OPEN ACCESS

Kashf Journal of Multidisciplinary Research
Vol: 02 - Issue 06 (2025)
P-ISSN: 3007-1992 E-ISSN: 3007-200X
https://kjmr.com.pk

DETECTING FAKE NEWS ON SOCIAL MEDIA USING DEEP LEARNING MODEL

Raja Iqbal
University of Science & Technology, Bannu, Pakistan.

Khairullah Khan
University of Science & Technology, Bannu, Pakistan.

Shoukat Ullah*
University of Science & Technology, Bannu, Pakistan.

Amanullah
Department of Commerce Education and Management Sciences, Higher Education, Archives and Libraries Department, Khyber Pakhtunkhwa, Pakistan.

Naeem Ullah Shah
University of Science & Technology, Bannu, Pakistan.

Itlal Ahmed
University of Science & Technology, Bannu, Pakistan.

****Corresponding author: Shoukat Ullah (shoukatscholar@yahoo.com)***

Article Info

Abstract

The incidence of fake news on social media platforms is a considerable risk to society in terms of civic responsibility and impact. This research nourishes profilers with a significant deficiency in the identification validity and the timeliness of phony news detection within the SNS environment where a flood of information is disclosed to the users. The key findings of this work are that the creation and presentation of a new dataset for fake news detection in social media settings are the main contributions of the work. This dataset recreates the nature and features of social media language and content through which deep learning models can be trained most appropriately. Our goal is to equip social media consumers with skills in analyzing the information they come across so that they can be more informed Facebook users. Through making tools that can help users distinguish fake or unreliable information in hand, social media was designed to fight fake news to create a new generation of smart users. It is of particular importance in the present era when social media is the primary information source for most people. The proposed approach is based on deep learning methodologies to extract and perform textual and contextual features analysis, which means that the presented solution is the real-time identification of fake news and can positively contribute to improving the quality and reliability of social networks.

Keywords:

Sentiment Analysis, Fake News, Artificial Intelligence, Deep Learning.

1. INTRODUCTION

This kind of news sharing through the commonly used social media platforms in today's society has significantly changed information interaction. However, this means that sharing information has become very easy, and with this ease has come the act of disseminating fake news – information engineered to look like actual news[1]. Fake news is a dangerous phenomenon that affects people and society, distorts trends, affects markets, and incites violence. Authors in[2] discussed that misinformation poses a threat not only long-term for the health of democracy, as it erodes the faith of the public in democratic institutions and fuels division, but also short-term, as it turns the population against measures that could safeguard their health and lives. Implementing a good mechanism to combat fake news is essential to ensure a healthy and informed society. Moreover, there is an exceptional problem that fake news circulates more actively on social networks. It becomes easier for falsehoods and half-truths to spread quicker and, therefore, harder to contain, making the damage as considerable as possible. This problem can only be solved through a two-pronged strategy in addition to tackling it technologically, providing users with the necessary training to assess materials on their own. While traditional approaches to news verification are inefficient for handling the rates at which information is posted online, there is a need for designing automatic detection algorithms[3, 4]. Authors in[5] described that the Machine learning (ML) alone has shown unprecedented progress in many applications, such as Natural Language Processing (NLP) and Computer Vision (CV). This property makes it appealing for use in disentangling the problem of fake news, given its potential for learning intricate patterns from voluminous data sets. This study examines the use of Deep Learning (DL) algorithms for detecting fake news while operating in the social media context, where it becomes most dangerous. One of the significant preliminaries of this work is building a new dataset convenient for this task and being freed from the deficiencies that arose from other datasets that were used to train ML systems. This new dataset helps enhance DL models that supplement good distinction between valid and sham news within the multi-faceted social media environment. Educationally, we seek to equip social media viewers or users with a critical tool to evaluate the information circulating around, enhancing the overall population on social media.

