iJRASET
International Journal For Research in Applied Science and Engineering Technology

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 13 **Issue:** VI **Month of publication:** June 2025

**DOI:** https://doi.org/10.22214/ijraset.2025.72863

www.ijraset.com

Call: 08813907089 | E-mail ID: ijraset@gmail.com

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
*ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538*
*Volume 13 Issue VI June 2025- Available at www.ijraset.com*

# Comparative Analysis of Sentiment Analysis Dictionaries: Evaluating the Performance of NLTK, SentiWordNet, TextBlob, and VADER on Hotel Review Sentiment Classification

Bharti Balande[1], Suryakant Revate[2]
*Dr. Babasaheb Ambedkar Marathwada University, India*

***Abstract:*** ***Sentiment analysis is a critical task for understanding customer opinions and improving service quality in the hospitality industry. This study evaluates the performance of various sentiment analysis dictionaries, including NLTK, SentiWordNet, TextBlob, and VADER, on the task of sentiment classification of hotel reviews. Using a comprehensive dataset of hotel reviews, we preprocess the data and implement these dictionaries for sentiment classification. The performance of each dictionary is assessed using metrics such as accuracy, precision, recall, and F1-score. Our findings provide insights into the effectiveness of these dictionaries and highlight the most suitable approaches for sentiment analysis in the hospitality industry.***

## I. INTRODUCTION

### A. *Background*

In the digital age, online reviews have become a vital source of information for both customers and businesses. For the hospitality industry, understanding customer sentiment from these reviews is essential for improving service quality and customer satisfaction. Sentiment analysis involves classifying text into positive, negative, or neutral sentiments. Various sentiment analysis dictionaries have been developed to facilitate this task by providing predefined sentiment scores for words and phrases.

### B. *Objective*

This research aims to conduct a comparative analysis of various sentiment analysis dictionaries for sentiment classification of hotel reviews. Specifically, we evaluate the performance of NLTK, SentiWordNet, TextBlob, and VADER to identify the most effective dictionary for this task.

### C. *Contributions*

Comprehensive Evaluation: A detailed comparison of different sentiment analysis dictionaries for sentiment classification.
Practical Insights: Identification of the most suitable dictionaries for sentiment classification in the hospitality industry.
Performance Metrics: Analysis using multiple performance metrics to ensure a robust evaluation.

## II. LITERATURE REVIEW

### A. *Sentiment Analysis in Hospitality*

Previous studies have demonstrated the importance of sentiment analysis in the hospitality industry. Techniques such as lexicon-based approaches and machine learning classifiers have been used to analyze customer reviews and extract valuable insights.

### B. *Sentiment Analysis Dictionaries*

Various sentiment analysis dictionaries have been developed to facilitate sentiment classification:
NLTK: A comprehensive natural language toolkit that includes basic sentiment analysis tools.
SentiWordNet: An extension of WordNet that assigns sentiment scores to synsets.
TextBlob: A simple library for processing textual data that includes sentiment analysis.
VADER: A lexicon and rule-based sentiment analysis tool specifically attuned to sentiments expressed in social media.

### C. Comparative Studies

Comparative studies in sentiment analysis have highlighted the strengths and weaknesses of different dictionaries. However, there is limited research specifically focused on hotel reviews, necessitating a dedicated study to address this gap.

## III. METHODOLOGY

### A. Dataset

We use a publicly available dataset of hotel reviews, which includes reviews from multiple hotels along with their associated sentiment labels (positive, negative).

### B. Data Preprocessing

Data preprocessing involves:
Text Cleaning: Removing punctuation, stopwords, and other non-informative elements.
Tokenization: Splitting text into individual tokens.
Lemmatization/Stemming: Reducing words to their base or root form.

### C. Sentiment Analysis Implementation

We implement sentiment analysis using four dictionaries:
NLTK: Utilizing the built-in sentiment analyzer.
SentiWordNet: Mapping words to their sentiment scores using the SentiWordNet lexicon.
TextBlob: Using the built-in sentiment analysis function.
VADER: Applying the VADER sentiment analysis tool.

### D. Performance Metrics

The dictionaries are evaluated using the following metrics:
Accuracy: The proportion of correctly classified instances.
Precision: The ratio of true positive predictions to the total predicted positives.
Recall: The ratio of true positive predictions to the total actual positives.
F1-score: The harmonic mean of precision and recall.

