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A Bibliometric Analysis of Artificial Intelligence and Blockchain Technology in Fraud Prevention and Detection

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A B S T R A C T

This research aims to describe the evolution of publication activity, expand knowledge, identify the most representative authors and journals, and offer insights into potential new directions, especially regarding artificial intelligence and blockchain technology in fraud prevention and detection. This article presents an examination of the development and future trajectory of certain research trends through bibliometric analysis. This analysis involves identifying various research areas within an emerging field and visualizing the bibliometric network using R-bibliophily and Vos Viewer for citation matrices and sensitivity analysis. The data used in this research are around 83 documents consisting of 27 articles, 2 books, 8 book chapters, 29 conference papers, 10 conference reviews, 1 editorial, 1 note, and 5 review results published from 2017 to 2023. Based on World Collaboration Map data shows that there is 1 cooperation data from Chinese researchers to Indonesia and 1 from Indonesia to Australia, so it is hoped that this research can provide a reference, especially for Indonesian writers who will carry out international publications with similar themes.

Penelitian ini bertujuan untuk mendeskripsikan evolusi aktivitas publikasi, memperluas pengetahuan, mengidentifikasi penulis dan jurnal yang paling representatif, dan menawarkan wawasan tentang potensi arah baru, terutama mengenai artificial intelligence dan teknologi blockchain dalam pencegahan dan deteksi fraud. Artikel ini menyajikan pemeriksaan perkembangan dan lintasan masa depan dari tren penelitian tertentu melalui analisis bibliometrik. Analisis ini melibatkan identifikasi berbagai bidang penelitian dalam bidang yang sedang berkembang dan memvisualisasikan jaringan bibliometrik menggunakan R-bibliophily dan Vos Viewer untuk matriks kutipan dan analisis sensitivitas. Data yang digunakan dalam penelitian ini adalah sekitar 83 dokumen yang terdiri dari 27 artikel, 2 buku, 8 bab buku, 29 makalah konferensi, 10 ulasan konferensi, 1 editorial, 1 catatan, dan 5 hasil ulasan yang diterbitkan dari tahun 2017 hingga 2023. Berdasarkan data World Collaboration Map didapatkan data kerjasama peneliti Tiongkok ke Indonesia sebanyak 1 dan dari Indonesia ke Australia sebanyak 1, sehingga penelitian ini diharapkan dapat memberikan referensi khususnya bagi Penulis Indonesia yang akan melakukan publikasi internasional dengan tema serupa.

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INTRODUCTION

Blockchain technology has recently garnered considerable attention from both private enterprises and public institutions, heralded as a potentially more potent innovation than the internet itself, which stands as one of the foremost advancements of the digital era (Habib et al., 2022). Essentially, blockchain operates as a technology facilitating processes devoid of intermediaries, commonly known as third parties. In essence, it serves as a valuable database engineered to address the issues posed by third-party involvement in conventional systems. Defined as a decentralized database solution established through consensus among network participants, blockchain represents a continuously expanding repository of data records or technologies for recording transactions, disseminated peer-to-peer (Ghosh et al., 2023). Originally emerging alongside Bitcoin, blockchain serves as the underlying technology enabling the cryptocurrency, with Bitcoin remaining its most prevalent application. In essence, blockchain technology ensures that every piece of data undergoes generation, validation for authenticity, and cryptographic encapsulation, rendering it virtually impenetrable to human manipulation. Through the amalgamation of fundamental data into each created block, blockchain technology ensures the recording of every transaction, rendering them immutable and irrevocable (Brol, 2020; Gokoglan & Cetin, 2022).

Moreover, blockchain technology fosters a secure, transparent, and accountable ecosystem through a 'trust protocol', as initially outlined in Satoshi Nakamoto's seminal work "Bitcoin: A Peer-to-Peer Electronic Cash System" in 2009 (Adam & Dzang Alhassan, 2020). Nakamoto's elucidation of blockchain's structure illustrates each transaction block being cryptographically signed or encrypted, rendering the encryption process insurmountable.

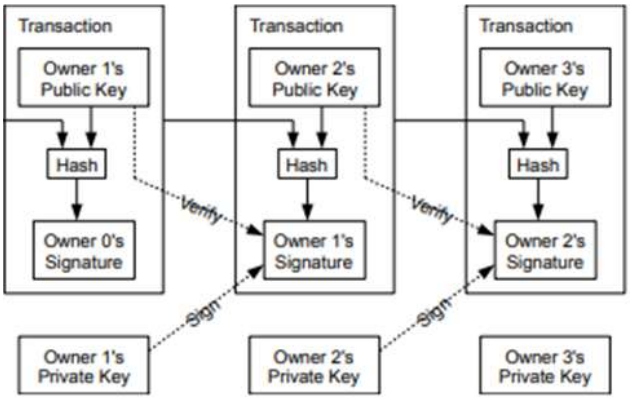

Figure 1 Blockchain Structure
Source: Nakamoto, 2009

Transactions recorded on the blockchain are immutable, owing to their incapacity for deletion or modification. Prior to the addition of a "block" of transactions to the blockchain, network participants must collectively affirm the validity of the transactions through a consensus mechanism. Furthermore, blockchain technology facilitates fraud detection by enabling real-time information sharing, granting all blockchain participants visibility into transactions. The transparency afforded by a shared digital ledger across supply chains and business networks aids in mitigating fraudulent activities, making fraudulent transactions more discernible.