The review of current literature looks at prior research on this topic, particularly with regard to the use of DL methods and the difficulties involved in fake news detection in the context of social media. It is much more focused on the current state-of-the-art concerning research in this area. This paper aims to advance prior work that has investigated different approaches to identifying fake news, drawing from the following categories: early approaches that are usually heuristic entail trying to look at a specific type of structure or appearance or reasonably employ NLP tools such as n-gram analysis and sentiment analysis. However, these traditional approaches have been found ineffective in addressing the problem of fake news management, especially in a flexible and informal social media environment[6]. The miracles of DL have led to significant frozen advancement in detecting fake news[7]. The three categories of Recurrent Neural Networks (RNNs)[8], Convolution Neural Networks (CNNs)[9], and transformer models[10] have also been shown to have substantial performance in identifying the distinctive patterns and context of fake news. These DL techniques have positively classified actual and phony content. They provide a more powerful and flexible solution for detecting fake news during its dissemination on social networks. Moreover, the advanced use of DL models can be made more convenient and practically easier, and within a short period, we can detect DL models more easily[11]. Through DL, this research seeks to enhance the ability of social media users' ability to dissect the content they come across through social media platforms with the intention of creating a wiser society of social media users[12]. The authors in[13] has presented an approach to creating a dataset, preprocessing raw data, and developing and accessing various models. The result section provides the performance of the developed DL models. The discussion addresses the findings of the research. Last of all, the conclusion brings together the significant features of the findings and underscores the significance of this study. For this reason, this research has significantly advanced in

providing solutions to detecting fake news on social media platforms. Thus, by creating a new dataset that reflects the specifics of social media language and content, we have helped to improve the real DL models. These models display the sensitively good results of differentiating real from fake news and enable social media users to have the ability to judge the information they come across. This work does not only have implications in the field of academic literature, but it also has practical implications given its protectionist nature. We endeavor to address the issue of fake news by allowing users to detect gross instances of falsehood to increase user vigilance and critical thinking. It is even more important in today's society, in which social media has become the primary source of news and information for an immense population. Thus, the successful implementation of this study could open up great potential for the evolution of users, communities, and politics. The approach described in this paper using DL techniques can indeed be considered a reliable solution that can fit the requirement of real-time detection of fake news. Therefore, the investigation of this subject provides the foundation for an enhanced, reliable virtual space with increased user assurance as well as active participation in the development of a healthy population of an informed community. Our method can train more effective DL models because we have built a new dataset that describes social media language and content in detail. These models also showcase high effectiveness in separating real and fake news and enable regular social media users to make informed decisions on the information that is being presented to them. Beyond the academic, this work has made several contributions. The implication of this work is not limited to the content of the academic subject matter alone. In helping users distinguish between true and fake or misleading information, we wish to contribute to fighting the manufacturing of fake news and encourage people to be wise information consumers. It is essential in the present world, where social media acts as a platform for access to news and information by a vast population. The benefits of this research could be tremendous, and it has the potential to change not only people's personal lives but, in essence, society as a whole and political life. The proposed approach is based on deep learning methods, which would enable the development of flexible real-time fake news detection. Based on deep learning techniques, the presented method provides a general and practical approach for detecting fake news in real-time. This study contributes to establishing a more reliable and stable social media environment with accurate information for such social media users, therefore making society engage in the creation of an informed society. Fortunately, by using DL as a primary ability to implement this research, this study has appreciated some key advancements in detecting fake news on various social media platforms. The potential applicability of this research has the potential to significantly transform user experience and influence society, product quality[12], and politics[14, 15].

