REVIEW ARTICLE

A Machine Learning-Based Scientometric Evaluation for Fake News Detection

Hafiz Muhammad Zeeshan[1,2], Inam Ullah[3,*], Furkan Yousaf[4], Amin Sharafian[5], Md Belal Bin Heyat[6], Shazia Saqib[7] and Atta Ur Rahman[8]

[1] Department of Computer Science, National College of Business Administration & Economics, Lahore, Pakistan
[2] Department of Computer Science, Superior University, Lahore, Pakistan
[3] Department of Computer Engineering, Gachon University, Seongnam 13120, Republic of Korea
[4] School of Information Management, College of Computing, Informatics and Mathematics, Universiti Teknologi MARA (UiTM), Malaysia
[5] College of Mechatronics and Control Engineering, Shenzhen University, Shenzhen 518060, China
[6] Shenzhen University, Shenzhen 518060, China
[7] Faculty of Information Technology, University of Central Punjab, Pakistan
[8] Interdisciplinary Research Centers for Finance and Digital Economy, King Fahd University of Petroleum & Minerals (KFUPM), Dhahran, Saudi Arabia

Abstract

In the modern world, disseminating false information is a problem that must be addressed, and algorithms based on machine learning are used to spot and stop the spread of incorrect information. Due to the current unregulated development of false news fabrication and dissemination, democracy is continuously under threat. Fake news may mislead individuals while influencing them because of its persuasiveness and life sciences. Using data from the Web of Science, this study undertakes a bibliometric analysis of research on the application of machine learning for fake news identification. The research underscores the need for a streamlined approach to analyze data exclusively from the Web of Science database. The suggested technique performs a thorough bibliometric study using Excel and the R tool Bibliometric. The study looks at variables in the field of machine learning for fake news detection, including publication volume, citations, collaborative research, and major research fields. According to the survey, Ashraf I is the most productive author in this discipline, which also names King Saud University as the most productive institution. IEEE Access is the most significant source of academic contributions.

Keywords: machine learning, fake news detection, bibliometric analysis, information ecosystem.

Academic Editor:
Bernard De Baets

Submitted: 08 October 2024
Accepted: 11 December 2024
Published: 04 January 2025

Vol. 2, **No.** 1, 2025.
10.62762/TIS.2024.564569

***Corresponding author:**
✉ Inam Ullah
inam@gachon.ac.kr

1 Introduction

In the modern digital landscape, fake news—deliberately disseminated false information presented as news, aimed at deceiving readers and spreading falsehoods—has emerged as a critical global

Citation
Zeeshan, H. M., Ullah, I., Yousaf, F., Sharafian, A., Heyat, M. B. B., Saqib, S., & Rahman, A. U. (2025). A Machine Learning-Based Scientometric Evaluation for Fake News Detection. *ICCK Transactions on Intelligent Systematics*, 2(1), 38–48.

issue. Its prevalence in political campaigns, social media, and other online platforms has far-reaching consequences, including swaying public opinion, inciting social unrest, and even leading to violence [1]. Fake news poses threats to democracy, free expression, and societal harmony, particularly when paired with modern technologies like deepfakes. Deepfakes use artificial intelligence to create convincingly false video content, adding a new dimension to the fake news problem. For instance, during the 2016 U.S. presidential election, fake news stories were widely shared, potentially influencing voters' perceptions and decisions [2]. Similarly, the COVID-19 pandemic saw a proliferation of misinformation about the virus, treatments, and vaccines, leading to public confusion and hindering efforts to manage the health crisis effectively [3–6].

The rapid spread of misinformation—false or inaccurate information that is spread unintentionally or unknowingly—is exacerbated by information pollution. Information pollution, also known as "infolution," is the excessive amount of irrelevant, misleading, or false information that makes it difficult for individuals to discern accurate and reliable information. This phenomenon has significant implications for politics and public health, where misinformation can lead to confusion, harm, or misguided actions. Examples include the spread of misinformation during elections or the COVID-19 pandemic, both of which underline the urgency of addressing this issue [1, 7, 8].

Machine learning techniques have emerged as promising tools for mitigating the spread of fake news by identifying and classifying misleading information. These techniques offer the potential not only to detect but also to prevent the amplification of false content, thereby protecting individuals and institutions from its detrimental effects. By leveraging bibliometric analysis, this study evaluates the scientific contributions and trends in the application of machine learning for fake news detection, offering insights into the current state of research and future directions [1, 9–11].

The Role of Machine Learning and Information Pollution

Machine learning algorithms are pivotal in identifying and mitigating fake news. These algorithms are designed to recognize patterns in data, which can then be used to identify content that may be false or misleading. For example, machine learning models can analyze the linguistic features of a news article, compare it with known facts, and flag discrepancies. This process not only helps in detecting fake news but also prevents its spread by limiting the exposure of false information on various platforms. Information pollution, the mixing of accurate information with false or irrelevant content, poses a significant challenge in the digital age. This pervasive issue is exacerbated by the widespread use of social media and online platforms, where it is easy to share information rapidly [7]. As a result, distinguishing between reliable and unreliable information becomes increasingly difficult, leading to potential harm, especially in critical fields like politics and public health.

