visitors are perceived as more authentic than official promotions [12]. In contrast, the dominance of negative sentiment in other destinations reflects a weakening of public trust, especially when reviews mention low service integrity, such as illegal fee practices and non-transparent management [13].

Furthermore, travel experiences delivered through online reviews can be understood as mediated experiences, where the perception of potential tourists is formed through the narrative of previous visitors [14]. In this context, Google Maps acts as a communication space that constructs a shared meaning about the quality of the destination. Therefore, tourism management is not only related to the physical aspect, but also to consistent communication management to maintain credibility, build trust, and maintain a digital reputation [15].

A key theme that emerges from the visualization of Word Cloud across destinations is the ambivalence between price and service ethics. Although visitors consistently rate destinations as "comfortable" and "cheap", this satisfaction is often hampered by ethical issues such as the practice of pungli (illegal fees) and operational constraints such as difficult access. From a communication perspective, these findings can be understood as a symbolic representation of the travel experience, where the words that appear in the reviews serve as communication symbols that reflect the quality-of-service communication between managers and visitors. The existence of the pungli issue shows low perceived fairness, which has direct implications for the decline in trust and credibility of the destination. Furthermore, the dominance of these negative symbols indicates the weakness of ethical communication in the management of tourism services, except for Tirta Sambara, where the issue is relatively insignificant and in line with the positive image formed digitally.

The implications of this study show that to increase tourism competitiveness in Tempuran District, the Magelang Regency government and local managers cannot rely solely on price advantage. Urgent management interventions are needed to eradicate illegal charges, improve road access infrastructure, and establish consistent hygiene standards. The positive image held by Tirta Sambara can be a benchmark for other destinations in managing visitor satisfaction through digital platforms such as Google Maps.

4 Conclusion

This study has successfully addressed its primary objectives by identifying tourist sentiment tendencies and uncovering the critical factors influencing visitor satisfaction and the digital image of hot spring destinations in Tempuran District. The application of Naïve Bayes-based sentiment analysis enabled a systematic classification of public opinion, while the integration of communication perspectives provided a deeper understanding of the symbolic meanings within Google Maps reviews as Electronic Word of Mouth (e-WOM) messages. The findings demonstrate that online reviews serve as valid indicators for evaluating service quality, management integrity, and the overall digital reputation of tourism destinations.

The computational analysis using RapidMiner revealed a diverse landscape of visitor experiences across five destinations. Tirta Sambara emerged with the highest performance, achieving 100% accuracy and a perfect positive sentiment ratio (1.000). Other destinations with predominantly positive feedback included Umbul Banyu Roso (85% accuracy, 0.850 positive) and Lintang Water Park (65% accuracy, 0.650 positive). Conversely, the study identified significant areas for improvement in Tirta Madu, which showed a polarized sentiment (50% accuracy, 0.500 ratio), and Ngasinan, which was dominated by negative sentiment (65% accuracy, 0.650 negative).

Visualization through word clouds further clarified the specific drivers of these sentiments. While keywords like “comfortable” and “cheap” were frequently associated with positive experiences, the recurrence of negative symbols such as “pungli” (illegal fees), “dirty,” “poor maintenance,” and “difficult access” across multiple destinations (except Tirta Sambara) highlights systemic operational and ethical challenges. Ultimately, this research concludes that to sustain a positive digital reputation, tourism managers must move beyond price advantages and focus on service integrity and infrastructure improvements. Methodologically, this study proves that integrating computational approaches with communication theory offers a robust framework for data-driven tourism management.