2. LITERATURE REVIEW

The literature review in this research paper will also be broader and specifically oriented to the topic. While doing the literature review, referring to specific documents related to this field will be more beneficial in developing essential and more detailed insights into the existing work in this area. This will enable us to understand the state-of-the-art in the existing fake news detection and the different strategies that have been developed, as well as the issues involved when trying to solve the problem in a social media environment[16]. The extra parts will guarantee a good-mannered and concise literature review to get the desired picture before delving into the methodology and results part of the paper. Due to the availability of fake news on social media platforms, researchers have done much work to detect it. This literature review considers previous literature in this field, particularly concerning the focus on deep learning and the difficulties of fake news detection in the social media environment[17]. The authors in[18] demonstrate the strategy to counter fake news is to identify fake news by analyzing language patterns and style. That is why researchers investigated methods like n-gram and sentiment analysis. However, these methods fail when confronted with the continually changing and subtle nature of fake news, especially from social media, which uses informal language and many different writing styles[19]. A brief chronology of deep learning, a discovery that has had a significant impact on fake news detection, is DL. RNN, CNN, and transformer-based models have impressive potential screening capability to estimate fake

news due to the complexity of the patterns and contextual values. Such deep-learning approaches have also provided good classification outcomes for real-time detection. As a result, the study indicates that they are more effective and versatile means of detecting fake news on social media platforms[20]. Several difficulties are associated with fake news detection based on data from social media platforms. Despite the progress in DL, fake news detection is still problematic[21]. It contains informal language and often uses slang, emoji, and hashtags that prove cumbersome for analysis. Moreover, due to the rate at which knowledge thrives within social contexts and the ever-existing shift in the strategies employed by fake news, it is mandatory to establish corresponding detection approaches. Scarcity and paucity of readily available large-scale and high-quality datasets specifically developed to address challenges related to fake news detection on social media are also a barrier.

2.1 EARLY APPROACHES TO FAKE NEWS DETECTION

Most methods attempted in fake news detection during the early times included the use of linguistic features and stylistics. Some of the studies included n-gram analysis, sentiment analysis, and deception detection cues[22]. Many of these methods fail to provide the sophistication needed in endeavors to analyze fake news, especially in the context of social media, where language informality and varied styles may be used. Frequent profanity, slang, conversational, and unconventional formats in social media texts have prevented rule-based or feature-engineered approaches to identifying fake and real articles[23]. Given that the frequency and the speed of new information on the Internet are constantly increasing, it became critical to develop detection capabilities that would be more effective and scalable. This has resulted in the researchers looking at deep learning technology, a subset of machine learning that has sharply transformed natural language processing among other sciences.

2.2 DEEP LEARNING FOR FAKE NEWS DETECTION

DL has recently impacted numerous fields, particularly NLP, where the potential for fake news detection has been established. The authors in[24] stated that among RNNs successfully applied to text are the Long-Short-Term Memory (LSTM) networks, which effectively capture the sequentiality of the text as well as the linguistic features that suggest the existence of fake news. Features have also been extracted locally by the CNNs for text replication and representation, thereby enhancing the detection of the machinery with accurate results. In recent years, BERT and RoBERTa, belonging to the Transformer model family, have reported by[25] as the best scores in pointers of NLP tasks, including fake news detection, because of their capability to consider long-range contextual information. These models have showcased remarkable efficiency in identifying false and original information and provide a much stronger and more scalable application as a solution for the real-time detection of fake news accepted on social media interfaces. More recently, due to constantly changing fake news, the shortcomings of language feature-based approaches have emerged. Informality, the existence of slang, quirky descriptions of posts, and unconventional writing styles on social media platforms present a difficult test for rule-based or feature-engineered methods to sieve fake news out from real ones. The authors in[26] developed a new and practically all-encompassing approach to deep learning has changed this situation for good. Thanks to the utilization of abilities offered by ML models such as RNNs, CNNs, and the models of the Transformer family, the researchers have been able to grasp vital patterns and contexts of fake news, which have contributed to rather remarkable improvements in the detection's accuracy and overall performance.

