



A REVIEW: EXPLORING INNOVATIVE MACHINE LEARNING FRAMEWORKS FOR DETECTING FABRICATED INFORMATION

Mr. Sachin Khandagale, Assistant Professor, Sangola College, Sangola (MS),
sachinraj3711@gmail.com.

Dr. Gajanan Kurundkar, Assistant Professor, Shri Guru Buddhiswami Mahavidyalaya, Purna
(Jn)(MS), gajanan.kurundkar@gmail.com.

Abstract

The rise of social media has resulted in conflicts about information, which causes people to be confused and apprehensive while making decisions. There are several studies aimed to differentiate between true and fake content on social media networks. The study aims to examine the effectiveness of various machine learning and deep learning algorithms in detecting fake news. The different datasets like Benjamin Political News, LIAR, FakeNewsNet, BuzzFeed News, KWON, MediaEval, RUMDECT, RUMOUREVAL, MULTI, LIAR, PHEME, FEVER, etc. pre-processed using NLP. The evaluation is based on ROC AUC, AUC, precision, recall, and accuracy. According to the present study, the fastText Word embedding model in combination with the LSTM bidirectional classification model achieved the highest accuracy, with an accuracy score of 99.24%, precision of 99.19%, recall of 99.26%, and an F1-score of 99.23%.

Keywords: social media networks, machine learning, deep learning, NLP, F1-score, recall, precision.

I. Introduction

At the present innovation age, this universe is compelled by various elements but one of the primary things is information. Data is the handled information that is precisely determined for a specific reason, significance, and pertinence. Data will be addressed in different configurations like text, picture, sound or video, and so on. Data sharing should be conceivable physically or electronically.

These days, web-based entertainment and electronic diversion are fundamental human prerequisites because of edge improvement close to held gadgets. This advanced period is growing and assuming an undeniably significant part of human existence. Lately, a rising number of clients have effectively taken an interest via Social Media Networks consistently to gain or share their considerations, subject conversation, political perspectives, stories, news, encounters, individual marking and perspectives, interactive media information, etc.[1].

As per a report of Digital Global Overview Report 2021, there are 4.62 billion users dynamically active on social media platforms, addressing 58.4% of the complete populace, and the day-to-day ordinary time spent on media by every individual is almost 02-03 hours. These figures reflect people's universality and dynamic participation on social media.[2].

The progress of Social Media Network is because of steady associations with different societies, families, and buddies, as well as the sharing of different varieties of data. There are 2910 million Facebook users worldwide, 2562 million YouTube users, 2000 million WhatsApp users, 1478 million Instagram users, 1263 million WeChat users, 1000 million TikTok users, and 436 million Twitter users, among others. [2].

Tragically, one of the critical issues with Social Media Networks is the genuineness, accuracy, honesty, or precision of the data. Most users on social media platforms intentionally or purposefully spread misleading and untruth data or information. [3].

The spread of spurious data can conceivably hurt the people and society like human feelings, control stock costs on worldwide securities exchanges, social battles, cause climate crises, severe violence, negative exposure, medical care choices, shopping, training and assessment, discernment, culture, and perspectives, in addition to other things. Hence, a human can make horrible decisions and spread fake information. It might be hazardous and dangerous [3]. A fake information storm affected



the US political decision in 2016. It additionally happened during the French official political decision. Besides, during the Coronavirus scourge, spreading lies harmfully affects well-being [4].

One of the significant origins of fake information is a boundless relationship between the web which spreads faulty and unfair data without any problem. It is practically illogical to keep or control fake information from being made or dispersed. [5]. It's a big problem concerning the truth and sensibleness of information. People are incapable of verifying or confirming the sources of information. They easily forward or share content on social media without thinking and aimlessly. The majority of information is presented in the text. We must examine that textual information or contents to spot fake information. Natural Language Processing (NLP) and text analysis are often used interchangeably to refer to the process of extracting meaningful insights and perceptions from unstructured textual data. The primary goal of text analysis is generate unstructured information into data which is easily analyzed and comprehended. This procedure investigates and examines a lot of unstructured information and renovates information into machine understandable.

The key use of Text analysis is for both qualitative and quantitative data analysis which identifies feelings, contents, theories, configurations, themes, ideas, policies, subjects, and various characteristics in the data. [7]. There are various challenges with fake information. These difficulties highlight the requirement for fake data detection.[3]. Already a lot of work has been done by most professionals. They work on various techniques, strategies, or methods [8]. The present study reviews some of the prominent works.

II. Literature

In this paper, Xichen Zhang, Ali A. Ghorbani worked on the analysis of existing fake news approaches in-depth and developed a broad model with author credibility and spreading patterns of the news. In the model, a combination of various types of analysis, alerts, and detection techniques protects users against the huge impact of fake news. For the study, the author uses Benjamin Political News Dataset, LIAR, FakeNewsNet, BuzzFeed News, etc. datasets [9].

The paper focuses on a deep learning ensemble model that categorises news as fake or real. The LIAR dataset is used by the author. Using Deep learning model, A Bi-LSTM-GRU-dense technique primarily concentrates on the textual attribute "Statement". NLP techniques are used for feature extraction. In the study, Nida Aslam et al., achieved a 0.913 precision, a 0.916 recall, 0.898 accuracy, and an F-score of 0.914, respectively. The paper focused on only the statement feature that achieved the highest results. But low performance after including some other attributes like speaker profile [10].

In the article, Vasu Agarwal et al., uses two steps in fake news detection. In the first step, text pre-processing is performed by Natural Language Processing using n-grams, bag-of-words, count vectorizer, etc. techniques. A machine learning classifier is applied to the election dataset with in second phase. With sci-kit learn library, A various classifier algorithms such as Nave Bayes, Linear SVM, Logistic Regression, Random Forest and Stochastic Gradient Classifier are used. Comparison of different classifier algorithms is done by using precision, F1 Score, and Recall parameters. The Comparatives result differentiate performance of logistic regression and Support Vector Machine classifiers. The research cannot improve feature extraction or selection and fine-tuned classification [11].

Ajeet Ram Pathak et al., emphasize the major discussion on KWON, MediaEval, RUMDECT, RUMOUREVAL, MULTI, LIAR, PHEME, and FEVER datasets for rumor detection. An effective analysis of multi-step classification and study of multiple features of rumors through the supervised and unsupervised machine learning approaches. The study uses deep learning algorithms like recursive and convolutional neural networks. The article provides a proportional analysis of ultra-modern rumor detection methods [12].

In the Paper, Ning Xiang worked on multi-model fake information detection on textual and visual information. The text feature vectors are obtained by the BERT model and visual features are obtained



by the VGG19 model. Instead of concatenating the two different types of features, A Multi-Model Compact Bilinear Pooling (MCBP) is used to combine both visual and text feature vectors. The dataset was downloaded from Twitter and Weibo for validating the MCBP method. Study shows that the single MCBP method is better than the dual MCBP method. Different evaluation majors like accuracy, precision, recall, and F1 scores are used [4].

In the article, Deepak S, Bhadrachalam Chitturi worked on a combination of the word vector representations with deep learning models. It develops Long Short-Term Memory (LSTM) and Glove Feed Forward Network (FNN) for detection of fake broadcast. These models are combined with a live data mining component that extracts supplemental data from news articles titles and body text. Before the word embedding stage, numerous different characteristics such as , author details, domain names and so on are incorporated into the original article. For testing purpose, The Fake News Dataset by George McIntire has been used. According to classification results, a significant enhancement in accuracy, F1 score, precision, and recall with the blend of word2vec and LSTM representation [3].

Arvin Hansrajh et al., dedicated ensemble model is a combination of several machine learning algorithms including SVM, linear discriminant analysis, logistic and ridge regression, stochastic gradient descent. It is designed to leverage the strengths of each algorithm to improve overall predictive accuracy. For data analysis, the LIAR as well as ISOT datasets are used. Firstly, A dataset was pre-processed using NLP and extraction of features from news texts. This cleaned dataset is passed to the blending ensemble method to improve accuracy. Finally, A performance analysis go through precision, ROC, accuracy, AUC and recall on different model. The limitations of the blended machine learning ensemble model are often inconsistent, which leads to errors or anomalies in the predictions [13].

In the paper, Deep learning is used in combined with pre-trained word embedding's such as Word2Vec, fastText, and GloVe. It has trained on four different datasets. I. Kadek Sastrawan et al., uses deep learning algorithms like CNN, Bidirectional LSTM, and ResNet. In order to reduce data imbalance between classes, each data set goes through back-translation to enhance data quality. The paper used a fastText Word embedding model with the LSTM bidirectional classification model and returned results accuracy of 99.24%, recall of 99.26%, precision of 99.19%, and F1 score of 99.23%.The Bidirectional LSTM architecture performed better than the CNN and ResNet architectures. According to the results, data enhancement is effective in improving the consistency of model performance. LIAR dataset is used [14].

In the paper, Sakshini Hangloo, Bhavna Arora Researchers investigated content- and context-based approaches to detect fake news. This approach focuses on the textual and visual content of the article or post. A content-based approach to identifying fake news in its early stages. The social context-based approach takes into account publisher structure and publisher reputation. But social context-based approaches are unable to identify fake news in the early stages because they lack the propagation details [8].

Z Khanam et al., built a new model for fake news detection using Python. They use one of the most popular machine learning modules scikit learn. The module can provide different machine learning features such as tokenization, feature extraction, Count Vectorizer, Tiff Vectorizer, etc. XGBOOST algorithm shows the highest accuracy with more than 75%, whereas Support Vector Machine and Random Forest algorithms show around 73% accuracy [15].

In the article, using various sets of linguistic features, ensemble methods were used to categories news articles and reports contexts as either true or incorrect. Iftikhar Ahmad et al., a performance of different ensemble methods was evaluated using multiple datasets. For a model generation, linguistic features need some textual properties to be transformed into a numerical form. To maximize the accuracy of a dataset it needs to maintain an ideal balance between variance and bias, for that purpose various hyper parameters were used. On dataset1 (ISOT Fake News Dataset), ensemble learners achieve an average accuracy of 97.67% and 95.25% for individual learners. On dataset1, the Perez-LSVM and random forest algorithm achieved accuracy 99%, while multilayer perceptron, linear SVM, boosting and



bagging classifiers achieved 98% accuracy. But on dataset2, these algorithms and classifier did not perform well. In comparison with all algorithms, a Wang-Bi-LSTM and Wang-CNN executed worse performance [16].

The researchers suggested a novel fake news classification approach expending with combination of recurrent neural networks (RNNs) and convolutional neural networks (CNNs). For experimental purposes, Jamal Abdul Nasir et al., uses ISOT and FA-KES datasets. It has provided better detection results than non-hybrid baseline methods. These models perform well on the above dataset, but other dataset works poorly. Overall, using artificial neural networks to detect fake news is promising. In addition, CNNs and RNNs are more complicated neural network architectures that will be examined in future research [17].

Uma Sharma et al., A binary classification is performed on news articles using, natural language processing, artificial intelligence and machine learning models. With the use of grid search parameter optimization of the Logistic Regression model, the accuracy was increased from 65% to 75%. Using a specific news article or its headline for input, there is a 75% chance of correctly classifying it as real or fake [18].

The paper primarily focused on using deep learning frameworks such long short-term memory (LSTM) and neural network architecture for detecting fake news. Tavishee Chauhan, Hemant Palivela et al., have extracted features with help of the GloVe approach for word embedding's and tokenization. This architecture primarily designed for sequential prediction and data classification. The model achieved an accuracy of 99.88%. The ultimate goal was to use this model as a foundation to develop an automated system [19].

Shrutika S. Jadhav, Sudeep D. Thepade presents a detailed description of a DSSM and an enhanced Recurrent Neural Network (RNN) model for detecting fake news. The results showed that the DSSM-LSTM configuration outperformed other classifiers in terms of accuracy, as measured by performance criteria. With an accuracy of 99%, this model takes news events as input and uses Twitter reviews with classification algorithms to predict whether the given news is honest or fake. The aim was to increase the current work to incorporate added another social media in our system.[23]

In this study, M. Sudhakar, K.P. Kaliyamurthie M. Sudhakar and K.P. Kaliyamurthie conducted a study on detecting fake political news articles using a machine learning model. They used a dataset of political news articles and applied logistic regression and Naive Bayes algorithms to classify the articles as fake or genuine. Their results showed that logistic regression algorithms were more accurate than Naive Bayes algorithms, with a significance rate of 0.013 confirming the validity of their hypothesis [24].

The researchers developed a novel fake news identification model that considers both the echo chambers and the content of news articles in social networks. They created an efficient deep learning algorithm that uses tensor factorization, with multiple filters across each dropout layer and a dense layer. Next, they implemented a deep neural network (DNN) with optimal hyper parameters to classify the news and social content separately. The model was tested on BuzzFeed and PolitiFact datasets, and its efficacy was found to be superior to traditional models for detecting fake news. [25]

Alina Vereshchaka et al. addressed the issue of identifying fake news by extracting sociocultural and textual features to identify and classify fake news. In addition, data analytics was investigated in order to create a phase and word frequency harmonization. They created binary classifiers to extract features using deep learning techniques such as GRU, RNN, and LSTM on the dataset FakeNewsNet3. At last, it saw one of the qualities of disinformation is its philosophical perspective[26].

III. Conclusion

Fake information is one of the important challenges in this information age. Lots of work has already been done in this field. The present study has thoroughly reviewed some of the prominent works in fake information detection. It included details on several deep and machine learning methodologies



with details of simulation environments, datasets, techniques, and their characteristics and difficulties. The study has provided performance measures for evaluating the performance of the fake news detection algorithm, as well as identifying potential challenges and future research directions for developing novel algorithms for detecting fake news. According to the present study, the fastText Word embedding model in combination with the LSTM bidirectional classification model achieved the highest accuracy, with an accuracy score of 99.24%, precision of 99.19%, recall of 99.26%, and an F1-score of 99.23%. This study should strongly encourage academics to focus on trimming fake news detection models that use novel approaches. The development of effective fake news identification models using innovative approaches can help scholars and the general public to more accurately spot fake news and gain a better understanding of current issues, potential solutions, and future prospects.

References

- [1] <https://www.theglobalstatistics.com/india-social-media-statistics/>, accessed on 4/8/2022.
- [2] <https://datareportal.com/reports/digital-2022-global-overview-report>
- [3] Deepak S, Bhadrachalam Chitturi, “Deep neural approach to Fake-News identification”, International Conference on Computational Intelligence and Data Science (ICCIDS 2019), 2020, Elsevier B.V, Procedia Computer Science, 167pp, 2236–2243
- [4] Ning Xiang, “Deep Learning-Based Fake Information Detection and Influence Evaluation”, 2022, Article ID 8514430, Hindawi Computational Intelligence and Neuroscience, pp 8
- [5] Arvin Hansrajh, Timothy T. Adeliyi, and Jeanette Wing, “Detection of Online Fake News Using Blending Ensemble Learning”, 2021, Article ID 3434458, Hindawi Scientific Programming, pp 10
- [6] <https://www.webwise.ie/teachers/what-is-fake-news/>, accessed on 4/8/2022
- [7] <https://monkeylearn.com/text-mining/>, accessed on 4/8/2022
- [8] Sakshini Hangloo, Bhavna Arora, “FAKE NEWS DETECTION TOOLS AND METHODS – A REVIEW”, April – June 2021, International Journal of Advance and Innovative Research, Volume 8, Issue 2 (IX), ISSN 2394 – 7780
- [9] Xichen Zhang, Ali A. Ghorbani, “An overview of online fake news: Characterization, detection, and discussion”, 8 March 2019, Information Processing and Management, Elsevier
- [10] Nida Aslam, Irfan Ullah Khan, Farah Salem Alotaibi, Lama Abdulaziz Aldaej, and Asma Khaled Aldubaikil, “Fake Detect: A Deep Learning Ensemble Model for Fake News Detection”, 2021
- [11] Vasu Agarwal, H.Parveen Sultana, Srijan Malhotra, Amitrajit Sarkar, “Analysis of Classifiers for Fake News Detection”, 2019, INTERNATIONAL CONFERENCE ON RECENT TRENDS IN ADVANCED COMPUTING 2019, Procedia Computer Science, 165, 377–383, Elsevier Ltd
- [12] Ajeet Ram Pathak, Aditee Mahajan, Keshav Singh, Aishwarya Patil, Anusha Nair, “Analysis of Techniques for Rumor Detection in Social Media”, International Conference on Computational Intelligence and Data Science, 2019, Procedia Computer Science 1877-0509, Elsevier B.V
- [13] Arvin Hansrajh, Timothy T. Adeliyi, and Jeanette Wing, “Detection of Online Fake News Using Blending Ensemble Learning”, 2021, Article ID 3434458, Hindawi Scientific Programming, pp 10
- [14] I. Kadek Sastrawan, I.P.A. Bayupati, Dewa Made Sri Arsa, “Detection of fake news using deep learning CNN–RNN based methods”, Oct 2021, Korean Institute of Communications and Information Sciences, Elsevier B.V.
- [15] Z Khanam, B N Alwasel, H Sirafi, M Rashid, “Fake News Detection Using Machine Learning Approaches”, 2021, IOP Conf. Series: Materials Science and Engineering, 1099 (2021) 012040, IOP Publishing
- [16] Iftikhar Ahmad, Muhammad Yousaf, Suhail Yousaf, Muhammad Ovais Ahmad “Fake News Detection Using Machine Learning Ensemble Methods”, 17 October 2020, Hindawi Complexity Volume 2020, Article ID 8885861, 11 pages



- [17] Jamal Abdul Nasir, Osama Subhani Khan, Iraklis Varlamis, “Fake news detection: A hybrid CNN-RNN based deep learning approach”, 29 December 2020, 2667-0968, International Journal of Information Management Data Insights 1 (2021), Elsevier Ltd.
- [18] Uma Sharma, Sidarth Saran, Shankar M. Patil, “Fake News Detection Using Machine Learning Algorithms”, International Journal of Creative Research Thoughts (IJCRT), 6 June 2020, Volume 8, ISSN: 2320-2882, 1394-1402 pp.
- [19] Tavishee Chauhan, Hemant Palivela, “Optimization and improvement of fake news detection using deep learning approaches for societal benefit”, 2021, International Journal of Information Management Data Insights 1 100051, Elsevier Ltd
- [20] <https://serokell.io/blog/data-preprocessing>, accessed on 23 Aug 2022
- [21] Dipak R. Kawade, Kavita S. Oza, “News Classification: A Data Mining Approach”, Indian Journal of Science and Technology, Vol 9(46), ISSN (Online): 0974-5645, December 2016
- [22] <https://www.altexsoft.com/blog/machine-learning-metrics/>, accessed on 23 Aug 2022
- [23] Shrutika S. Jadhav & Sudeep D. Thepade, “Fake News Identification and Classification Using DSSM and Improved Recurrent Neural Network Classifier”, Applied Artificial Intelligence, 33:12, 1058-1068, ISSN: 0883-9514 (Print) 1087-6545 (Online), 03 Sep 2019.