

INTRODUCTION

Sentiment analysis is the process of determining sentiment and classifying the polarity of text in a document or sentence to be categorized as positive, negative, or neutral. This technique is often used in social media, especially X, to understand the public's perception of an entity such as a particular service, product, individual, or topic [1]. X provides a real-time platform where users can express their opinions dynamically, making it a rich data source for sentiment analysis. In the context of the 2024 General Election in Indonesia, sentiment analysis via X can provide insights into people's opinions towards Presidential candidates and the evolving political dynamics [2].

In recent years, numerous studies have been conducted to improve the accuracy and efficiency of sentiment analysis models. Deep learning methods such as GRU (Gated Recurrent Unit) and CNN (Convolutional Neural Network) have shown high accuracy in sentiment analysis. For instance, research by Kiran Baktha and his colleagues demonstrated that the GRU model achieved the highest accuracy in sentiment analysis of Amazon product reviews [3]. GRU is particularly effective in handling sequential data, such as text, due to its ability to retain information over time without the vanishing gradient problem often faced by traditional RNN models.

Similarly, the Convolutional Neural Network (CNN) has proven to be effective in sentiment analysis. A study by Aldiansyah and Priyo demonstrated that the CNN model achieved 88.21% accuracy in sentiment analysis of public opinion towards Smartfren 4G network services [4]. CNN's ability to perform feature extraction from text data by utilizing convolution layers to detect important patterns and features makes it a valuable tool for sentiment classification.

Despite these advancements, there is still a need for more comprehensive approaches that can further improve the performance of sentiment analysis models. For example, the use of GloVe (Global Vectors for Word Representation) feature expansion has been shown to enhance sentiment analysis performance. GloVe is a word embedding model that uses global statistical information from the entire document to generate word representations in vector form. Research by Sani Kamış and his colleagues found that the use of GloVe improved sentiment analysis performance by 5%-7% compared to Word2Vec [5]. The vector representation generated by GloVe is richer in context, making it more effective in understanding and classifying text sentiment.

In addition, research by Severyn and Moschitti explored the effectiveness of CNN in sentiment analysis, but they focused primarily on sentence-level classification without integrating sequential data processing, which limits the model's ability to capture the context of the entire document [6]. On the other hand, Zhang et al. proposed a hybrid approach combining CNN with LSTM (Long Short-Term Memory) networks for text classification, highlighting the potential of hybrid models but leaving room for optimization in terms of feature selection and model efficiency. These studies underline the importance of exploring hybrid models but also point out that the combination of CNN and GRU, as well as the integration of GloVe and Genetic Algorithm, remains underexplored. [7].

Optimization techniques such as Genetic Algorithms (GA) can significantly improve the accuracy of sentiment analysis models by optimizing feature selection and model parameters, thereby enhancing overall performance. Research by Riska Aryanti and her colleagues demonstrated that the GA-based Support Vector Machine algorithm improved the average accuracy value and AUC in public transportation sentiment analysis [8]. Additionally, Loussaief & Abdelkrim provided a comprehensive study on the integration of Genetic Algorithms with deep learning models, specifically highlighting how GA can be employed to optimize hyperparameters and feature selection to enhance classification performance. Their findings suggest that GA is particularly effective in improving model efficiency and accuracy in complex classification tasks. However, while their research offers valuable insights, it was primarily conducted on traditional datasets, leaving the application of GA in more dynamic and real-time environments, such as social media sentiment analysis, relatively unexplored [9]. This gap presents an opportunity for further exploration, particularly in the context of real-time sentiment analysis during politically charged events like elections.

However, the existing research primarily focuses on individual techniques such as CNN, GRU, or GloVe, without fully exploring the potential of combining these methods in a hybrid model. Moreover, the majority of studies do not address the specific challenges posed by analyzing sentiment in real-time political contexts, such as the 2024 Indonesian Presidential Election, where the public's opinions can rapidly shift due to emerging political events.

This research focuses on proposing a novel approach that integrates a hybrid CNN-GRU model with GloVe feature expansion and Genetic Algorithm optimization for sentiment analysis related to the 2024 Election on X. This hybrid approach leverages the strengths of CNN in feature extraction and GRU in handling sequential data, which is expected to improve the accuracy and robustness of sentiment analysis. Additionally, by incorporating

Genetic Algorithm optimization, this research aims to develop a more efficient and accurate model for classifying the sentiment of public opinion towards the 2024 Election, thus providing valuable insights for political stakeholders.

The importance of sentiment analysis in the context of the 2024 Indonesian Presidential Election lies in its ability to capture and analyze the public's evolving perceptions and attitudes towards the candidates. This is crucial for understanding the dynamics of voter behavior and for informing campaign strategies. The insights generated from this analysis can help political parties and candidates to tailor their messages and strategies in real-time, potentially influencing the outcome of the election. Therefore, this study not only contributes to the field of sentiment analysis but also holds practical significance in the context of political decision-making during elections.