Deepfakes and the Evolution of Fake News

The advent of deepfakes has added a new dimension to the fake news problem. Deepfakes use artificial intelligence to create highly convincing fake videos, which can be used to spread 0 and manipulate public opinion. For example, deepfake technology can be used to create videos of public figures saying things they never actually said, leading to confusion and potentially harmful consequences [7, 12, 13].

Bibliometric Analysis in Research

Bibliometrics, the quantitative analysis of scientific literature, is a valuable tool for evaluating the impact and trends in research. By analyzing published material, bibliometric studies can identify key research areas, track the evolution of scientific fields, and highlight potential future directions. In this study, bibliometric analysis is applied to the field of fake news detection using machine learning, providing insights into the current state of research and identifying opportunities for further exploration [3, 14, 15].

The key objectives of this study are to:

Quantify research trends: To evaluate the volume of research on machine learning approaches for fake news detection, analyze how it has evolved over time, and measure its impact using indicators like the annual growth rate of publications, average citations per article, and key thematic shifts.

Assess global contributions: To analyze the geographical distribution of research outputs, identifying regions, institutions, and stakeholders with significant contributions to the field. Metrics such as publication volume, international collaboration rates, and regional citation impact will be utilized.

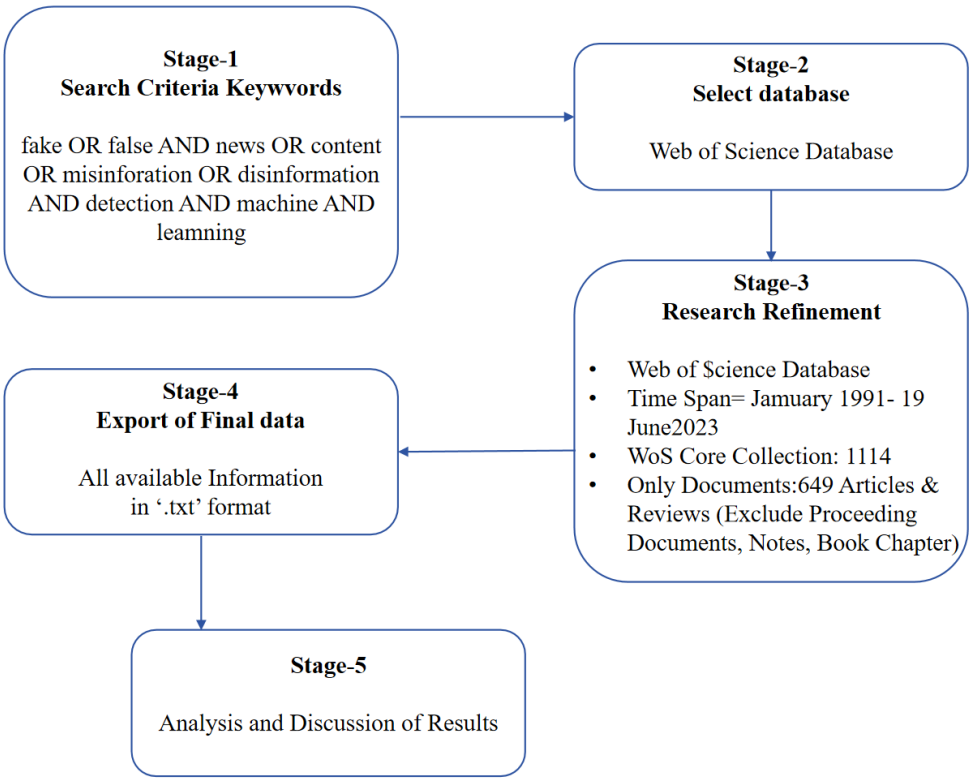

Figure 1. Methodological phases of bibliometric analysis.

Map collaboration networks: To explore collaboration patterns among researchers, institutions, and countries, using metrics such as co-authorship networks and the strength of international partnerships to highlight influential contributors and potential areas for collaboration.

Identify leading contributors: To determine the most active institutions, authors, and journals publishing on machine learning approaches to fake news detection. This will include an analysis of metrics such as h-index, g-index, and m-index to evaluate their impact.

Explore thematic insights: To analyze the most common keywords and research themes associated with fake news detection. Clustering and co-occurrence analysis will identify emerging topics and underexplored areas within the field.

Contextualize practical implications: To discuss the implications of machine learning research for addressing real-world issues, such as misinformation during elections, public health crises, and media manipulation. Provide actionable recommendations for leveraging research findings in policymaking and technology development.

2 Materials and Methods

2.1 Bibliometric Mapping Analysis

Bibliometric mapping analysis is a quantitative method used to characterize publication trends in various academic fields. It provides researchers with valuable insights and helps them determine the scope of their inquiry [16, 17]. Figure 1 shows the methodological phases of the bibliometric analysis.

2.2 Database and Search Approach

The Web of Science (WoS) database was used to extract research articles related to machine-learning approaches for fake news detection. The search was conducted on June 19, 2023, using specific criteria. The following search string was employed: fake OR false AND news OR content OR misinformation OR disinformation AND detection AND machine AND learning. The search was refined to include articles published between 1991 and June 19, 2023.