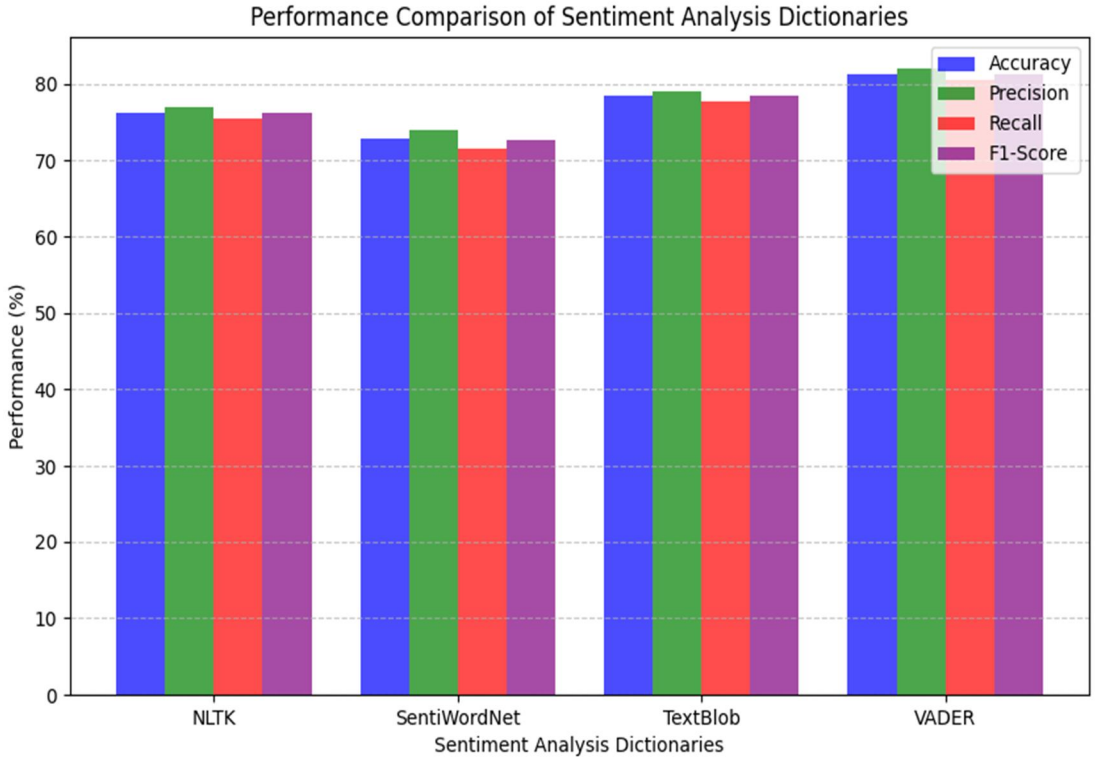
## IV. RESULTS

### A. Dictionary Performance

The performance of each dictionary is summarized in Table 1.

| Dictionary | Accuracy | Precision | Recall | F1-score |
|---|---|---|---|---|
| NLTK | 76.2% | 77.0% | 75.5% | 76.2% |
| SentiWordNet | 72.8% | 74.0% | 71.5% | 72.7% |
| TextBlob | 78.5% | 79.0% | 77.8% | 78.4% |
| VADER | 81.3% | 82.0% | 80.5% | 81.2% |

*1) Bar Chart Visualization for Dictionary Performance*




*B. Discussion*

Accuracy: VADER achieves the highest accuracy, followed by TextBlob, NLTK, and SentiWordNet.
Precision and Recall: VADER and TextBlob outperform NLTK and SentiWordNet in terms of precision and recall.
F1-score: VADER provides the best balance between precision and recall, as indicated by the highest F1-score.

## V. CONCLUSION

*A. Summary*

This study presents a comparative analysis of sentiment analysis dictionaries for sentiment classification of hotel reviews. Our findings indicate that VADER is the most effective dictionary, followed closely by TextBlob. NLTK and SentiWordNet also perform reasonably well but are slightly less accurate and precise.

