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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.

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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%

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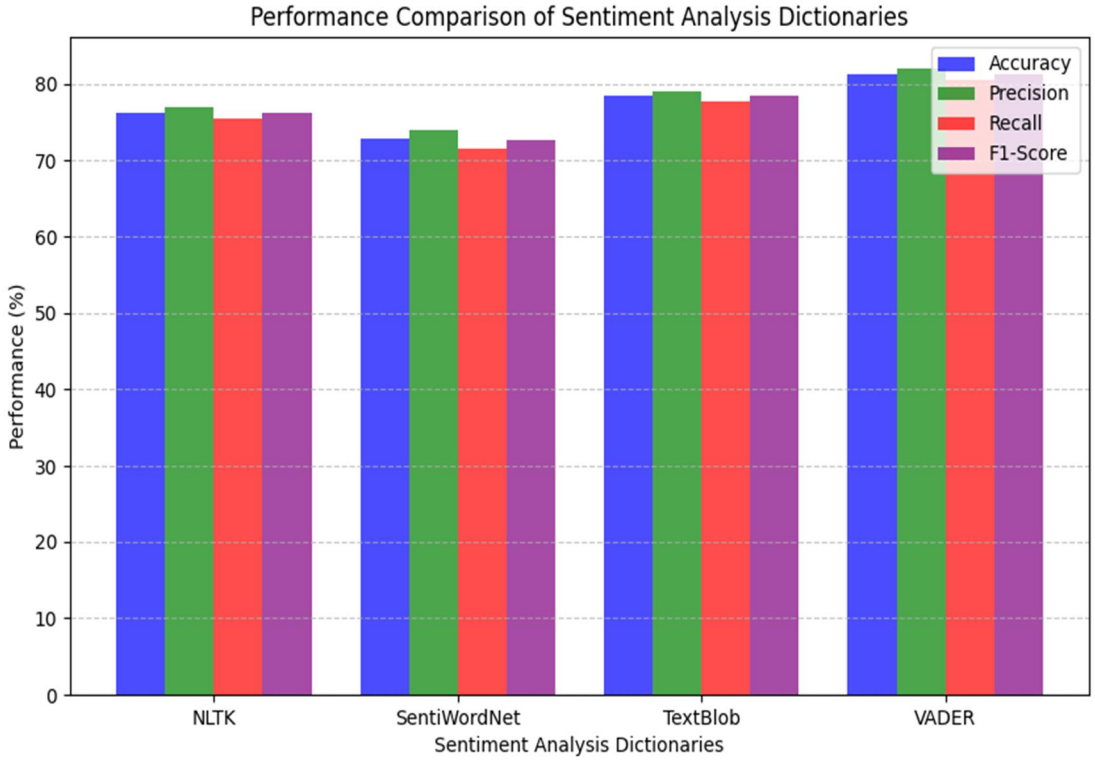
1) Bar Chart Visualization for Dictionary Performance



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.

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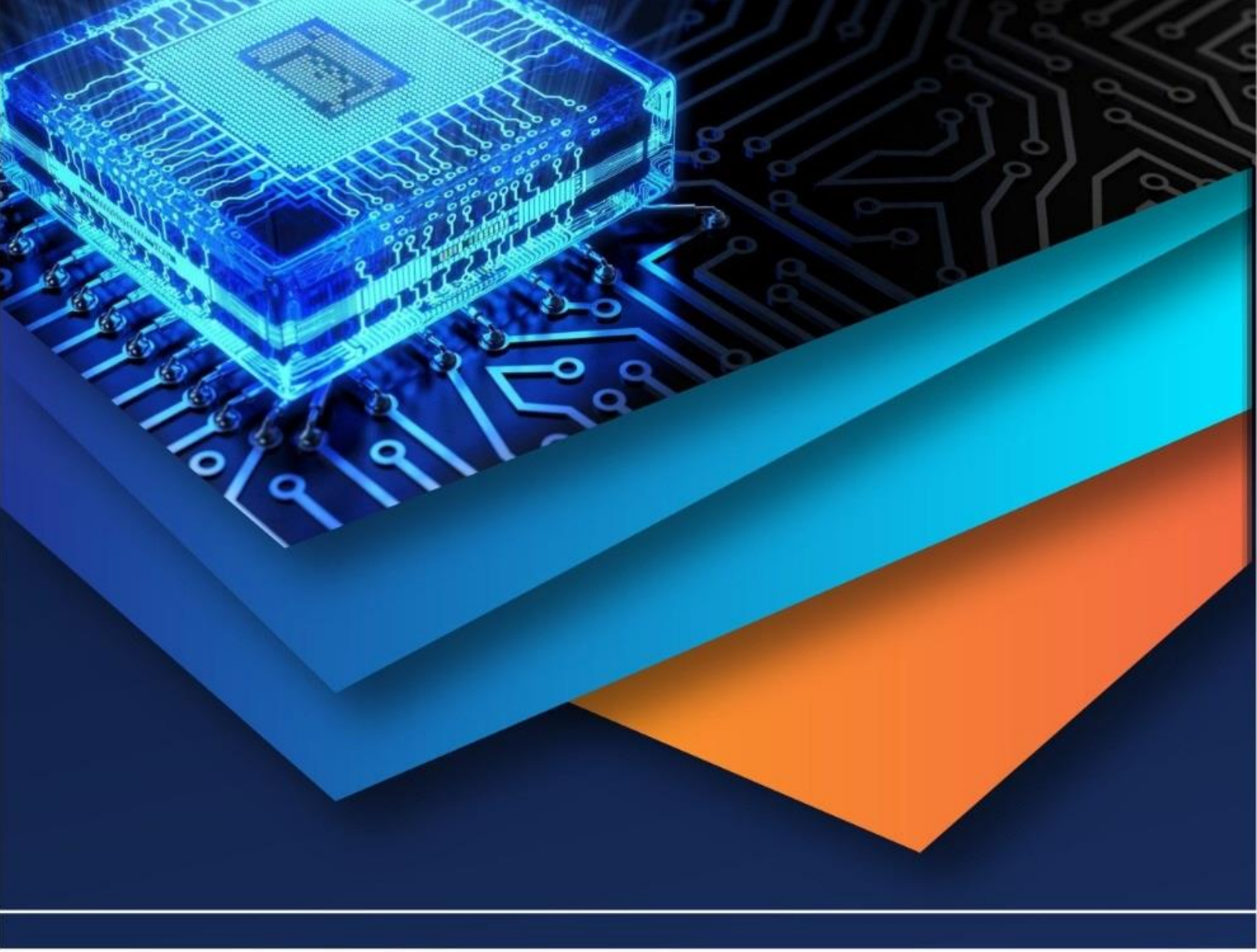

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