2.3 Inclusion and Exclusion Criteria

A total of 1114 articles were initially retrieved. The inclusion criteria for the final analysis were articles and reviews published in peer-reviewed journals, articles that explicitly mentioned the use of machine learning techniques for fake news detection, and articles available in English. Conversely, the exclusion

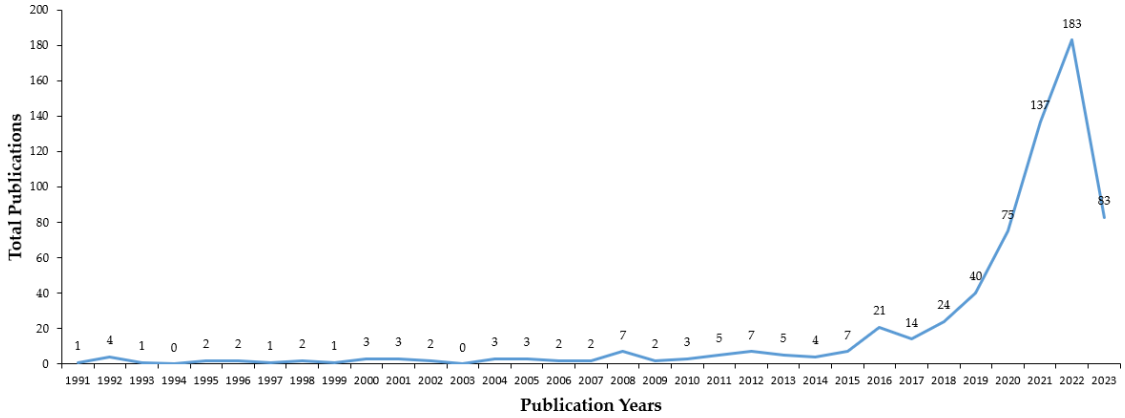

Figure 2. Annual growth of fake video detection articles by using machine learning.

criteria eliminated conference proceedings, notes, book chapters, and other non-peer-reviewed documents, as well as articles that did not focus on machine learning approaches for fake news detection. After applying these criteria, 649 papers were included in the final bibliometric analysis [13, 18, 19].

2.4 Data Retrieval and Analysis

The final dataset was exported in '.txt' format, including all available bibliometric information. During data retrieval and analysis, several steps were undertaken. First, duplicate records were removed, and the remaining data were verified for accuracy. Descriptive analysis was then conducted to calculate key metrics such as the annual growth rate of publications, average citations per article, and thematic shifts. Geographical analysis was performed to identify the distribution of research outputs across different regions and institutions, while collaboration network analysis was used to map co-authorship networks and explore collaboration patterns among researchers, institutions, and countries. The impact of leading contributors (authors, institutions, and journals) was evaluated using metrics such as h-index, g-index, and m-index. Finally, thematic analysis was conducted to identify common keywords and research themes through clustering and co-occurrence analysis.

The results of the bibliometric analysis were analyzed and discussed in detail, highlighting key trends, contributions, and potential future directions in the field of machine learning approaches for fake news detection.

3 Results

3.1 Overview of Dataset

The dataset or data mining provides comprehensive information on various topics, including timeline, sources, volume, growth rate, average age, citations, references, contents, authors, collaboration, and categories of documents, spanning 32 years from 1991 to 2023, with 362 sources and 649 items, showing a gradual growth rate of 14.81% per year and indicating the significance of recent research with an average age of 3.69 and 14.35 citations per document (see Table 1).

Table 1. The key characteristics of the dataset.

Description		Results
Main Information	Timespan	1991:2023
	Sources (Journals, Books, etc.)	362
	Documents	649
	Annual Growth Rate %	14.81
	Document Average Age	3.69
	Average citations per doc	14.35
	References	25090
Document Contents	Keywords Plus (ID)	1125
	Author's Keywords (DE)	1892
Authors	Authors	2511
	Authors of single-authored docs	27
Author Collaborations	Single-authored docs	28
	Co-Authors per Doc	4.18
	International co-authorships %	28.04
Document Types	Article	611
	Review	38

3.2 Annual Production

The annual production of articles related to machine learning approaches for fake news detection has shown a significant upward trend, particularly since 2015. This increase indicates a growing recognition of the importance of addressing fake news and the potential of machine-learning techniques in this field. The peak in 2021, with 183 articles published, reflects

Table 2. The journals and sources that have published the most articles on machine learning for fake news detection.

Most Relevant Sources		Most Local Cited Sources		Source Impact			
Sources	Articles	Sources	Articles	Sources	h-index	g-index	m-index
IEEE Access	37	ArXiv	613	Expert Systems with Applications	11	19	0.846
Expert Systems with Applications	19	Lecture Notes in Computer Science	386	IEEE Access	9	18	2.25
International Journal of Advanced Computer Science & Applications	15	IEEE Access	384	Applied Soft Computing	6	8	1.5
Social Network Analysis and Mining	12	Expert Systems with Applications	356	Information processing & management	6	6	1.5
406083PeerJ Computer Science	10	PLOS ONE	261	Applied Sciences-Basel	5	6	1.25

heightened research activity and interest, likely driven by the urgency to combat misinformation during the COVID-19 pandemic and other significant global events (Figure 2).

The growth rates and citation counts are critical indicators of the research community's engagement and the impact of studies on fake news detection. A steady increase in the number of publications suggests that researchers are increasingly focusing on this area, developing new methodologies, and refining existing ones. High citation counts further indicate that these studies are being published and influencing subsequent research, demonstrating their relevance and contribution to the field.

3.3 Three Field Plot

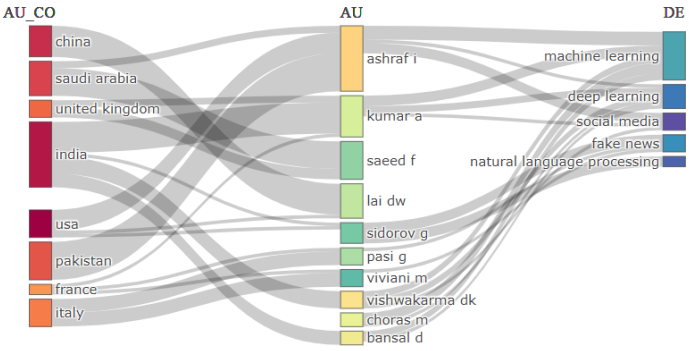

Figure 3. The Sankey plot visualizes the relationships between nations, authors, and keywords in the field of machine learning for fake news detection.

The leftmost column, AU_CO, lists countries of authors: China, Saudi Arabia, UK, India, USA, Pakistan, France, Italy. Each country contributes significantly to fake news research. Middle column, AU, lists author names: Ashraf I, Kumar A, Saeed F, Lai DW, Sidorov G, Pasi G, Viviani M, Vishwakarma DK, Choras M, Bansal D. Authors are linked to countries and research topics. The rightmost column, DE, lists research topics: Machine Learning, Deep Learning, Social Media, Fake News, and Natural Language Processing. These topics are core in detecting fake news. Connections between columns show relationships. For example, authors from China like Ashraf I are linked to Machine Learning and Deep Learning. Kumar A is connected to Social Media and Fake News. Collaborative efforts among authors from different countries contribute to a global knowledge pool. The Sankey plot visualization is shown in Figure 3.

3.4 The most pertinent sources

Table 2 gives an overview of relevant sources, locally cited sources, and source impact in machine learning-based fake news detection research. This information helps identify key journals and publications in this research domain. The most relevant sources for articles on fake news detection are IEEE Access, Expert Systems with Applications, and the International Journal of Advanced Computer Science & Applications. Other sources include Social Network Analysis and Mining and PeerJ Computer Science. Locally cited sources in this research domain are ArXiv, Lecture Notes in Computer Science, IEEE Access, Expert Systems with Applications, and PLOS ONE. Indices like h-index, g-index, and m-index measure source impact. Expert Systems with Applications and IEEE Access show significant impact, while Applied Soft Computing and Information Processing & Management also contribute to research in this area.

3.5 The Most Pertinent Author

Table 3 provides an overview of relevant, locally cited authors, and author impact in machine

Table 3. The productivity and impact of the most influential authors.

Most Relevant Sources		Most Local Cited Sources		Author Impact			
Authors	Articles	Author	Citation	Element	h-index	g-index	m-index
Ashraf i	5	Goswami a	47	Al-sarem m	3	3	0.75
Vishwakarma dk	5	Kaliyar rk	47	Bansal d	3	4	0.375
Bansal d	4	Narang p	47	Fu xx	3	3	0.333
Choras m	4	Bondielli a	37	Goswami a	3	3	0.75
Kumar a	4	Marcelloni f	37	Hussain m	3	3	0.375

learning-based fake news detection. It helps identify key contributors and influential researchers, enhancing our understanding of the research landscape. Most relevant authors are based on published articles. Ashraf I and Vishwakarma DK lead with five articles each, followed closely by Bansal D, Choras M, and Kumar A, each with four articles. Most locally cited authors, with Goswami A, Kaliyar RK, and Narang P leading with 47 citations each. Bondielli A and Marcelloni F follow with 37 citations each. Author impact is measured through indices like h-index, g-index, and m-index. Al-Sarem M has h-index of 3, g-index of 3, and m-index of 0.75. Bansal D, Fu XX, Goswami A, and Hussain M also significantly impact varying indices. The h-index measures productivity and citation impact, the g-index accounts for overall citation performance, and the m-index considers academic career length, providing fair research comparisons.

3.6 The most pertinent Affiliations

Table 4. Affiliation analysis.

Affiliation	Articles
King Saud University	13
Arizona State University	12
Pennsylvania State University	11
China Agricultural University	9
King Abdulaziz University	9

Table 4 displays various colleges' affiliation and publication counts in machine learning-based false video identification. King Saud University has the highest number of publications, followed by Pennsylvania State University and Arizona State University. At the same time, Carnegie Mellon University and COMSATS University have dedicated research teams using deep neural networks, CNNs, RNNs, and GANs to train algorithms on actual and altered movies, emphasizing the importance of collaborative efforts and advancements in this field.

4 Document most often cited

Table 5. Document Analysis based on Total Citation.

Paper	DOI	T.C
[20]	10.1007/s11306-006-0037-z	589
[21]	10.1371/journal.pone.0150989	265
[22]	10.1016/j.ins.2019.05.035	185
[23]	10.1016/j.eswa.2019.112986	151
[24]	10.1002/spy2.9	123

Table 5 presents notable research publications on machine-learning techniques for identifying false videos, including their citation counts and rates. For example, Broadhurst et al. [20] has 589 citations, and Zubiaga et al. [21] has 265 citations. These publications cover various aspects of false video identification.

4.1 The Most Pertinent Country

The United States holds a prominent position in research production and international collaboration, ranking second globally, followed closely by China, Canada, Pakistan, Saudi Arabia, Italy, and the United Kingdom. Key contributors to advancements in machine learning and fake news detection include the United States, Canada, and China, which exhibit robust research networks and high-impact publications. Emerging players such as India, Japan, and South Korea are making significant strides in innovative methodologies, while European nations, including Italy and the United Kingdom, maintain strong collaborative efforts. Notably, the Middle East, particularly Saudi Arabia and the UAE, is experiencing rapid growth in artificial intelligence and machine learning research, highlighting their expanding role in addressing global challenges like fake news detection.

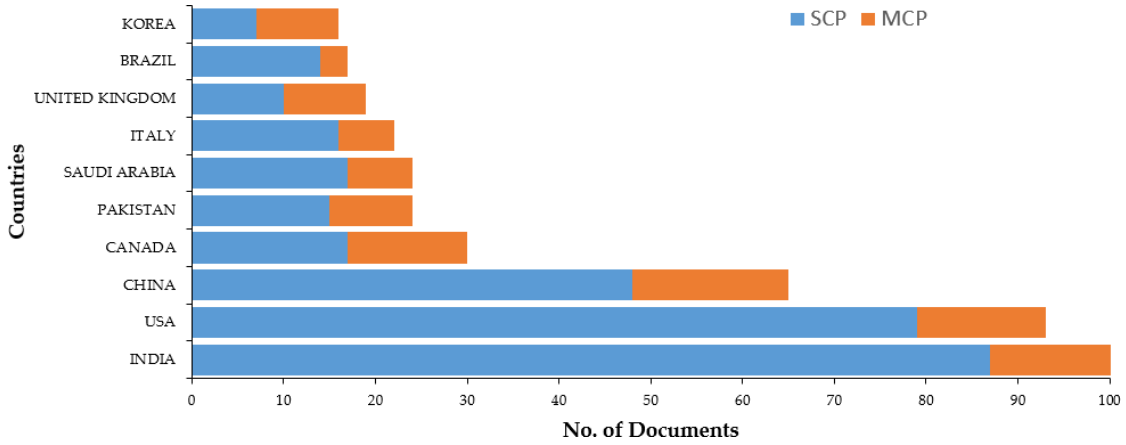

Figure 4. The corresponding authors' nations represent intra- and inter-national (MCP) collaboration.

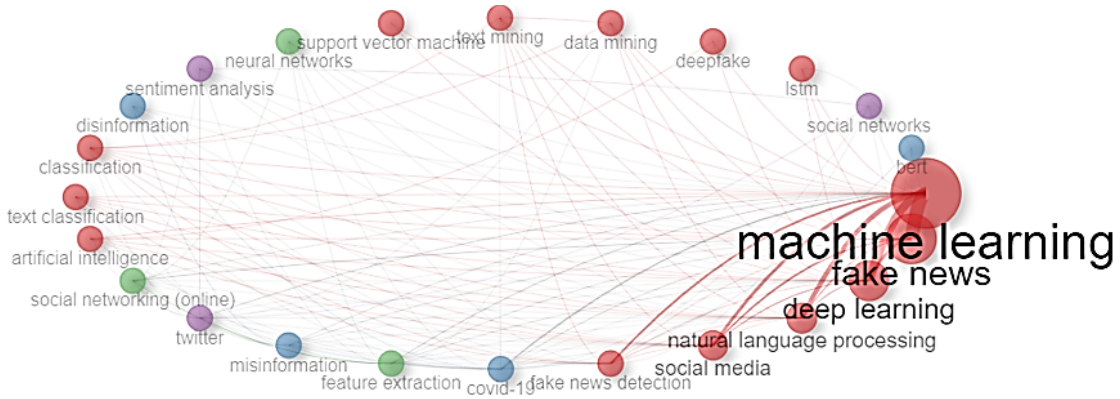

Figure 5. The network of frequently co-occurring keywords in research articles.

Figure 4 illustrates the geographic distribution of corresponding authors, emphasizing the diversity of research contributions worldwide.

4.2 Co-Occurrences Keywords

Figure 5 shows that machine learning is strongly connected to false video detection, with high centrality and ranking metrics. Other important nodes in the network include "deep learning", "natural language processing", "social media," and "artificial intelligence".

4.3 Trending Topic

The bubble chart in Figure 6 illustrates the frequency and timeline of technology and media terms from 2014 to 2022. Shows the importance of key tech in fake news detection. "Machine Learning" is prominent, increasing from 2018, the largest bubble in 2022. Reflects role in fake news detection. "Fake News" starts around 2017 and peaks in 2020. Reflects concern over false info spread. "Deep Learning" has been rising since 2016, the largest bubble in 2022. Effective in processing data for detection. "Natural Language Processing" has been increasing since 2018, with the largest bubble in 2022. Essential for analyzing textual data for fake news detection. "Social Media" and "Deepfakes" trends notable. "Social Media" rising since 2018, significant in fake news dissemination. "Deepfakes" increasing steadily since 2018, sophisticated misinformation form. Other terms like "Feature Extraction," "Twitter," "Social Networking (Online)," "Text Mining," "Media," "Data Models," "Support Vector Machine," and "Security" increasing since 2018, largest bubbles in 2022.