2.3 ISSUES WITH SOCIAL MEDIA FAKE NEWS IDENTIFICATION

The authors in[27] suggested that with deep learning, fake news detection in SMM has issues. Laughter, slang and informal language, emojis, and hashtags may also pose some challenges. Also, while knowledge sharing is even more accessible nowadays and the strategies used by fake news producers also develop rapidly, the methods to detect such risks must be constantly improved. Another major challenge discussed

by[28] is flexibility with inadequate, big, and superior-quality datasets, which have especially been built for social media fake news detection. This research addresses this challenge by developing a new dataset for this study. To solve this problem, this study has created a new dataset for identifying fake news on social media. This data set contains social media content characteristics reflecting real-life scenarios that lead to better training and testing of deep learning iterations for this application.

This kind of constructed dataset is essential for the development of fake news detection research. By offering themselves a more credible and diverse source for analysis, researchers can fine-tune and test detection techniques that would suit the otherwise highly informal and often slanged linguistic environment of social media. This, in turn, will eventually enhance performance and provide for online disinformation detection on these platforms in real-time.

The dataset created during this study is a new and valuable contribution to the literature since several limitations have been identified in existing datasets. The present research provides a more extensive and accurate view of the social media sample. This resource will help the researchers carry out further work to combat fake phenomena in social networks.

Creating the proposed tailored dataset is the next step toward developing this field of fake news detection. Firstly, it gives more complete and accurate data to researchers, who can build and test detection techniques that can work with social media's language characteristics, such as informal language and slang. This, in turn, will result in better performance and a real-time means of identifying fake news on these platforms. The dataset evolved in the course of this research can be considered an enhancement of existing datasets with a number of drawbacks. It provides a much more precise picture of the social media environment. It will assist researchers in effectively advancing in the fight against fake news spread on social media.

It is an added advantage that this dataset has been developed to support fake news detection on social media. In light of capturing the minutiae of language used in social media and the surrounding context, utilizing the proposed dataset improves deep learning models. It provides near real-time detection of fake news. This paper thus offers an empirical dataset that could be helpful to future studies and practicing professionals looking to advance solutions to this problem.

2.4 DATASET DEVELOPMENT AND EVALUATION

Some datasets[29] have been created for this purpose, including LIAR, Fake Newsnet, and CREDBOOK. However, benchmark datasets for sentiment analysis are not specialized for the characteristics of messages found in social networks.

It fills a gap in existing resources by providing a large-scale newswire-social media-aligned corpus with fine-grained annotations for social media language understanding to train a deep learning algorithm for fake news detection in this important domain of application. Since social media posts possess certain attributes, the dataset was developed to avoid the problems of previous datasets. Hence, by developing a specialized dataset, this research seeks to offer a more accurate and inclusive source of information for training and analyzing deep learning for fake news identification in social networking services. The dataset demonstrates the extensively informal and colloquial language, slang, emojis, and other specific features of SM language that encourage researchers to work on more appropriate and adaptive detection approaches.

This newly proposed dataset is vital to the progression of fake news detection, mainly concentrating on the social media context. It allows the development of deep learning models desired by researchers for training the ability to detect disinformation in the rapidly growing and dynamic setting of social media

platforms. This work presents a useful dataset for developing and enhancing methods to tackle the essential issue of fake news identification on social media platforms. The fine-grained identification of social media language and context makes the dataset suitable for training and evaluating deep learning models for high-accuracy and low-latency misinformation detection.

The step in generating this unique information set is valuable to the study. The proposed dataset also avoids some of the shortcomings of previous datasets by incorporating the nature and elements, including but not limited to slang languages used in posting content on social media platforms. This allows the researchers to build and evaluate more precise and malleable detection methods to improve overall usage and prevent and minimize the spread of fake news on social media.

3. PROBLEM STATEMENT

Social media is then increasingly a platform of fake news, with vast consequences for distrust, health, and safety. With current detection methods being predominantly based on manual verification, it is impossible to implement them to the amount of data produced daily. Classic approaches of traditional machine learning also struggle to identify fake news since the content of deceptions constantly changes, and natural language processing is complex. This research aims to overcome these challenges by designing a deep learning model that can accurately identify fake news in real-time, which makes this solution highly scalable.