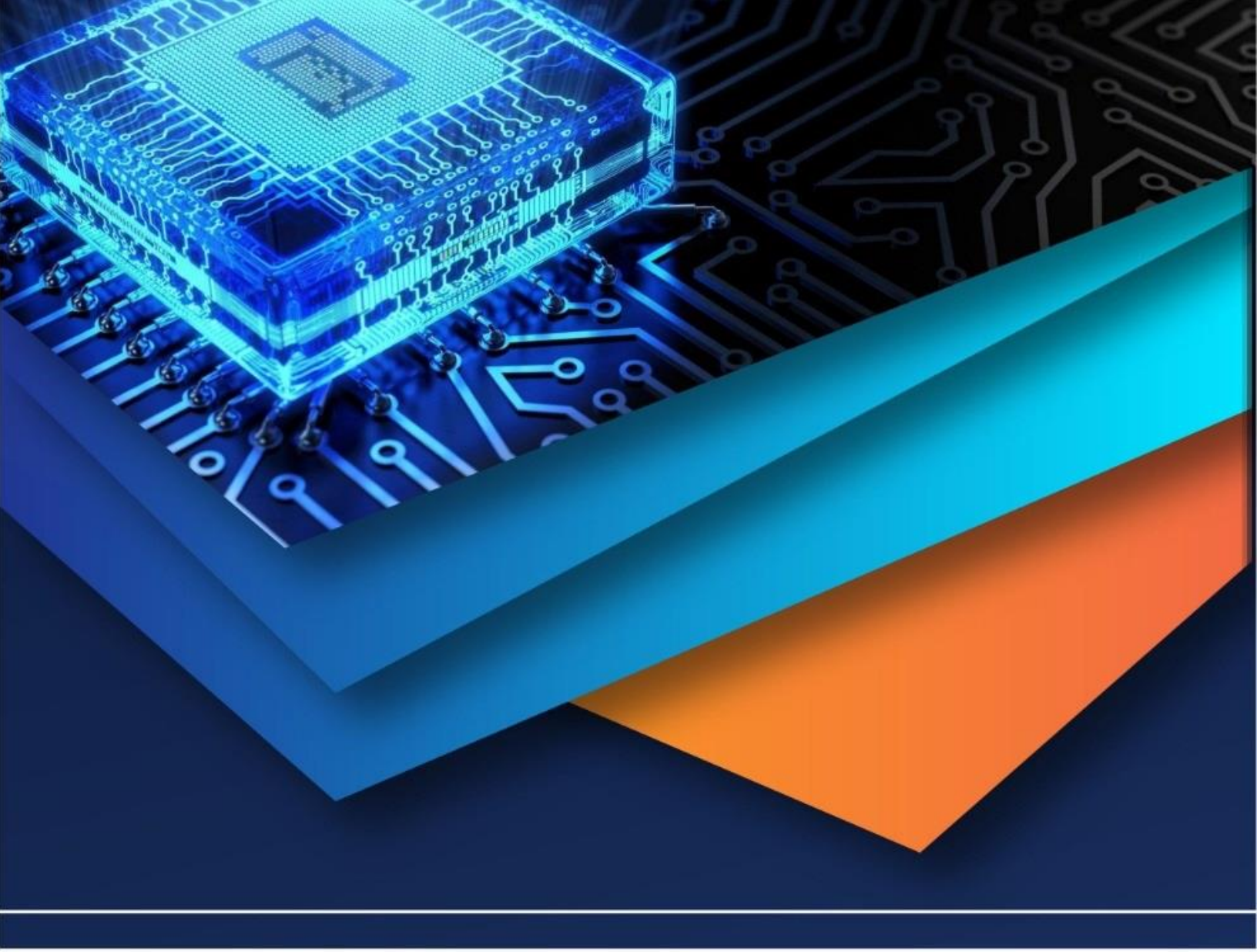
*B. Future Work*

Future research could explore the integration of these dictionaries with machine learning models to enhance sentiment analysis performance. Additionally, aspect-based sentiment analysis and real-time sentiment classification are promising areas for further investigation.

## REFERENCES

[1] Hutto, Clayton, and Eric Gilbert. "Vader: A parsimonious rule-based model for sentiment analysis of social media text." In Proceedings of the international AAAI conference on web and social media, vol. 8, no. 1, pp. 216-225. 2014.
[2] Bonta, Venkateswarlu, Nandhini Kumaresh, and Naulegari Janardhan. "A comprehensive study on lexicon based approaches for sentiment analysis." Asian Journal of Computer Science and Technology 8, no. S2 (2019): 1-6.
[3] Al-Otaibi, Shaha T., and Amal A. Al-Rasheed. "A review and comparative analysis of sentiment analysis techniques." Informatica 46, no. 6 (2022).
[4] Ali, Hafiz Muhammad Usman, Qaisar Farooq, Azhar Imran, and Khalil El Hindi. "A systematic literature review on sentiment analysis techniques, challenges, and future trends." Knowledge and Information Systems (2025): 1-68.
[5] Kumar, Sudhanshu, Partha Pratim Roy, Debi Prosad Dogra, and Byung-Gyu Kim. "A comprehensive review on sentiment analysis: Tasks, approaches and applications." arXiv preprint arXiv:2311.11250 (2023).