Additionally, blockchain technology fortifies fraud prevention through enhanced security mechanisms. The technology's heightened security emanates from its inherent characteristics, such as maintaining an immutable transaction ledger with end-to-end encryption, effectively barricading unauthorized access and fraudulent activities. Furthermore, blockchain distributes data across computer networks, rendering it exceedingly arduous to breach compared to centralized server-based systems. Moreover, blockchain technology can address privacy concerns more effectively than conventional systems by anonymizing data and imposing access limitations (Hartoyo et al., 2021; Triantonno & Firmanto, 2018).

While blockchain technology has revolutionized transaction processes and data storage methodologies, it also grapples with the pervasive issue of fraud, necessitating innovative solutions. Combining blockchain with artificial intelligence (AI) presents a potential alternative solution to traditional fraud detection and prevention methods (Rakshit et al., 2022)(Bron, 2023). AI offers a proactive approach, leveraging machine learning algorithms to derive insights from historical data, thereby enhancing the

accuracy of fraud detection. Integrating AI into blockchain analytics holds promise for bolstering fraud prevention efforts. Nevertheless, the full potential of these technologies in combating fraud remains largely untapped, with scant analyses exploring their synergistic effects. This paper aims to enrich the understanding of this intersection, delineating the evolution of research activity, identifying key authors and journals, and shedding light on potential future directions through a systematic literature review.

METHOD

This article presents an examination of the development and future trajectory of a specific research trend through bibliometric analysis. The analysis involves identifying various research areas within this emerging field and visualizing the bibliometric network using R-bibliophily and the Vos Viewer for citation matrix and sensitivity analysis (Elsevier B.V. A, 2014; Glänzel, 2003; Rahmawati & Subardjo, 2022; Ratzinger-Sakel & Tiedemann, 2022). By employing bibliometric methods, the study offers insights into macro research components such as authorship, publication sources, and citation patterns, facilitating an accessible understanding of the communication process in research (Rahmawati & Subardjo, 2022) (Glänzel, 2003).

Utilizing the Scopus database, the analysis focuses on articles related to AI and blockchain technology in fraud prevention and detection published between 2009 and 2023. Scopus, known for its comprehensive coverage across various publication types, facilitates efficient retrieval and filtering of relevant document data. Keywords such as Artificial Intelligence, Blockchain Technology, and Fraud Prevention and Detection were employed for data retrieval in May 2023, followed by additional filtering to include only English-language articles in the final publication stage and of the journal type, ensuring relevance and quality.

The results of the analysis reveal the evolution of publishing activity in this domain and highlight key authors and journals contributing to research on AI and blockchain technology in fraud prevention and detection. Through meticulous bibliometric analysis, this study sheds light on the scholarly landscape and trends within this burgeoning field.

RESULT AND DISCUSSION

This study utilized a dataset comprising 83 documents, including 27 articles, 2 books, 8 book chapters, 29 conference papers, 10 conference reviews, 1 editorial, 1 note, and 5 published review results spanning the years 2017 to 2023. R Biblioshiny was employed for data analysis and visualization, supplemented by further analysis using the Vos Viewer. Among the documents, 9 were authored by single authors. Analysis of collaboration data from the World Collaboration Map revealed limited collaboration between Chinese and Indonesian researchers (1 instance), and between Indonesian and Australian researchers (1 instance), suggesting potential for international collaboration, particularly for Indonesian authors seeking to publish on similar themes.

The study's findings offer valuable insights and guidance for future research, particularly in exploring the impacts of artificial intelligence and blockchain technology on fraud prevention and detection—a topic with relatively sparse literature. The mapping and identification of factors related to these technologies in this context contribute to the body of knowledge and provide a foundation for further investigation in this field.

1. Main Information

The research materials encompass publications spanning from 2009 to 2023, yet notably, the most recent data pertains to the year 2017, focusing specifically on fraud prevention and detection. The dataset utilized for this study comprises 83 sources, including 27 articles, 2 books, 8 book chapters, 29 conference papers, 10 conference reviews, 1 editorial, 1 note, and 5 review results dated between 2017 and 2023. A comprehensive overview of the data is provided in Table 1.

Table 1. Main data information

No	Description	Results
	MAIN INFORMATION ABOUT THE DATA	
1	Timespan	2017:2023
2	Sources (Journals, Books, Etc.)	68
3	Documents	83
4	Average Years From Publication	1.69
5	Average Citations Per Document	6,349
6	Average Citations Per Year Per Doc	1,608
7	References	2929
	DOCUMENT TYPES	
1	Article	27
2	Book	2

3	Book Chapter	8
4	Conference Paper	29
5	Conference Review	10
6	Editorial	1
7	Note	1
8	Reviews	5
	DOCUMENT CONTENTS	
1	Keywords Plus (ID)	478
2	Author's Keywords (DE)	274
	AUTHORS	
1	Authors	277
2	Author Appearances	289
3	Authors Of Single-Authored Documents	9
4	Authors Of Multi-Authored Documents	268
5	AUTHORS COLLABORATION	
6	Single-Authored Documents	9
7	Documents Per Author	0.3 _
8	Authors Per Document	3.34
9	Co-Authors Per Documents	3.48
10	Collaboration Index	4.19

2. Publication And Citation Trends

The initial entry in Scopus utilizing the specified keywords—Artificial Intelligence, Blockchain Technology, Fraud Prevention and Detection, Artificial Intelligence in Fraud Prevention and Detection, and Blockchain Technology in Fraud Prevention and Detection—dates back to 2017, with a consistent increase observed until 2022 (refer to Figure 1a). Notably, publications centered on the convergence of artificial intelligence and blockchain technology in the realm of fraud prevention and detection peak in availability in 2022. The average growth trend of publications addressing this thematic intersection stands at 1.69.

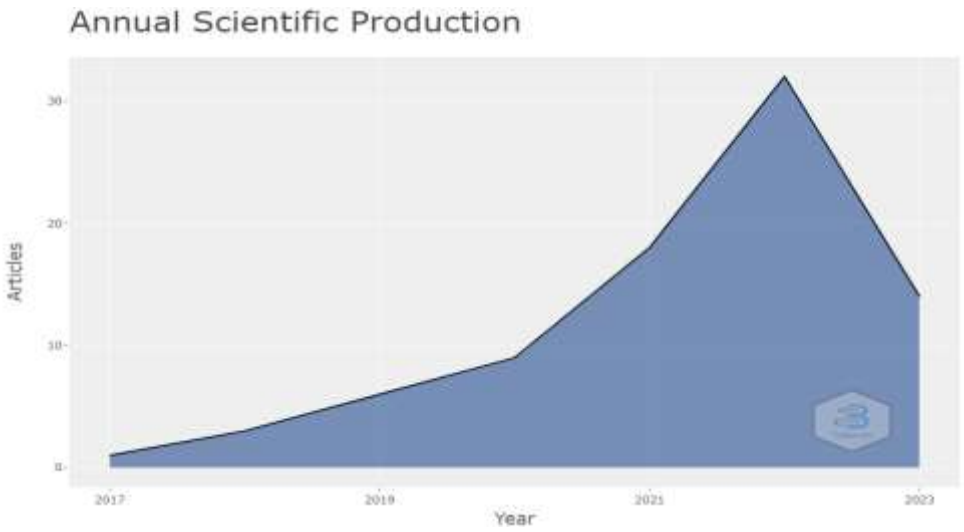

Figure 1a. Average Scientific Production

The trajectory of publications focusing on the application of artificial intelligence and blockchain technology in fraud prevention and detection is on the rise. Between 2017 and 2019, citations averaged over 7.5 per year, but this figure decreased to less than 5.0 between 2019 and 2021. The trend of decline persists into 2022-2023, with an average annual citation rate dropping to less than 2.5 (refer to Figure 1b).

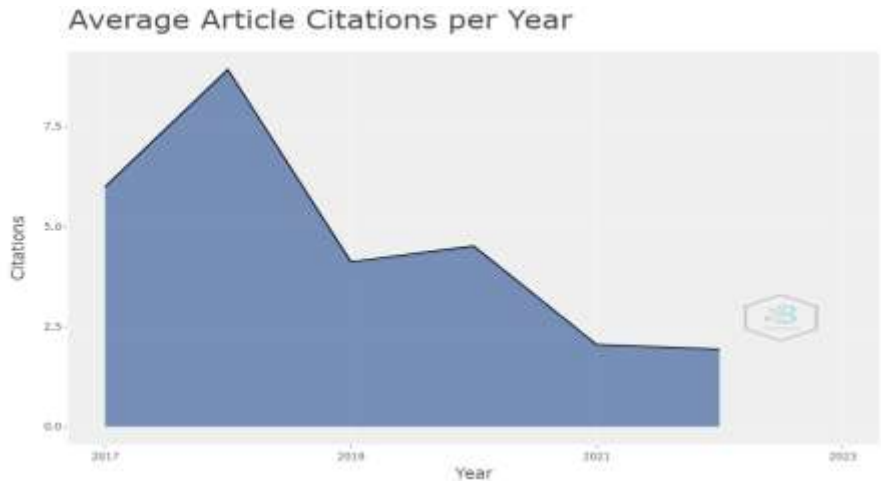

Figure 1b. Average Citations per Year

3. Most Relevant Journals and Most Citations

In terms of institutional affiliation, Hunan University of Finance and Economics led with 13 documents, followed by Nirma University with 7 documents, and Dnyanshree Institute of Engineering and Technology with 5 documents. Additionally, The Scientific and Technological Research Council of Turkiye, University Campus Bio-Medico of Rome, University of Johannesburg, and Uttaranchal University each contributed 4 documents. The remaining institutions had between 2 to 3 documents each (refer to Figure 2a).

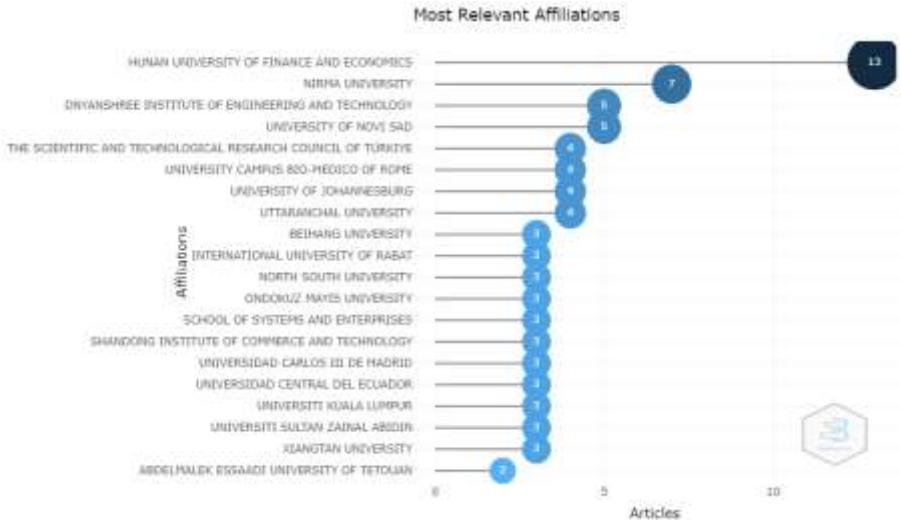

Figure 2a. Most Relevant Affiliations

According to Figure 2b, the most impactful publications in terms of global citations are attributed to Kamel Boulus, with an article published in 2018 in the International Journal of Health Geographics garnering 133 citations. Following closely, the two articles with the highest global citations were authored by Mosteanu NR, published in 2020 in Qualitative Access to Success, accumulating 62 citations (refer to Figure 3b).

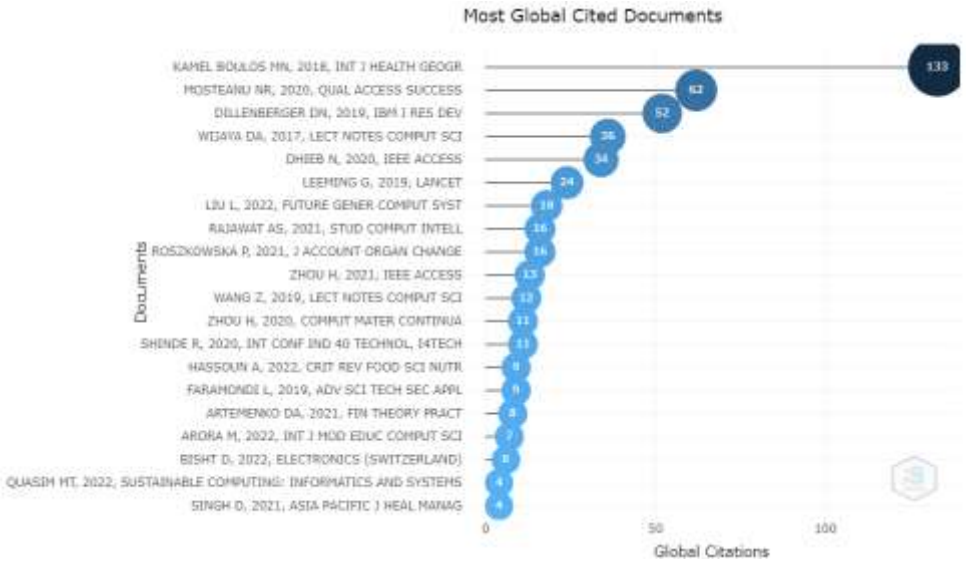

Figure 2b. Most Global Cited Documents

Based on Figure 2c, it can be seen that publications related to AI and blockchain technology concerning preventing and detecting fraud, as seen from the number of local citations, are still 0.

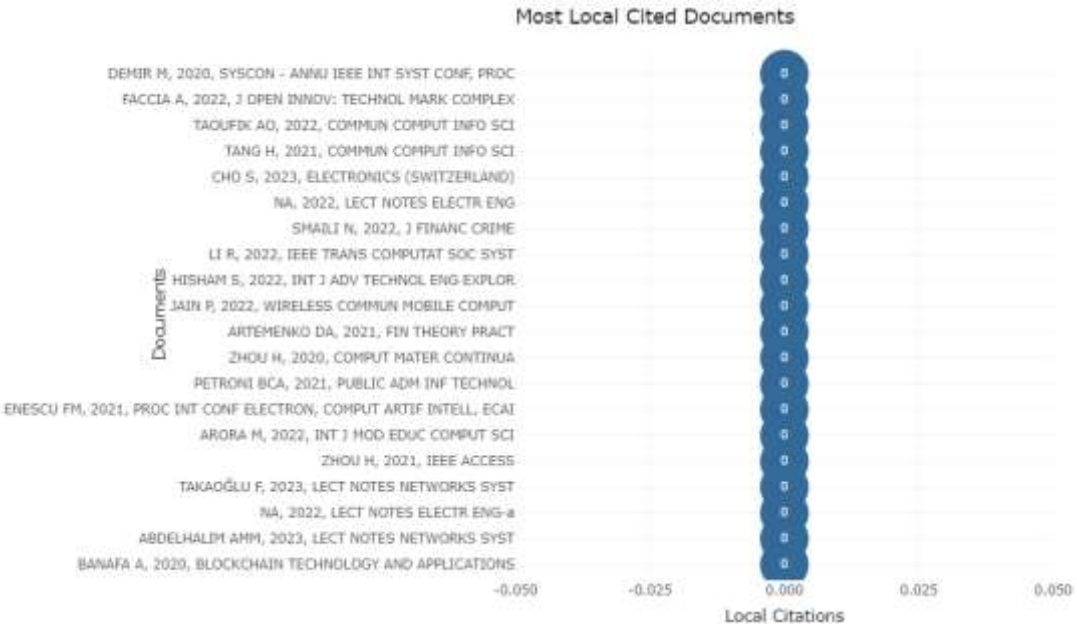

Figure 2c. Most Local Cited Documents

4. Most Relevant Affiliates and Most Citations

The leading journals in terms of publishing articles on the topic of AI and blockchain technology pertaining to fraud prevention and detection include the

Journals of Communication in Computer and Information Science, IEEE Access, Lecture Notes in Computer Science, and Lecture Notes in Network and Systems, each contributing 1,000 articles (refer to Fig. 3a).

