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Fact-checking with NLP: Automated detection of fake news and misinformation

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ABSTRACT

Political stability, public health, economic growth, and social harmony are seriously threatened by the explosive spread of fake news in digital culture. Relatively slow, resource-intensive, traditional fact-checking techniques based on human verification find it difficult to keep up with the enormous flood of internet content. Natural language processing (NLP) automated detection presents a methodical, scalable, and effective way to find false information. The difficulties of fake news spread, the limits of hand verification, and the part natural language processing can play in reducing false information are investigated in this work. Text categorization, linguistic analysis, fact-checking methods using machine learning (ML), and artificial intelligence (AI) are among the several computer methods covered here. Incorporating datasets, hybrid models, and explainable artificial intelligence frameworks, the paper also covers multidisciplinary theories and recent developments in automated false news identification. Recent developments in multimodal detection techniques, including textual, visual, and contextual signals, have improved the accuracy of false news categorization. Still, major issues are algorithmic biases, dataset dependability, and real-time misinformation spreading. This article also assesses online verification systems and fact-checking tools, therefore stressing their approaches and efficiency. This work emphasizes the need to create strong, scalable, and open fact-checking tools by combining multidisciplinary ideas with cutting-edge artificial intelligence methods.

Keywords: Fake News Detection, Fact-Checking Automation, Misinformation Analysis, Machine Learning (ML), Natural Language Processing (NLP)

I. INTRODUCTION

The increasing prevalence of fake news in modern digital society has become one of the most significant challenges, posing serious threats to social harmony, economic development, health, and political stability [1]. Fake news is often defined as information that is intentionally and deceptively presented as legitimate news, which includes swaying elections, tricking public opinion, splitting societies, and inciting violence. In the era of social media, the impact of fake news is pronounced, as news can easily be spread through platforms such as WhatsApp, Facebook, and Twitter, often without any checks or measures to verify the validity of the stories being shared [2]. The detection of fake news automatically involves investigating the validity of statements made

in news articles. This is an emerging and crucial problem in Natural Language Processing (NLP) that is gaining interest because of the huge impact traditional media and social platforms have on the state of society and politics. Exposure to false information can lead to the creation of public disillusionment, mistrust, or even alienation from political leaders. In some extreme cases, misinformation has been connected with real-world events that endangered public safety, such as PizzaGate. NLP for fake news detection is fundamental not just for validating the credibility of claims but also for other purposes around citizen education and media literacy.

Traditionally, news content verification was an essential duty of professional factcheckers, such as journalists, who scrutinised claims against established facts and trustworthy sources. The manual vetting process is very slow and resource intensive[3]. For instance, platforms like PolitiFact need a set of editors to check the veracity of a single news article. With the growth of online communities and the rapid spread of digital content, there is thus a growing need for the development of automated means for the detection of fake news. Over the last few years, advances in artificial intelligence (AI) have opened new avenues for research into automating this process, borrowing from ML, DM, and NLP. Objectives of automated fake news detection include shortening the time and resources spent on such human verification while containing the spread of disinformation. researchers are seeking AI-driven solution to improve the accuracy and efficiency of false information detection, consequently resulting in a more enlightened and aware society.

1. Fake News Detection

The ability to tell apart true information from falsehoods is essential for preventing the widespread spread of misinformation. The line between what is real and what is fabricated has become harder to see, especially with the intricate nature of fake news, and not everything can be easily recognized. It's estimated that over 80% of high school students struggle to differentiate between real news and misinformation. Additionally, the fast pace at which information spreads on digital platforms makes it even more challenging, leaving little time for thorough manual verification.

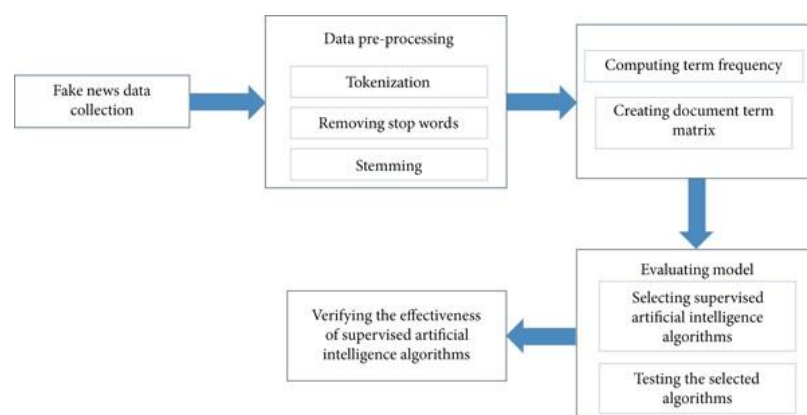


Figure 1: Fake News Detection Process

This important incidence of modern life requires the NLP tool to be developed to detect misinformation[4]. Various methods can be employed to test the credibility of news contents: most notably, Natural Language Processing, which is a branch of artificial intelligence that focuses on allowing machines to analyze, alter, and understand human language. The practitioners can deploy NLP techniques to systematically analyze the texts to discern instances of misinformation, biases, and other linguistic anomalies in the news stories. Such indicators



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that lie below human perception may well be traced with the help of such NLP methodology. Moreover, due to its contextual understanding, NLP can also adjudge the coherence of the content with facts. Textual content analysis, source credibility assessment, and fact-checking are various techniques employed by NLP technology to verify information.

1.1 Limitations of Manual Fact-Checking

In the past, misinformation was addressed predominantly through methods human fact-checkers would use to assess the veracity of a claim before they would label it true or false. While offering in-depth analysis, this approach suffers from a few very serious drawbacks:

Long Time to Verify: It could take hours, maybe days, to verify one claim, and during this period, false narratives may have spread far and wide and influenced public opinion.

Problems of Scale: With all the digital content generated every day, that the constant stream of information on social media and news sites is impossible to be kept up with by purely manual means of fact-checking [5].

Human Biases and Subjectivity: Even able fact-checkers may subconsciously be influenced in their decision-making by bias, which tends to affect the verification processes' reliability and objectivity. **Resource-Intensive:** Because fact-checking usually absorbs immense human and monetary resources, it would be almost impossible for any organization to sustain massive verification undertakings-for instance, a news cycle with too many events occurs at once.

Lagged Effect: Usually falsified info is corrected after it is channelized to a greater audience, which aggravates damage control attempts and renders corrective measures ineffective.

Given these challenges, there has, therefore, arisen pressure to develop automated procedures to detect and deal with misinformation in real-time. AI-driven systems for fact-checking claim to be scalable, efficient, and free from human interference in analyzing massive amounts of digital content. Using machine learning, natural language processing (NLP), and data-mining techniques, these automated systems quickly identify patterns, validate claims against credible sources, and raise alerts about possibly false information within seconds. A fast response is so vital to hindering the spread of misinformation and ensuring that accurate news prevails within the digital arena.

II. LITERATURE SURVEY

The linguistic methodology tries to discover what can be derived from texts as style and content to discriminate real from fake news stories. It sets before itself the idea that punctuation, word choice, and part-of-speech tags, as well as emotional tone of text, are mostly automatic and hence not under should the author's control. Thus, they reveal its innermost nature. Use of languages to differentiate humor from real news has shown promise [7]. The writers used a collection of satire news (from The Onion and The Beaverton) and real news (from The Toronto Star and The New York Times) in four areas: business, science, politics, and "soft news." They studied differences between linguistic features to separate real and fake news. The best results came from classifiers constructed with language, punctuation, and, absurdity classes.

While, fact-checking methods work by computers which check whether or not statements in news stories are true such as "According to LA times, Barack Obama took office on Tuesday" [8]. Structured queries on the Web



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have been made possible by knowledge systems like DBpedia 2. These questions can then be used to see if other sources also have information that backs up the news story (for example, that Barack Obama took office on a Tuesday). Other studies have looked at social network activity (like tweets) about a news story to judge how credible it is. For example, and found tweets that were skeptical about the truth of a claim made in a news story. Fact-checking methods are getting better, but they depend on outside sites like FakeCheck.org and Snopes.com to be able to confirm the information. This isn't always easy to do, though, because external sources aren't always available, especially for news stories that were just released. Because of this, fact-checking is mostly useful for finding lies in texts where there is external, proven information available.

Other research that is related to this paper looks at ways to automatically spot fake content in places like forums, consumer review sites, online ads, online dating, and crowdfunding platforms [9]. Finding fake news is a lot like finding lies, which means figuring out if someone is telling the truth or not. But there are some big differences between the two[10]. First, people who spread fake news usually want to get political or financial benefit as well as promote themselves. On the other hand, people who lie do it for more social reasons, like self-defense, avoiding conflict or harm, managing their impressions, or hiding their identity. Second, they are very different in who they are trying to reach and how they spread. For example, fake news is usually spread on a bigger scale through the Internet and social media, while deception is more focused on one person at a time.

III. RESEARCH METHODOLOGY

The literature review sought to gather systemically, identify and analyze relevant research studies on Fake News Detection (FND) in the most clear and organized way. Following this methodology described in , the studies were inclusively and exclusively structured to help understand the problems and progress in automated FND. To get an internal and thorough review of literature, a keyword-based search strategy was used, such as "Fake News Detection", "Interdisciplinary Theories on Fake News and Users", "Fake News Detection within Machine Learning," and "Fake News Detection Datasets." These keywords helped consult over a broad scope of research that discusses different aspects of FND, be it methodological, interdisciplinary perspective, or dataset creation. Research articles from prominent academic databases like IEEE Xplore, Elsevier, Springer, and other highly reputed publishers were used. Out of 45 articles found during the first search, most of them were early access or from conference proceedings and journals. A rigorous screening was done through abstracts, titles, and keywords, and the exclusion of editorials and irrelevant studies was performed. After this screening, 20 studies were found to be relevant and included in our analysis. These selected studies offered insights into various methodologies, emerging trends, and significant challenges related to automated FND. The distribution of these studies across different publication types. The final dataset formed the basis for assessing the effectiveness of existing approaches and pinpointing potential research gaps in the field of Fake News Detection.

Precise Flowchart for Fake News Detection Literature Review

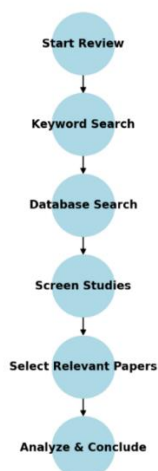


Figure2: Methodology of Review Analysis

Based on three most crucial elements, the investigation will determine FND and mitigating strategies. One can summarize the main efforts of the literature in the following manner. We review concepts from several domains about FN and OSN users. Examining several multidisciplinary perspectives on FN and OSN users helps one to understand why the FND initiatives are working and may be justified. It displays a review of the datasets, approaches of research, and technical models applied in FND research nowadays. Using multimodal technology in innovative ways addresses and rates the advancement of scientific research in communication, language, and other FND-related fields .

3. Interdisciplinary Theories

FN is aimed at the weak spots and social links of its users. Different things affect whether people intentionally or unintentionally spread FN. Researchers look at the small differences in their plans based on their social identity and what they know about certain news stories [11]. So, it's clear that more study needs to be done on the things that make them share FN and how their behavior changes . FND studies are interesting, and they can use current cross-disciplinary behavioral studies from the social sciences (like psychology, forensic psychology, and philosophy) and economics that help us understand how people act and what they tend to do. The suggested studies [12] show that datasets are analyzed (both qualitatively and quantitatively), and SOTA models are made by looking at how users think and act. This part of FND analysis hasn't been looked into much so far. The review of the literature for these multidisciplinary studies shows that these theories are important to FND and how it is analyzed. These ideas offer a proactive method (early FND) by finding and studying the behavior of the virus's spreader.

Table 1: Interdisciplinary Theories

Theories	Explanation
Impact of Fake News	Fake news influences multiple sectors, including politics, economics, and society. Different countermeasures are needed for each domain.
Undeutsch Hypothesis	Statements derived from real experiences differ in content and structure from those



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Theories	Explanation
	based purely on speculation.
Rhetoric and Persuasion	Communication styles can either reinforce or polarize public opinion, affecting emotional responses.
Reality Monitoring	Genuine events tend to include more sensory and perceptual details compared to fabricated ones.
Erfurth's Theory of Deception	Strategic misinformation can create uncertainty and disrupt adversaries' decision-making.
Strategic Deception	Misleading narratives are crafted to align with existing beliefs and influence audiences.
Four-Factor Framework	Fake news often exhibits bias, steering public opinion towards specific agendas.
Wittgenstein's Perspective	Sensory observations provide contextual understanding of current realities.
Information Distortion Theory	Deceptive content frequently embeds a mix of truth and bias to manipulate perceptions.
Credibility of Sources	Persuasion is fundamental in political discourse and media communication.

3.1 Online Fact-Checking Websites

Users can access several outside third-party FND services for fact-checking needs. A single category outcome cannot analyze and approve several news facts since the complexity of news items in terms of facts and numbers [13]. To find the accuracy of news, the fact-checking services apply several evaluations and graphical indications. Following proper care, fact-checking services mark news articles based on their veracity values, therefore enabling readers to separate real from false news.

Table 2: Online Fact-Checking Websites

Tool Name	Platform	Methodology Used	Data Processed	Analysis Outcome	Reference Sources
Fake News Analyzer	Browser Extension	AI-driven learning, user feedback	News reports	Detects misleading headlines, bias, and misinformation	Multiple verification tools
SafeSurf	Browser Extension	Text & image matching, content evaluation	Online material	Categorizes as Safe, Warning, or Unsafe	Fact-verification agencies
News Trust	Browser	MetaCert-based	Web-based	Classifies content as	Verified media



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Tool Name	Platform	Methodology Used	Data Processed	Analysis Outcome	Reference Sources
Checker	Extension	content validation	news articles	Trustworthy, Biased, or Satirical	sources
FiB Scanner	Browser Extension	Data extraction, image-text analysis	Facebook posts	Generates reliability scores	Image matching, keyword search
BS-Detection Tool	Browser Extension	URL validation & credibility assessment	Web links	Identifies conspiracy content, clickbait, and false news	Unverified domain listings
Fake News Shield	Browser Extension	AI-powered fact-checking, network analysis	URLs, webpages	Verifies if content is authentic or deceptive	Fact-checking platforms
BotCheck	Website & API	Behavioral classification algorithm	Twitter user accounts	Estimates likelihood of bot activity	User interaction patterns
TrustyTweet Monitor	Browser Extension	Media literacy-based verification	Twitter posts	Provides transparency indicators for tweets	Existing credibility research
Decodex Evaluator	Browser Extension	Content fragmentation & validation	Online snippets	Labels data as Informative, Unavailable, or Parody	Public information sources
LiT.RL Verifier	Web Browser	NLP & Support Vector Machine (SVM)	Text-based data	Detects fabricated news, satire, and clickbait	Lexical & syntactic analysis
TweetCred Analyzer	Browser Extension	Semi-supervised credibility assessment	Twitter feeds	Assigns credibility scores to tweets	Twitter database

3.2 Challenges and Approaches in Fact-Checking and Fake News Detection

Tools and websites for fact-checking have natural limits. Their limited coverage of verified fake news (FN), domains, geographic areas, and languages is one of the key negatives. Verifying incorrect or manipulated multimedia content requires a lot of investigation and knowledge, which makes the procedure time-consuming and sometimes results delayed. Furthermore, differences in fact-checking techniques produce contradictions since different platforms may come to different decisions on the same news item. Instead, than clearing false information, this conflict among fact-checking organizations might perplex consumers[14]. Online users have to improve their media literacy abilities if they are to clearly separate credible from fake news. Researchers and professionals are also actively creating automated, flexible, methodical algorithms for fake news detection

(FND). Three interesting methods—news content-based, social context-based, and creator-based analyses—are highlighted in a thorough evaluation of present approaches.

3.3 Social Context-Based Interpretation

Examining the cultural and contextual backdrop of fake news is a reasonable method of spotting it. This includes determining the publication date of the news, its linked sources, and the validity of the platforms distributing it. Studies on the structure of hyperlink connections between news-related websites have been conducted in quest of a main clue to identify false material.

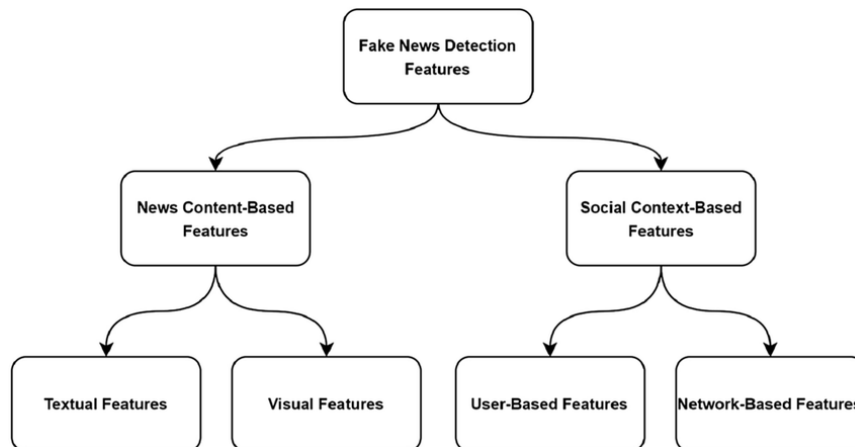


Figure 3: Fact-Checking and Fake News Detection

3.4 News Content-Based Analysis

Particularly for those with sensationalized titles (clickbait), readers often difficult to separate real from fake news as FN is so widely shared online. Social theory-based techniques can enable people to spot false information. Readers should not rely just on striking headlines since FN sometimes uses false claims to draw guests. To confirm its validity, one must carefully go over the complete material. Fake news stories often feature citations, expert comments, and research data among other kinds of supporting proof. Still, a close study of these components will help ascertain their genuineness [15]. Furthermore, FN is meant to take advantage of public worries by covering delicate subjects such as health crises, natural catastrophes, and other concerning events. Online social network content often seems too dramatic, funny, or disturbing to be true. Users have to be skeptical and evaluate whether the given material fits reality[16].

Using these analytical techniques helps researchers and professionals create more successful false news detection systems, thereby improving the dependability of internet information sources.

IV. RESULTS AND DISCUSSION

There are various aspects in which this review is rather relevant. By means of the evaluation of multidisciplinary theories, datasets, false news detection technologies, websites and methods, future research paths have a potential to provide an automated system for FND in many situations[17]. First, the investigation of multidisciplinary concepts on false news (FN) indicates how well designed FN traits are meant to start the readers and target their associations. This motivates and convinces people to deliberately publish unverified FN on the OSNs. Moreover, these concepts highlight various FN features—writing style, sources, quality,



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comments, etc.—that would let readers to grasp its accuracy. Similarly, theories of OSN users focused on users' actions and intents disclose the cause behind both intentional and unintentional FN dissemination on OSNs. The in-depth analysis of these theories shows that the targeted FN or trending articles produce the group polarization and psychological stress to unintentionally propagate FN on OSNs[18]. These concepts so provide knowledge of fundamental factors that should be considered while designing automated systems for FND.

V. CONCLUSION & FUTURE DIRECTION

This work is to investigate extant fake news detecting technologies [19] and provide a summary of the present research situation of fake news detection approaches. We assembled almost all frequently used datasets, classified them from single-mode to multi-mode, and generated the study methods for false news detection. Among these are knowledge-based detection approaches, social network-based detection techniques, and content-based detection strategies. We have also set multimodal false news detection techniques [20] considering the ubiquity of multimodal technology. Additionally covered in this study is the emergence of false news in several spheres

REFERENCES

Journal Papers:

- [1] S. Vosoughi, D. Roy, and S. Aral, The spread of true and false news online, *Science*, 359(6380), 2018, 1146–1151.
- [2] O.D. Apuke and B. Omar, Fake news and COVID-19: Modelling the predictors of fake news sharing among social media users, *Telemat. Inform.*, 56, 2021, 101475.
- [3] S. Van Der Linden, J. Roozenbeek, and J. Compton, Inoculating against fake news about COVID-19, *Front. Psychol.*, 2020, 2020, 2928.
- [4] Y.M. Rocha, G.A. de Moura, G.A. Desidério, C.H. de Oliveira, F.D. Lourenço, and L.D. de FigueiredoNicolete, The impact of fake news on social media and its influence on health during the COVID-19 pandemic: A systematic review, *J. Public Health*, 31, 2021, 1007–1016.
- [5] A. Moscadelli, G. Albora, M.A. Biamonte, D. Giorgetti, M. Innocenzio, S. Paoli, C. Lorini, P. Bonanni, and G. Bonaccorsi, Fake news and Covid-19 in Italy: Results of a quantitative observational study, *Int. J. Environ. Res. Public Health*, 17, 2020, 5850.
- [6] X. Zhou and R. Zafarani, A survey of fake news: Fundamental theories, detection methods, and opportunities, *ACM Comput. Surv. (CSUR)*, 53, 2020, 1–40.
- [7] X. Zhang and A.A. Ghorbani, An overview of online fake news: Characterization, detection, and discussion, *Inf. Process. Manag.*, 57, 2020, 102025.
- [8] L. Hu, S. Wei, Z. Zhao, and B. Wu, Deep learning for fake news detection: A comprehensive survey, *AI Open*, 3, 2022, 133–155.
- [9] A.B. Athira, S.M. Kumar, and A.M. Chacko, A systematic survey on explainable AI applied to fake news detection, *Eng. Appl. Artif. Intell.*, 122, 2023, 106087.



ISBN: 978-93-48954-45-9

11th National Conference on Emerging Trends in Engineering and Technology

Bharati Vidyapeeth's College of Engineering, Kolhapur
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- [10] A. Hotho, A. Nürnberger, and G. Paaß, A brief survey of text mining, *J. Lang. Technol. Comput. Linguist.*, 20, 2005, 19–62.
- [11] Y. LeCun, Y. Bengio, and G. Hinton, Deep learning, *Nature*, 521, 2015, 436–444.
- [12] A. Voulodimos, N. Doulamis, A. Doulamis, and E. Protopapadakis, Deep learning for computer vision: A brief review, *Comput. Intell. Neurosci.*, 2018, 2018, 7068349.
- [13] Y. LeCun, B. Boser, J.S. Denker, D. Henderson, R.E. Howard, W. Hubbard, and L.D. Jackel, Backpropagation applied to handwritten zip code recognition, *Neural Comput.*, 1, 1989, 541–551.
- [14] J.L. Elman, Finding structure in time, *Cogn. Sci.*, 14, 1990, 179–211.

Books:

- [15] Z.-H. Zhou, *Machine learning* (Cham, Switzerland: Springer Nature, 2021).

Book Chapters:

- [16] K. Chowdhary and K.R. Chowdhary, Natural language processing, in *Fundamentals of Artificial Intelligence* (New Delhi, India: Springer, 2020), 603–649.

Proceedings Papers:

- [17] A. Vaswani, N. Shazeer, N. Parmar, J. Uszkoreit, L. Jones, A.N. Gomez, Ł. Kaiser, and I. Polosukhin, Attention is all you need, *Proc. Advances in Neural Information Processing Systems 30 (NIPS 2017)*, Long Beach, CA, USA, 4–9 December 2017, 30.

Online Resources / Preprints / Blogs:

- [18] J. Devlin, M.-W. Chang, K. Lee, and K. Toutanova, *BERT: Pre-training of deep bidirectional transformers for language understanding*, arXiv, 2018, arXiv:1810.04805.
- [19] A. Radford, K. Narasimhan, T. Salimans, and I. Sutskever, *Improving language understanding by generative pre-training*, OpenAI Blog, 2018.
- [20] A. Radford, J. Wu, R. Child, D. Luan, D. Amodei, and I. Sutskever, *Language models are unsupervised multitask learners*, OpenAI Blog, 1, 2019, 9.