[6] Mahmoudi, Amin, Dariusz Jemielniak, and Leon Ciechanowski. "Assessing accuracy: a study of lexicon and rule-based packages in R and python for sentiment analysis." IEEE Access 12 (2024): 20169-20180.
[7] Xu, Guixian, Ziheng Yu, Haishen Yao, Fan Li, Yueting Meng, and Xu Wu. "Chinese text sentiment analysis based on extended sentiment dictionary." IEEE access 7 (2019): 43749-43762.
[8] Nguyen, Heidi, Aravind Veluchamy, Mamadou Diop, and Rashed Iqbal. "Comparative study of sentiment analysis with product reviews using machine learning and lexicon-based approaches." SMU Data Science Review 1, no. 4 (2018): 7.
[9] Ahmed, Murtadha, Qun Chen, and Zhanhuai Li. "Constructing domain-dependent sentiment dictionary for sentiment analysis." Neural Computing and Applications 32 (2020): 14719-14732.
[10] Cruz, Laura, José Ochoa, Mathieu Roche, and Pascal Poncelet. "Dictionary-based sentiment analysis applied to a specific domain." In Annual International Symposium on Information Management and Big Data, pp. 57-68. Cham: Springer International Publishing, 2015.
[11] Gunasekaran, Karthick Prasad. "Exploring sentiment analysis techniques in natural language processing: A comprehensive review." arXiv preprint arXiv:2305.14842 (2023).
[12] Chaithra, V. D. "Hybrid approach: naive bayes and sentiment VADER for analyzing sentiment of mobile unboxing video comments." International Journal of Electrical and Computer Engineering (IJECE) 9, no. 5 (2019): 4452-4459.
[13] Palwe, Yash Sanjay. "Hybrid Classifier for Analyzing Customer Satisfaction." PhD diss., Dublin, National College of Ireland, 2021.
[14] Khoo, Christopher SG, and Sathik Basha Johnkhan. "Lexicon-based sentiment analysis: Comparative evaluation of six sentiment lexicons." Journal of Information Science 44, no. 4 (2018): 491-511.
[15] Bashiri, Hadis, and Hassan Naderi. "LexiSNTAGMM: an unsupervised framework for sentiment classification in data from distinct domains, synergistically integrating dictionary-based and machine learning approaches." Social Network Analysis and Mining 14, no. 1 (2024): 102.
[16] Kwon, Wooseok. "Reading customers' minds through textual big data: Challenges, practical guidelines, and proposals." International Journal of Hospitality Management 111 (2023): 103473.
[17] Abiola, Odeyinka, Adebayo Abayomi-Alli, Oluwasefunmi Arogundade Tale, Sanjay Misra, and Olusola Abayomi-Alli. "Sentiment analysis of COVID-19 tweets from selected hashtags in Nigeria using VADER and Text Blob analyser." Journal of Electrical Systems and Information Technology 10, no. 1 (2023): 5.
[18] Mërgim, H., and Jaumin AJDARI. "SENTIMENT ANALYSIS USING THE VADER MODEL FOR ASSESSING COMPANY SERVICES BASED ON POSTS ON SOCIAL MEDIA." DOI: 10.2478/seeur-2023-0043
[19] Samuel, Jim, Gavin Rozzi, and Ratnakar Palle. "The dark side of sentiment analysis: An exploratory review using lexicons, dictionaries, and a statistical monkey and chimp." Dictionaries, and a Statistical Monkey and Chimp (January 6, 2022) (2022).
[20] Eng, Titya, Md Rashed Ibn Nawab, and Kazi Md Shahiduzzaman. "Improving accuracy of the sentence-level lexicon-based sentiment analysis using machine learning." International Journal of Scientific Research in Computer Science Engineering and Information Technology 3307 (2021): 57-68.



10.22214/IJRASET

45.98

IMPACT FACTOR: 7.129

IMPACT FACTOR: 7.429

# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY