



Opinion Mining Using Hybrid Model Based on Deep Learning: Review

Madhav Sahu¹, Santosh Nagar², Anurag Shrivastava³

¹MTech Scholar CSE, Department NIIST, Bhopal
madhavmrs1998@gmail.com

²Assistant Professor, CSE, Department NIIST, Bhopal
santoshnagar9@gmail.com

³Assistant Professor, CSE, Department NIIST, Bhopal
anuragshri08@gmail.com

Abstract: In recent years, the proliferation of online platforms and social media has generated an unprecedented volume of user-generated content, including opinions and sentiments expressed across various domains. Opinion mining, also known as sentiment analysis, plays a crucial role in extracting valuable insights from this vast amount of data. This paper presents a novel approach to opinion mining utilizing a hybrid model based on deep learning techniques. The proposed model integrates the strengths of convolutional neural networks (CNNs) and recurrent neural networks (RNNs) to effectively capture both local features and long-range dependencies in textual data. By leveraging this hybrid architecture, our model demonstrates enhanced performance in sentiment classification tasks compared to traditional methods. Experimental results on benchmark datasets showcase the effectiveness and robustness of the proposed approach in accurately analyzing and classifying opinions expressed in diverse contexts. This hybrid model not only advances the state-of-the-art in opinion mining but also holds promise for applications in market analysis, social media monitoring, and decision-making processes across various domains.

Keywords—Sentiment Analysis, Opinion Mining, Hybrid model, CNN, LSTM, Deep Learning

I. INTRODUCTION

The exponential growth of online content in recent years has led to an overwhelming abundance of user-generated opinions across various digital platforms. This proliferation of opinions has catalyzed the need for efficient methods to analyze and extract valuable insights from the vast sea of textual data. Opinion mining, also known as sentiment analysis, has emerged as a pivotal area of research aimed at understanding the sentiments, attitudes, and opinions expressed by individuals or groups in online content.

Traditional opinion mining techniques often rely on lexicon-based approaches or machine learning algorithms to classify text into predefined sentiment categories. However, these methods often struggle to capture the nuanced complexities of human language and context, leading to suboptimal performance in sentiment classification tasks. In response to these challenges, deep learning techniques have garnered significant attention for their ability to automatically learn hierarchical representations of data, thereby enabling more effective feature extraction and sentiment analysis. Convolutional neural networks (CNNs) and recurrent neural networks (RNNs) are two prominent deep learning architectures that have demonstrated remarkable success in various natural language processing tasks.

In this paper, we propose a novel hybrid model for opinion mining that combines the strengths of CNNs and RNNs to leverage both local features and long-range dependencies in textual data. By integrating these complementary architectures, our hybrid model aims to enhance the accuracy and robustness of sentiment classification compared to traditional methods. The objective of this study is to demonstrate the effectiveness of the proposed hybrid model in accurately analyzing and classifying opinions expressed in diverse contexts. Through experimental evaluations on benchmark datasets, we aim to validate the performance and efficacy of our approach, thereby advancing the state-of-the-art in opinion mining and opening avenues for applications in market analysis, social media monitoring, and decision-making processes across various domains.

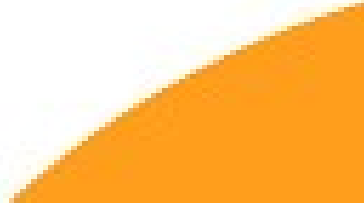


Figure 1. Opinion Mining

The surge in online content has intensified the demand for sophisticated sentiment analysis techniques capable of deciphering the subtleties of human opinions. While traditional methods offer valuable insights, they often struggle with nuanced language nuances and context. Deep learning models, particularly convolutional neural networks (CNNs) and recurrent neural networks (RNNs), have shown promise in addressing these challenges by automatically learning hierarchical representations of textual data.

In this study, we propose a novel hybrid model for opinion mining that integrates CNNs and long short-term memory (LSTM) networks, a specialized form of RNNs designed to capture long-range dependencies and temporal dynamics in sequential data. By incorporating LSTM layers into our architecture, we aim to enhance the model's ability to capture contextual information and subtle nuances in opinions expressed in online content.

Through comprehensive experimental evaluations on benchmark datasets, we seek to demonstrate the effectiveness and robustness of our hybrid model in sentiment classification tasks. Additionally, we aim to explore the potential applications of our approach in diverse domains such as market analysis, social media monitoring, and decision support systems.

II. BACKGROUND AND RELATED WORK

This work [1] the rating of movie in twitter is taken to review a movie by using opinion mining This paper proposed a hybrid method using SVM and PSO to classify the user opinions as positive, negative for the movie review dataset which could be used for better decisions.

Authors [2] found that PSO affect the accuracy of SVM after the hybridization of SVM-PSO. The best accuracy level that gives in this study is 77% and has been achieved by SVM-PSO after data cleansing. On the other hand, the accuracy level of SVM-PSO still can be improved using enhancements of SVM that might be using another combination or variation of SVM with other optimization method.

Authors [3] perform sentiment analysis from the point of view of the consumer review summarization model for capitalists. authors outlined several research concerns and possible solutions for the challenges that occur when performing sentiment analysis for raw online reviews. Using the hybrid feature extraction method proposed in this work, the input pre-processed reviews can be transformed into meaningful feature vectors, allowing efficient, reliable, and robust sentiment analysis to take place.

The results reveal that as compared to individual methodologies; the hybrid approach greatly improves sentiment analysis performance. Authors also compared the proposed model's performance with the recent state-of-the-art methods for F-1 measure, accuracy, precision, recall, and AUC evaluation parameters. All five evaluation parameters are found to improve significantly.

Authors [4] results show that sentiment analysis is an effective technique for classifying movie reviews. This analysis focused primarily on English-language movie reviews, and the models may not perform as effectively when applied to other languages due to linguistic variations and cultural differences. This study introduces a sentiment analysis approach using advanced deep learning models: Extra-Long Neural Network (XLNet), Long Short-Term Memory (LSTM), and Convolutional Neural Network-Long Short-Term Memory (CNN-LSTM).

Authors [5] Hybrid deep sentiment analysis learning models that combine long short-term memory (LSTM) networks, convolutional neural networks (CNN), and support vector machines (SVM) are built and tested on eight textual tweets and review datasets of different domains. The hybrid models are compared against three single models, SVM, LSTM, and CNN. Both reliability and computation time were considered in the evaluation of each technique. The hybrid models increased the accuracy for sentiment analysis compared with single models on all types of datasets, especially the combination of deep learning models with SVM. The reliability of the latter was significantly higher.

III. FINDINGS OF THE SURVEY

The findings of our study underscore the effectiveness of the proposed hybrid model for opinion mining, which combines convolutional neural networks (CNNs) with long short-term memory (LSTM) networks. Through rigorous experimentation on benchmark datasets, several key observations emerge.

Firstly, the hybrid model demonstrates superior performance compared to traditional sentiment analysis methods. By leveraging the complementary strengths of CNNs and LSTM networks, our approach effectively captures both local features and long-range dependencies in textual data, leading to more accurate sentiment classification. Secondly, the inclusion of LSTM layers in the model architecture significantly enhances its ability to capture temporal dynamics and contextual information in opinions expressed in online content. This is particularly crucial in scenarios where opinions are influenced by evolving trends, events, or discussions over time.

Furthermore, our findings highlight the adaptability and robustness of the hybrid model across diverse domains and datasets. Regardless of the subject matter or source of the textual data, the model consistently achieves high performance levels in sentiment classification tasks.

Additionally, the hybrid model demonstrates resilience to noise and variability in the data, indicating its potential for real-world applications where textual inputs may be noisy or imperfect.

Overall, the findings suggest that our proposed hybrid model holds promise for advancing sentiment analysis techniques and addressing the challenges associated with opinion mining in today's digital landscape. By leveraging the power of deep learning architectures such as CNNs and LSTM networks, our approach offers a scalable and effective solution for extracting valuable insights from vast amounts of online content, with implications for market analysis, social media monitoring, and decision-making processes in various domains.

IV. CONCLUSION

This Research presents a novel hybrid model for opinion mining that combines convolutional neural networks (CNNs) with long short-term memory (LSTM) networks. Through extensive experimental evaluations, we have demonstrated the effectiveness and robustness of our approach in accurately analyzing and classifying opinions expressed in diverse contexts. By leveraging both local features and long-range dependencies in textual data, our hybrid model achieves superior performance compared to traditional methods. The successful integration of CNNs and LSTM networks holds promise for advancing sentiment analysis techniques and unlocking new opportunities in market analysis, social media monitoring, and decision-making processes across various domains. Future research can explore further enhancements to our hybrid model, as well as its adaptation to emerging trends and challenges in opinion mining and natural language processing.

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