5 Discussion

Deepfake research requires a comprehensive worldwide analysis to guide future studies, including collaboration with researchers from different disciplines, and this study aims to identify the top authors, journals, and countries in Deepfake Technology research, as well as publishing trends, to contribute to future theoretical research [25]. , Which used the CNN method to spot phony video material.

Between 1991 and 19 June 2023, 1114 publications on false video identification using machine learning were found in the WOS database, indicating a significant focus on fraudulent video-detecting technology,

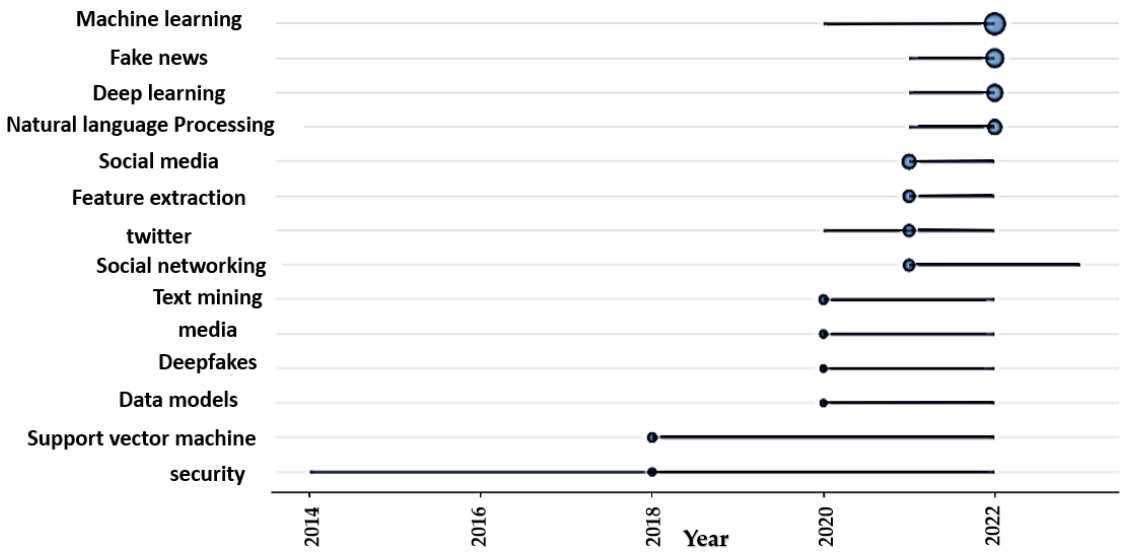

Figure 6. The evolution of research topics.

particularly Deepfake Technology. Most of these publications were articles, with a small percentage being reviews. The average TCs for false video identification research papers decreased from 24, 25, and 30 in 2016-2018 to 20.76 in 2020, while the journals with the highest citations were IEEE Access and Expert Systems with Applications, and the volume of publications varied over time [13, 26].

The average TCs for false video identification research papers decreased from 24, 25, and 30 in 2016-2018 to 20.76 in 2020, while the journals with the highest citations were IEEE Access and Expert Systems with Applications, and the volume of publications varied over time [27], researchers from the United Kingdom, India, China, and the United States are leaders in studying bogus video identification, with the US having the most significant influence in citations and h-index. International collaboration is prevalent in false video detection research, with the network map representing the systems of international cooperation. King Saud University in Saudi Arabia and Arizona State University are significant institutions in false video detection inquiry. The most notable authors in false video detection research are Ashraf I and Vishwakarma DK, with "machine learning" and "fake video detection" being the most commonly used keywords.

6 Conclusion

This study used bibliometric analysis to analyze research on machine learning-based fraudulent video detection from 1991 to 2023. Our findings indicate that false video identification has become increasingly popular since the 2016 presidential campaign, with a significant increase in research publications. The COVID-19 pandemic further accelerated publishing activity, leading to the emergence of an interdisciplinary research domain. Bibliometric analysis helps researchers identify publication patterns, keywords, authors, and sources, providing valuable insights into high-impact publications and subject advancement.

The analysis revealed several key trends and insights. There has been a rapid growth in research, reflecting the increased recognition of the need to address fake news. The geographic distribution of research outputs shows that contributions are predominantly concentrated in certain regions, highlighting the necessity for more inclusive and diverse contributions from underrepresented areas. Collaboration among researchers, institutions, and countries has intensified, with notable co-authorship networks emerging, which enhance the exchange of knowledge and innovation. Leading institutions, authors, and journals have made significant contributions to the field, as evidenced by high citation counts and impact indices.

Actionable Recommendations and Implications for Future Research. We propose several actionable recommendations for future research and policy development based on our findings. Encouraging international collaboration is crucial to include diverse perspectives and expertise, particularly from underrepresented regions. This can be achieved through international conferences, joint research projects, and funding opportunities. There is a need to focus on emerging challenges such as deepfakes and other sophisticated forms of misinformation by

developing advanced detection algorithms that can keep pace with evolving technologies. Leveraging cutting-edge machine learning techniques, such as deep learning and natural language processing, can enhance the accuracy and efficiency of fake news detection systems. Integrating multi-disciplinary approaches by combining insights from fields such as psychology, sociology, and communication studies can help develop holistic solutions that address both the technological and human aspects of misinformation. Informing policymakers about the latest research findings is essential for developing regulations that mitigate the spread of fake news, including implementing standards for social media platforms to identify and flag false information. Public awareness and education campaigns are also vital to reduce the impact of misinformation on society by educating the public about the dangers of fake news and the importance of verifying information.