References

1. Tati Haryati; A. Gafar Hidayat Konsep Wisata dari Perspektif Ekonomi Masyarakat. *J. Pendidik. Ips* **2019**, *9*, 113–122, doi:10.37630/jpi.v9i2.170.
2. Susanti, D.; Muliawanti, L.; Pambuko, Z.B.; Annisa, N.N.; Praditya, M.W.R.; Luhtitisari, A.R.N.; Nafisah, N.; Yunita, A. Local potential downstreaming and pokdarwis institutional strengthening: Towards a sustainable halal tourism destination. *Community Empower.* **2025**, *10*, 2169–2179, doi:10.31603/ce.15297.
3. Muliawanti, L.; Pambuko, Z.B.; Yuliastuti, F.; Pradani, M.P.K. Development of village website and hot spring water quality evaluation for sustainable tourism empowerment in Sumberarum Village, Magelang. *Community Empower.* **2024**, *9*, 1699–1704, doi:10.31603/ce.12360.
4. Yap, Y.Y.; Tan, S.H.; Tan, B.C.; Tan, S.K. Smart tourism technologies and tourist satisfaction: A systematic literature review and research agenda. *Acta Psychol. (Amst).* **2025**, *258*, 105191, doi:10.1016/j.actpsy.2025.105191.

5. Amanah, D.; Agustini, F.; Harahap, D.A. The satisfaction level of foreign tourists in Indonesia. *Qual. - Access to Success* **2021**, *22*, 117–123.
6. Mao, Y.; Liu, Q.; Zhang, Y. Sentiment analysis methods, applications, and challenges: A systematic literature review. *J. King Saud Univ. - Comput. Inf. Sci.* **2024**, *36*, 102048, doi:10.1016/j.jksuci.2024.102048.
7. Xiao, L.; Li, Q.; Shen, J.; Chen, Y.; Zhang, Q.; Yang, Y. Research on the Tourists' aspect sentiment spatiotemporal features in high-A-level tourist attractions: based on target-aspect-sentiment joint detection. *Expert Syst. Appl.* **2025**, *270*, 126396, doi:10.1016/j.eswa.2025.126396.
8. Manosso, F.C.; Ruiz, T.C.D. Using sentiment analysis in tourism research: A systematic, bibliometric, and integrative review. *J. Tour. Herit. Serv. Mark.* **2021**, *7*, 16–27, doi:10.5281/zenodo.5548426.
9. Kurniawan, Y.I.; Sidiq, R.H.; Widadi, A.D.U.; Yubiharto, A.R.A.; Gibran, A.K.; Aditama, M.R.; Laksono, F.A.T. Naive Bayes Classifier with SMOTE for Sentiment Analysis of Blibli App Reviews on The Google Play Store. *J. Penelit. Inov.* **2025**, *5*, 2675–2688, doi:10.54082/jupin.1842.
10. Hashim, R.; Omar, B.; Saeed, N.; Ba-Anqud, A.; Al-Samarraie, H. The application of sentiment analysis in tourism research: A brief review. *IJBTS Int. J. Bus. Tour. Appl. Sci.* **2020**, *8*, 51–60.
11. Alvarez, S.; Bahja, F.; Fyall, A. A framework to identify destination vulnerability to hazards. *Tour. Manag.* **2022**, *90*, 104469, doi:10.1016/j.tourman.2021.104469.
12. Hussain, K.; Didarul Alam, M.M.; Malik, A.; Tarhini, A.; Al Balushi, M.K. From likes to luggage: The role of social media content in attracting tourists. *Heliyon* **2024**, *10*, e38914, doi:10.1016/j.heliyon.2024.e38914.
13. Liang, L.J.; Choi, H.C.; Joppe, M. Exploring the relationship between satisfaction, trust and switching intention, repurchase intention in the context of Airbnb. *Int. J. Hosp. Manag.* **2018**, *69*, 41–48, doi:10.1016/j.ijhm.2017.10.015.
14. Mensah, E.A.; Odame, D.N.A.; Ankrah, I.; Obuobisa-Darko, T.; Hinson, R.E. From reviews to reflections: Understanding tourist sentiments and satisfaction in African destinations through user-generated content. *Ann. Tour. Res. Empir. Insights* **2025**, *6*, 100174, doi:10.1016/j.annale.2025.100174.
15. Mior Shariffuddin, N.S.; Azinuddin, M.; Yahya, N.E.; Hanafiah, M.H. Navigating the tourism digital landscape: The interrelationship of online travel sites' affordances, technology readiness, online purchase intentions, trust, and E-loyalty. *Heliyon* **2023**, *9*, e19135, doi:10.1016/j.heliyon.2023.e19135.