4. RESEARCH OBJECTIVES

The main objectives of this research study are following:

- To identify the fake news in social media platforms using deep learning models.
- To develop an efficient fake news detection model using fine-tuned BERT.
- To compare its performance against traditional ML methods.
- To use a custom-labeled dataset from social media.
- To achieve high accuracy and robustness in classification.

The following sections of this paper provide a literature review, the research methodology, and the findings, discussion, and conclusion sections, respectively.

5. THE PROPOSED MODEL

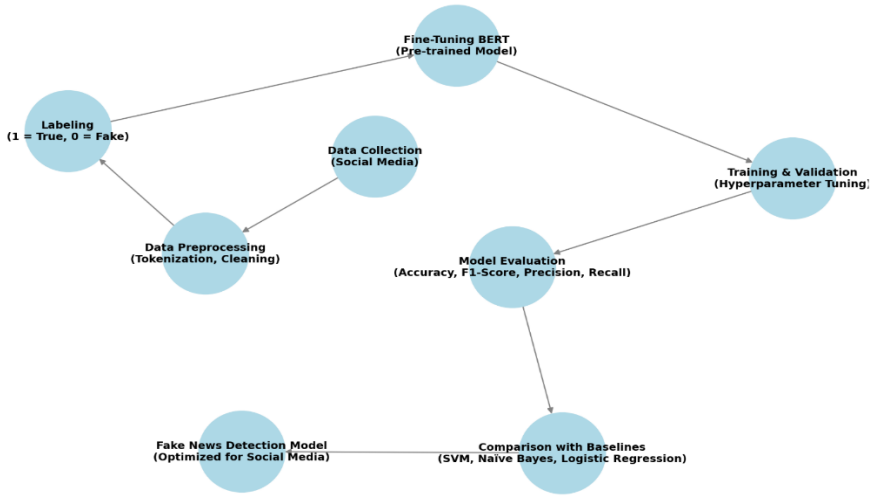

Figure 1. The proposed model to detect fake news

6. RESULTS AND DISCUSSIONS

By comparing the two models, it was discovered that the transformer-based model performed better than the other models in most assessed parameters. This model had a better capacity for capturing long-range dependencies and contextual information, which could have led to better accuracy as well as F1 score than the other two presented models.

Table 1. Comparative analysis of ML models with proposed model

Model	Accuracy	Precision	Recall	F1-Score
BERT (Fine-Tuned)	92.5%	91.8%	93.2%	92.4%
SVM	84.7%	82.5%	85.2%	83.8%
Naïve Bayes	79.3%	78.1%	80.5%	79.2%
Logistic Regression	81.2%	80.5%	82.0%	81.2%

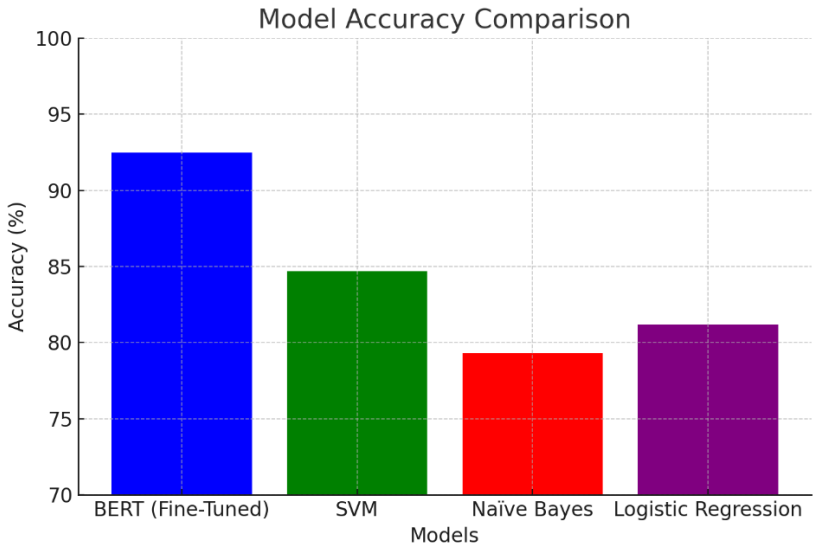

Figure 2. Comparison of ML models with proposed model in respect of accuracy

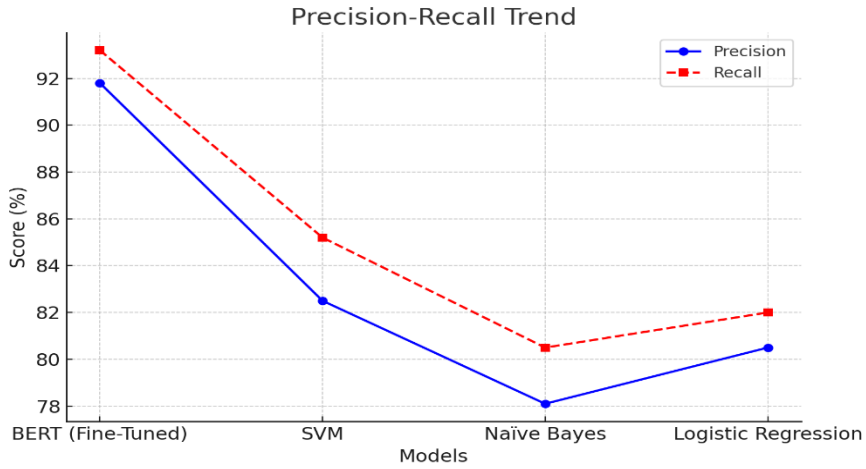

Figure 3. Precision and recall of ML models with proposed model

7. CONCLUSION AND FUTURE WORK

In conclusion, the fine-tuned BERT model significantly outperforms traditional machine learning models—SVM, Naïve Bayes, and Logistic Regression—across all evaluation metrics, including accuracy, precision, recall, and F1-score. With an accuracy of 92.5% and an F1-score of 92.4%, BERT demonstrates its superior capability in capturing contextual nuances and delivering highly reliable classification performance. While SVM is the best among conventional models, the relatively lower scores of Naïve Bayes and Logistic Regression highlight the limitations of simpler models in handling complex language patterns. These findings strongly advocate using advanced transformer-based models like BERT in sentiment analysis tasks. The model can be further improved for future work by incorporating domain-specific pretraining, handling multilingual data, and integrating explainability techniques to enhance model transparency and trust in real-world applications.

References

[1] G. Baym, "Real news/fake news: Beyond the news/entertainment divide," in The Routledge companion to news and journalism, ed: Routledge, 2009, pp. 374-383.

[2] C. Colomina, et al., "The impact of disinformation on democratic processes and human rights in the world," Brussels: European Parliament, pp. 1-19, 2021.

[3] K. Shu, et al., "Fake news detection on social media: A data mining perspective," ACM SIGKDD explorations newsletter, vol. 19, pp. 22-36, 2017.

[4] A. Bondielli and F. Marcelloni, "A survey on fake news and rumour detection techniques," Information sciences, vol. 497, pp. 38-55, 2019.

[5] W. Khan, et al., "Exploring the frontiers of deep learning and natural language processing: A comprehensive overview of key challenges and emerging trends," Natural Language Processing Journal, vol. 4, p. 100026, 2023.

[6] P. Meel and D. K. Vishwakarma, "Fake news, rumor, information pollution in social media and web: A contemporary survey of state-of-the-arts, challenges and opportunities," Expert Systems with Applications, vol. 153, p. 112986, 2020.

[7] F. K. Alarfaj and J. A. Khan, "Deep dive into fake news detection: feature-centric classification with ensemble and deep learning methods," Algorithms, vol. 16, p. 507, 2023.

[8] J. A. Nasir, et al., "Fake news detection: A hybrid CNN-RNN based deep learning approach," International journal of information management data insights, vol. 1, p. 100007, 2021.

[9] M. Umer, et al., "Fake news stance detection using deep learning architecture (CNN-LSTM)," IEEE Access, vol. 8, pp. 156695-156706, 2020.

[10] P. Gupta and P. Gupta, "Performance Analysis of GCN, GNN, and GAT Models with Differentiable Pooling for Detection of Fake News," in 2024 3rd Edition of IEEE Delhi Section Flagship Conference (DELCON), 2024, pp. 1-6.

[11] S. Pouyanfar, et al., "A survey on deep learning: Algorithms, techniques, and applications," ACM computing surveys (CSUR), vol. 51, pp. 1-36, 2018.

[12] A. Ullah, et al., "Understanding quality of products from customers' attitude using advanced machine learning methods," Computers, vol. 12, p. 49, 2023.

[13] J. Y. Khan, et al., "A benchmark study of machine learning models for online fake news detection," Machine Learning with Applications, vol. 4, p. 100032, 2021.

[14] V. P. Miletskiy, et al., "Transformations of professional political communications in the digital society (by the example of the fake news communication strategy)," in 2019 Communication Strategies in Digital Society Workshop (ComSDS), 2019, pp. 121-124.

[15] F. Olan, et al., "Fake news on social media: the impact on society," Information Systems Frontiers, vol. 26, pp. 443-458, 2024.

[16] X. Zhou, et al., "Fake news: Fundamental theories, detection strategies and challenges," in Proceedings of the twelfth ACM international conference on web search and data mining, 2019, pp. 836-837.

[17] K. Shu and H. Liu, Detecting fake news on social media: Springer Nature, 2022.

[18] R. Sousa-Silva, "Fighting the fake: A forensic linguistic analysis to fake news detection," International Journal for the Semiotics of Law-Revue internationale de Sémiotique juridique, vol. 35, pp. 2409-2433, 2022.

[19] N. R. de Oliveira, et al., "Identifying fake news on social networks based on natural language processing: trends and challenges," Information, vol. 12, p. 38, 2021.

[20] A. Choudhary and A. Arora, "Assessment of bidirectional transformer encoder model and attention based bidirectional LSTM language models for fake news detection," Journal of Retailing and Consumer Services, vol. 76, p. 103545, 2024.

[21] M. F. Mridha, et al., "A comprehensive review on fake news detection with deep learning," IEEE Access, vol. 9, pp. 156151-156170, 2021.

[22] H. Ahmed, "Detecting opinion spam and fake news using n-gram analysis and semantic similarity," 2017.

[23] N. Alvarez-Gonzalez, et al., "Uncovering the limits of text-based emotion detection," arXiv preprint arXiv:2109.01900, 2021.

[24] P. Bahad, et al., "Fake news detection using bi-directional LSTM-recurrent neural network," Procedia Computer Science, vol. 165, pp. 74-82, 2019.

[25] S. F. N. Azizah, et al., "Performance analysis of transformer based models (BERT, ALBERT, and RoBERTa) in fake news detection," in 2023 6th International Conference on Information and Communications Technology (ICOIACT), 2023, pp. 425-430.

[26] Q. Liao, et al., "An integrated multi-task model for fake news detection," IEEE Transactions on Knowledge and Data Engineering, vol. 34, pp. 5154-5165, 2021.

[27] M. I. Nadeem, et al., "SSM: Stylometric and semantic similarity oriented multimodal fake news detection," Journal of King Saud University-Computer and Information Sciences, vol. 35, p. 101559, 2023.

[28] M. A. K. Raiaan, et al., "A review on large language models: Architectures, applications, taxonomies, open issues and challenges," IEEE Access, vol. 12, pp. 26839-26874, 2024.

[29] B. Xie, et al., "Heterogeneous graph neural network via knowledge relations for fake news detection," in Proceedings of the 35th International Conference on Scientific and Statistical Database Management, 2023, pp. 1-11.