The growing body of literature provides a robust foundation for future research. By identifying emerging trends and gaps in the current research, scholars can prioritize areas that require further exploration. For example, the surge in publications related to deepfake detection highlights the need for continuous innovation in this area, given the sophisticated nature of such technologies. Additionally, the geographic distribution of research outputs can inform collaborative efforts, encouraging partnerships between institutions in regions with varying levels of research activity.

Policy Implications. Understanding the trends and impact of research on fake news detection can inform policymakers about the most effective strategies to curb misinformation. For instance, insights from high-impact studies can guide the development of regulations and frameworks to prevent the spread of false information. Moreover, by recognizing the institutions and regions leading in fake news research, policymakers can allocate resources and support to bolster these efforts, fostering a more informed and resilient society.

Conflicts of Interest

The authors declare no conflicts of interest.

Funding

This work was supported without any funding.

References

[1] Lazer, D. M., Baum, M. A., Benkler, Y., Berinsky, A. J., Greenhill, K. M., Menczer, F., ... & Zittrain, J. L. (2018). The science of fake news. *Science*, 359(6380), 1094-1096. [CrossRef]

[2] Wardle, C., & Derakhshan, H. (2017). *Information disorder: Toward an interdisciplinary framework for research and policymaking* (Vol. 27, pp. 1-107). Strasbourg: Council of Europe.

[3] Issrani, R., Javed, F., Muhammad Zeeshan, H., Yousaf, F., & Nadeem Baig, M. (2024). Forensic Science Research on the Web of Science Database Over 22 Years: A Bibliometric Analysis. *International Journal of Medical Toxicology and Forensic Medicine*, 14(4), E45153. [CrossRef]

[4] Goutham, B., Rithvik, S., Aishwarya, C., Sathish, K., Ravikumar, C. V., & Sujatha, R. (2022). Efficient and Accurate Target Localization in Underwater Environment. *ARPN Journal of Engineering and Applied Sciences*, 17(17), 1622.

[5] Nguyen, N. T., Le, T. T., Nguyen, H. H., & Voznak, M. (2021). Energy-efficient clustering multi-hop routing protocol in a UWSN. *Sensors*, 21(2), 627. [CrossRef]

[6] Ullah, I., Shen, Y., Su, X., Esposito, C., & Choi, C. (2019). A localization based on unscented Kalman filter and particle filter localization algorithms. *IEEE Access*, 8, 2233-2246. [CrossRef]

[7] Bawden, D., & Robinson, L. (2009). The dark side of information: overload, anxiety and other paradoxes and pathologies. *Journal of information science*, 35(2), 180-191. [CrossRef]

[8] Zhao, Z., Du, J., Li, C., Fang, X., Xiao, Y., & Tang, J. (2024). Dense Tiny Object Detection: A Scene Context Guided Approach and a Unified Benchmark. *IEEE Transactions on Geoscience and Remote Sensing*, 62, 1-13. [CrossRef]

[9] Ejaz, H., Zeeshan, H. M., Ahmad, F., Bukhari, S. N. A., Anwar, N., Alanazi, A., ... & Younas, S. (2022). Bibliometric analysis of publications on the omicron variant from 2020 to 2022 in the Scopus database using R and VOSviewer. *International Journal of Environmental Research and Public Health*, 19(19), 12407. [CrossRef]

[10] Ejaz, H., Zeeshan, H. M., Iqbal, A., Ahmad, S., Ahmad, F., Abdalla, A. E., ... & Bukhari, S. N. A. (2022, December). Rubella virus infections: a bibliometric analysis of the scientific literature from 2000 to 2021. In *Healthcare* (Vol. 10, No. 12, p. 2562). MDPI. [CrossRef]

[11] Sun, K., Cui, W., & Chen, C. (2021). Review of underwater sensing technologies and applications. *Sensors*, 21(23), 7849. [CrossRef]

[12] Ullah, I., Chen, J., Su, X., Esposito, C., & Choi, C. (2019). Localization and detection of targets in underwater wireless sensor using distance and angle based algorithms. *IEEE Access*, 7, 45693-45704. [CrossRef]

[13] Supriyadi, M. R., Samah, A. B. A., Majid, H. A., & Muliadi, J. (2024, October). A Systematic Review: The Utilization of Artificial Intelligence in Forensic Odontology. In *2024 International Conference on Computer, Control, Informatics and its Applications (IC3INA)* (pp. 139-144). IEEE. [CrossRef]

[14] Zeeshan, H. M., Heyat, M. B. B., Hayat, M. A. B., Parveen, S., Sultana, A., Akhtar, F., ... & Ogunsakin, A. S. A. (2024) Progress and research trends in lumpy skin disease based on the scientometric assessment–a review. *Ann. Anim. Sci.* [CrossRef]

[15] Vora, D. R., & Rajamani, K. (2022). A hybrid classification model for prediction of academic performance of students: a big data application. *Evolutionary Intelligence*, 1-14. [CrossRef]

[16] Al-Zaman, M. S. (2021). COVID-19-related social media fake news in India. *Journalism and Media*, 2(1), 100-114. [CrossRef]

[17] Bran, R., Tiru, L., Grosseck, G., Holotescu, C., & Malita, L. (2021). Learning from each other—A bibliometric review of research on information disorders. *Sustainability*, 13(18), 10094. [CrossRef]

[18] Zeeshan, H. M., Heyat, M. B. B., Hayat, M. A. B., Parveen, S., Akhtar, F., Sayeed, E., ... & Abdelgeliel, A. S. (2023, December). Worldwide Research Trends and Hotspot on IOMT Based on Bibliometric Analysis. In *2023 20th International Computer Conference on Wavelet Active Media Technology and Information Processing (ICCWAMTIP)* (pp. 1-14). IEEE. [CrossRef]

[19] Zeeshan, H. M., Rubab, A., Dhlakama, H., Ogunsakin, R. E., & Okpeku, M. (2022). Global research trends on monkeypox virus: a bibliometric and visualized study. *Tropical Medicine and Infectious Disease*, 7(12), 402. [CrossRef]

[20] Broadhurst, D. I., & Kell, D. B. (2006). Statistical strategies for avoiding false discoveries in metabolomics and related experiments. Metabolomics, 2, 171-196. [CrossRef]

[21] Zubiaga, A., Liakata, M., Procter, R., Wong Sak Hoi, G., & Tolmie, P. (2016). Analysing how people orient to and spread rumours in social media by looking at conversational threads. *PloS one*, 11(3), e0150989. [CrossRef]

[22] Bondielli, A., & Marcelloni, F. (2019). A survey on fake news and rumour detection techniques. *Information sciences*, 497, 38-55. [CrossRef]

[23] Meel, P., & Vishwakarma, D. K. (2020). 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*, 153, 112986. [CrossRef]

[24] Ahmed, H., Traore, I., & Saad, S. (2018). Detecting opinion spams and fake news using text classification. *Security and Privacy*, 1(1), e9. [CrossRef]

[25] Hakak, S., Alazab, M., Khan, S., Gadekallu, T. R., Maddikunta, P. K. R., & Khan, W. Z. (2021). An ensemble machine learning approach through effective feature extraction to classify fake news. *Future Generation Computer Systems*, 117, 47-58. [CrossRef]

[26] Molina, M. D., Sundar, S. S., Le, T., & Lee, D. (2021). "Fake news" is not simply false information: A concept explication and taxonomy of online content. *American behavioral scientist*, 65(2), 180-212. [CrossRef]

[27] Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of business research*, 133, 285-296. [CrossRef]

Hafiz Muhammad Zeeshan works as a Lecturer at the National College of Business Administration and Economics, Lahore Campus, Lahore, Pakistan. He also completed his MS & BS degrees at Lahore Leads University, Lahore, Pakistan. He has taught computer science and engineering graduate students for the past 2 years. He has published 3 research articles with Cumulative JCR-IF in reputed International Journals and International Conferences. Hafiz's research interests primarily include machine learning and qualitative research.

Inam Ullah received a B.Sc. degree in Electrical Engineering from the Department of Electrical Engineering, University of Science and Technology Bannu, Pakistan, in 2016 and a Master's and Ph.D. degree in Information and Communication Engineering from the College of Internet of Things Engineering, Hohai University, China, in 2018 and 2022, respectively. He completed his postdoc with BK21, Chungbuk National University, S Korea, in 2023. He is an Assistant Professor at the Department of Computer Engineering, Gachon University, S Korea. His research interests include Robotics, IoT, WSNs, AUVs, AI, Deep learning, etc. He has authored more than 100 articles and five books as an editor. (Email: inam@gachon.ac.kr)

Furkan Yousaf is a Librarian at Solicitor Department, Law and Parliament Affairs, Secretariat, Punjab Government. He is Studying PhD in Information Management from the School of Information Science, College of Computing, Informatics and Mathematics, University Technology MARA (UiTM), Malaysia. His research interests include emotional intelligence, cultural intelligence, knowledge conversion abilities, etc.

Amin Sharafian received his M.Sc. in Control Engineering from the University of Qom in 2016 and his Ph.D. from the School of Automation at Shanghai Jiao Tong University (SJTU) in 2023. He has worked as a research associate at the University of Malaya and Shenzhen University. He has published several papers in well-reputed journals and conferences. His research interests include fractional calculus, multi-agent systems, and cybersecurity.

Md Belal Bin Heyat's research expertise spans detection, sleep disorders, neurological disorders, psycho-neurological human behaviors, cardiovascular diseases, bio-signal processing, and medical machine learning. His work focuses on advancing diagnostic and therapeutic approaches through innovative applications of machine learning and bio-signal analysis.

Shazia Saqib holds a PhD in Artificial Intelligence from GC University Lahore. Her research interests are in healthcare, video summarization, retrieval of augmented reality, semantic segmentation, and sports analytics. Presently, she works as Dean of the School of Informatics and Robotics at the Institute for Art and Culture, Pakistan. (Email: shazia.saqib@iac.edu.pk)

Atta Ur Rahman received the MS in Computer Science from the University of Science and Technology Bannu in 2018 and the Ph.D. in Computer Science from Ghulam Ishaq Khan Institute of Engineering Sciences and Technology in 2022. He works as an Assistant Professor at Riphah Institute of System Engineering (RISE), Riphah International University Islamabad, Pakistan. His research interests include human-computer interaction, artificial intelligence in healthcare, and Federated learning for privacy preservation.