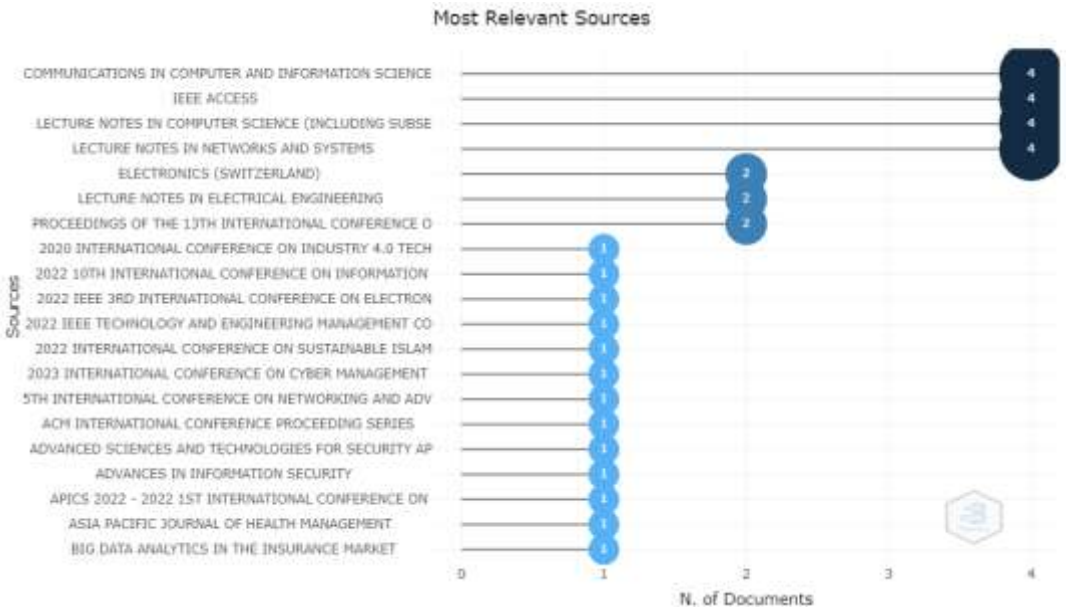

Figure 3a. Most Relevant Sources

In contrast, Figure 3b displays the journals most pertinent based on the cumulative number of local citations. Leading the citation count locally is Pandey P, with 13 citations, followed by Nakamoto S, accruing 12 citations. Hassoun A follows closely with 10 citations, while Chen W and Jagtap S each have 9 citations attributed to their journals. Conversely, other journals have citations ranging from 5 to 7 times.

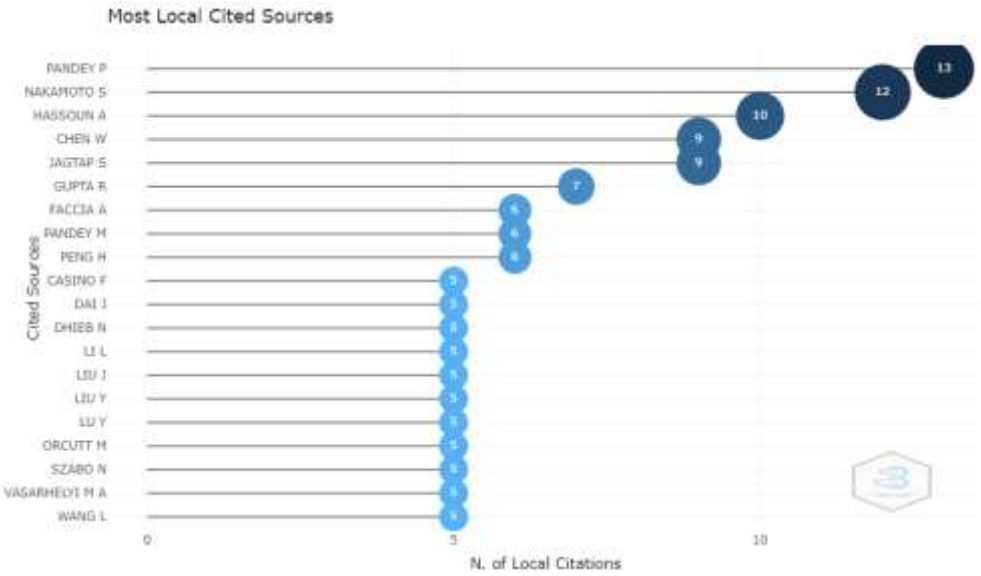

Figure 3b. Most Local Cited Sources

5. Most Productive Countries and Most Citations

Concerning the most impactful countries, as evidenced by the highest number of citations, the United Kingdom leads with 149 citations, followed by Malta with 62 citations, China with 56 citations, Australia with 36 citations, and the USA with 34 citations. In contrast, other countries received citations ranging from 0 to 24. This data is illustrated in Figure 4.

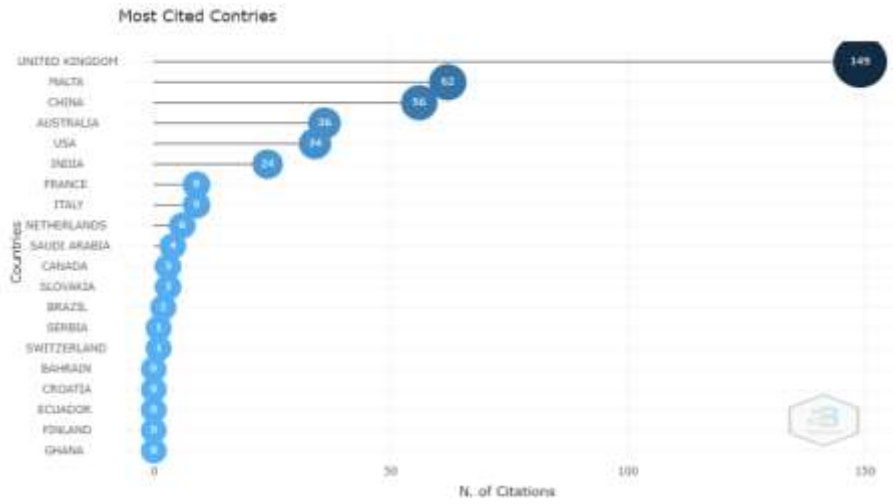

Figure 4. Most Cited Countries

6. International Researchers Collaboration

Regarding Figure 5 concerning the corresponding authorship, the majority hail from countries such as China, India, France, Korea, and Malaysia, with subsequent

representation from Morocco, the Netherlands, Saudi Arabia, the UK, Australia, Bahrain, Brazil, Canada, Croatia, Ecuador, Finland, Ghana, Italy, Malta, and Norway. Generally, it seems that authors tend to collaborate with others from the same country, referred to as Single Country Publication (SCP), rather than engage in Multiple Country Publication (MCP). However, Korea, Malaysia, and Morocco predominantly exhibit SCP, whereas France and the Netherlands are characterized by MCP dominance.

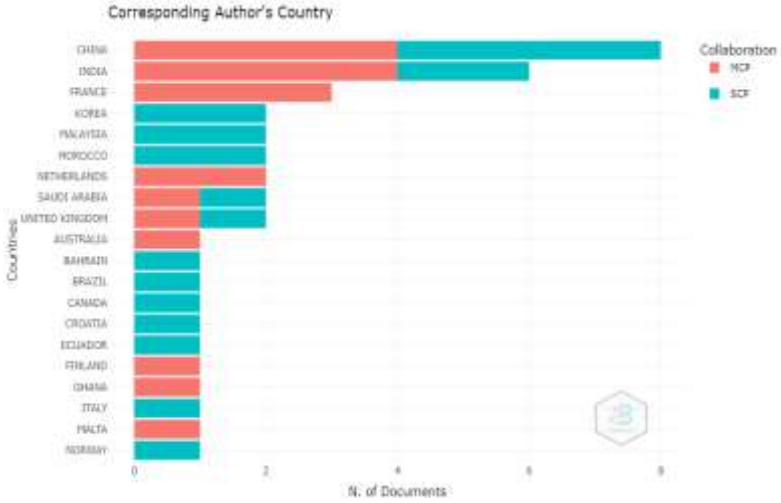

Figure 5. Corresponding Author's Country

7. Most Relevant Author

In Figure 6a, the top twenty authors prolific in articles focusing on artificial intelligence and blockchain technology are depicted. The blue dots represent the number of publications, with larger circles indicating a higher volume of publications. Meanwhile, the color intensity indicates the number of citations, with darker shades indicating more citations. The visualization of author productivity reveals that Tanwar S holds the top position, followed by Aadil RM, Bhattacharya P, and Bokoro PN.

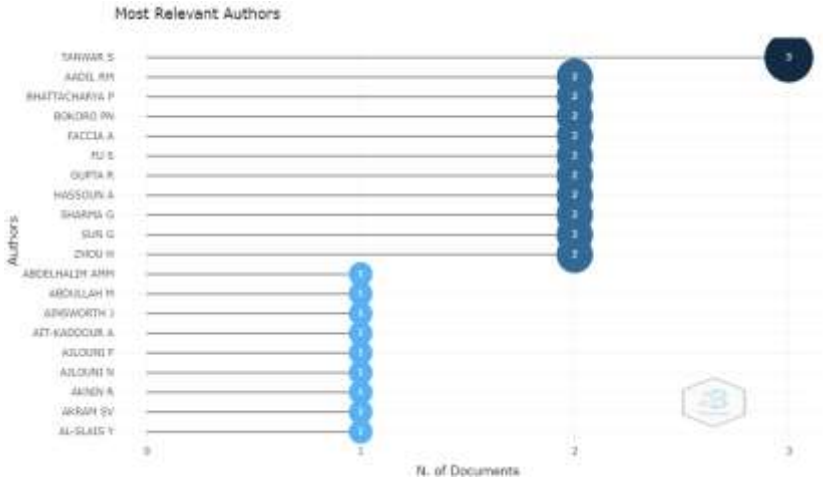

Figure 6a. Most Relevant Authors

Figure 6b offers a more intricate overview. Tanwar S emerges as the most prolific author, with publications spanning from 2021 to 2023. Following closely are Aadil RM, Bhattachandra P, and Bakoro PN, each contributing publications from 2021 to 2022. Additionally, Ainsworth began contributing as a researcher in 2019. Faccia, Fu, Shun, and Zhou initiated their article writing on the key topics of artificial intelligence and blockchain technology in 2021. The highest number of authors contributing in 2022 were Tanwar, Aadil, Bokoro, Faccia, Gupta, Hassoun, Sharma, Abdullah, Ait-Kaddour, Aknin, and Akram.

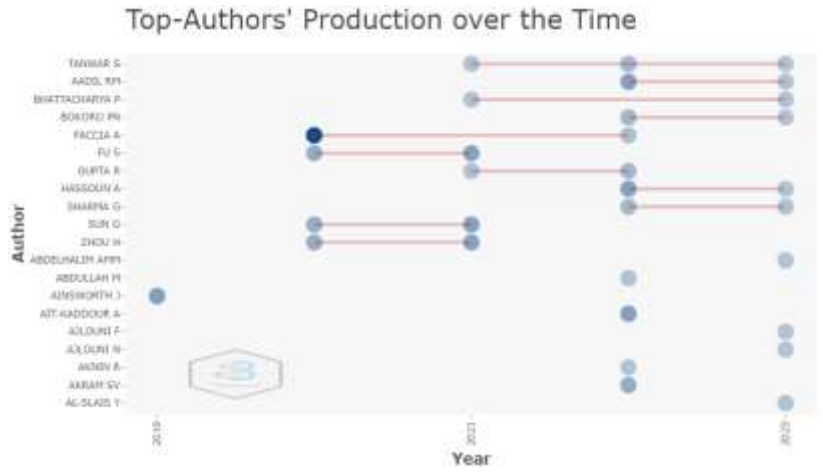

Figure 6b. Top Authors' Production Over the Time

Among local researchers, there is a relatively uniform level of influence, with each of the 20 authors contributing 1-2 articles. Notably, Fu, Sun, and Zhou emerge as the most impactful researchers locally. Additionally, Aadil, Ainsworth, Air-

Kaddour, Akram, Alamsyah, Alhaj, Alshehri, Arora, Artemenko, Banafa, Banga, Besbes, Besir, Bahrdwaj, Bhattacharya, Bhuiyan, and Bisht exhibit similar levels of influence in the realm of key articles on artificial intelligence themes and blockchain technology in fraud prevention and detection.

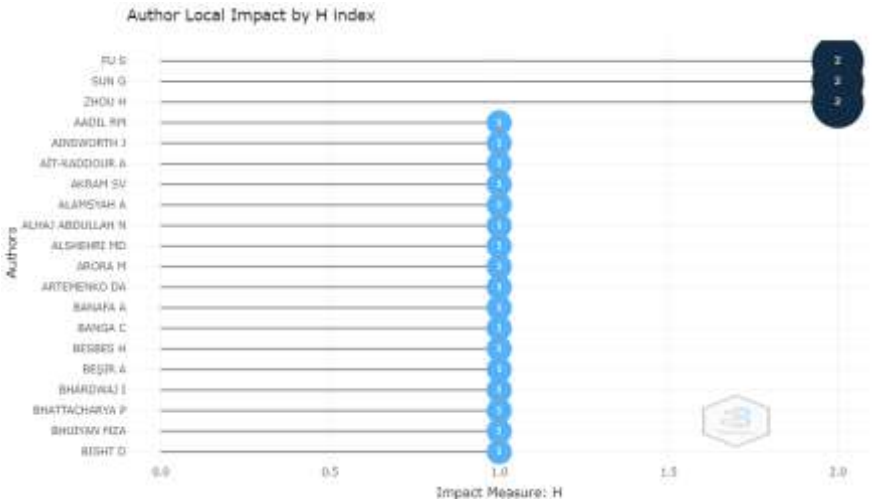

Figure 6c. Author Local Impact by H Index

While research related to AI and Blockchain Technology includes research by Nakamoto S in 2008-2009 regarding Bitcoin untill the latest research and related in 2022 Artificial Intelligence and Related Technologies in Food Industry (Applied Food Research).

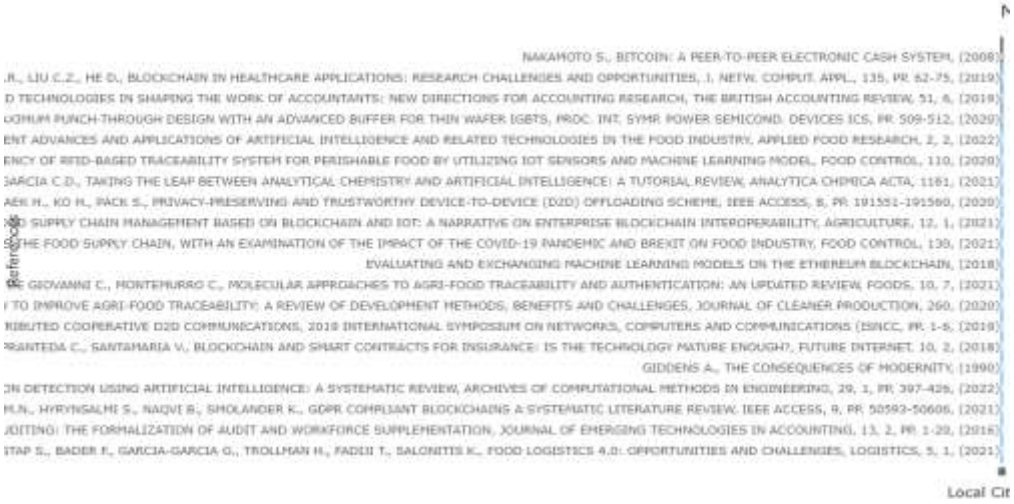

Figure 6d. Author Local Impact by H Index

8. Thematic Evolution

Figure 7 shows that there has been a shift in the theme between 2017-2022 and 2023. Crime and blockchain themes have been ranked as the top trending themes in the past year. Even so, the theme of artificial intelligence and blockchain technology is still interesting to study today.

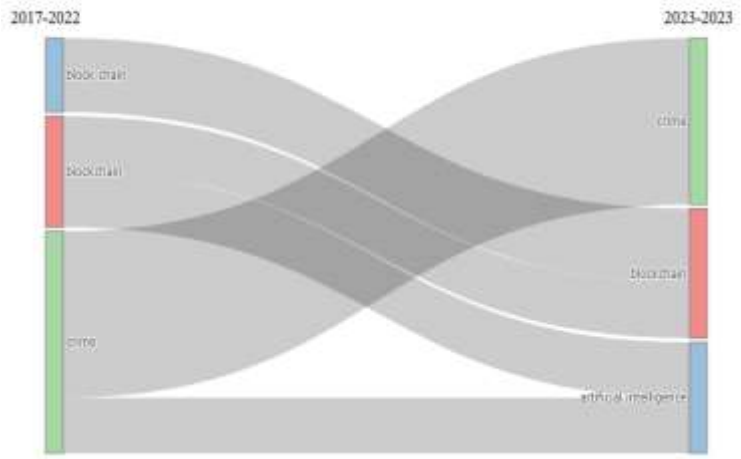

Figure 7. Theme Evolution Map

9. Keywords

In Figures 8a and 8b, it shows that the keywords that are widely used are blockchain as many as 38 (14%) articles, then artificial intelligence 30 (11%) articles, then blockchain as many as 24 (9%) articles, then crime as much as 16 (6%) articles, and internet of things and smart contracts 7 (3%) and 6 (2%) respectively. The remaining 5 articles.

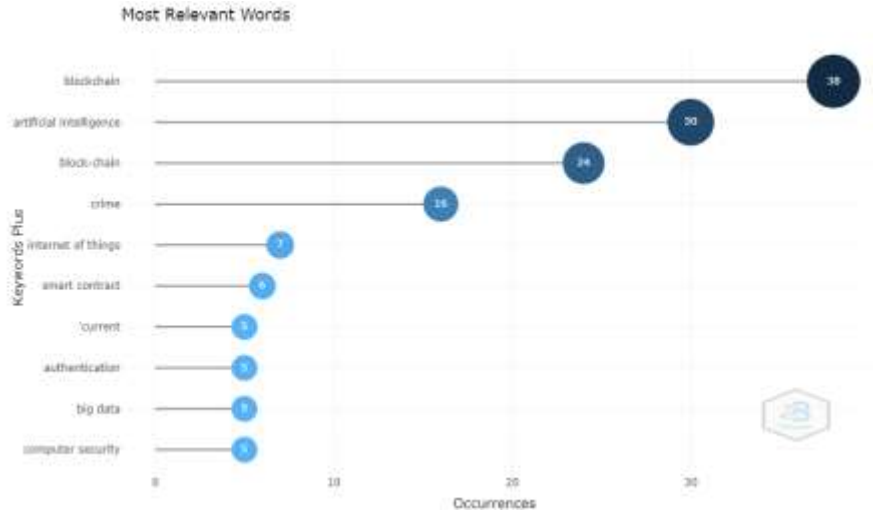

Figure 8a. Most Relevant Words

Figure 8b. Tree Map

10. Conceptual Structure

Additionally, supplementary analysis was conducted utilizing the Vos Viewer. The findings of the study reveal that artificial intelligence and blockchain technology remain compelling subjects of research to date, as evidenced by the trend in annual publications. Moreover, the conceptual framework based on co-occurrence highlights the interconnectedness between artificial intelligence and blockchain technology in fraud prevention and detection. The size of the keywords indicates the extent of their associations with other keywords (refer to Figure 9).

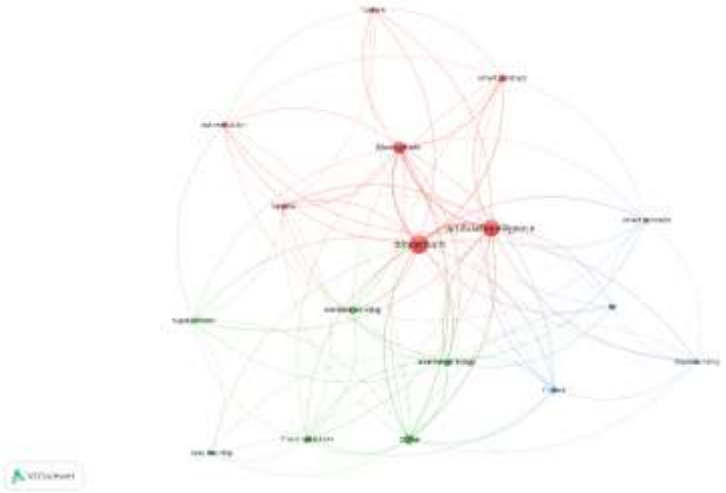

Figure 9. Thematic Map Vos Viewer (Co Occuranceship)

11. Network Visualization

Moreover, supplementary analysis was conducted utilizing the Vos Viewer. The research findings indicate that artificial intelligence and blockchain technology in fraud prevention and detection remain compelling subjects of study, as evidenced by the relatively limited number of researchers exploring this theme (refer to Figure 10). This is substantiated by the array of colors forming the network visualization. The deeper the blue hue, the more recent the keyword's usage in papers from 2021. Conversely, brighter colors denote keywords employed in papers from 2022.

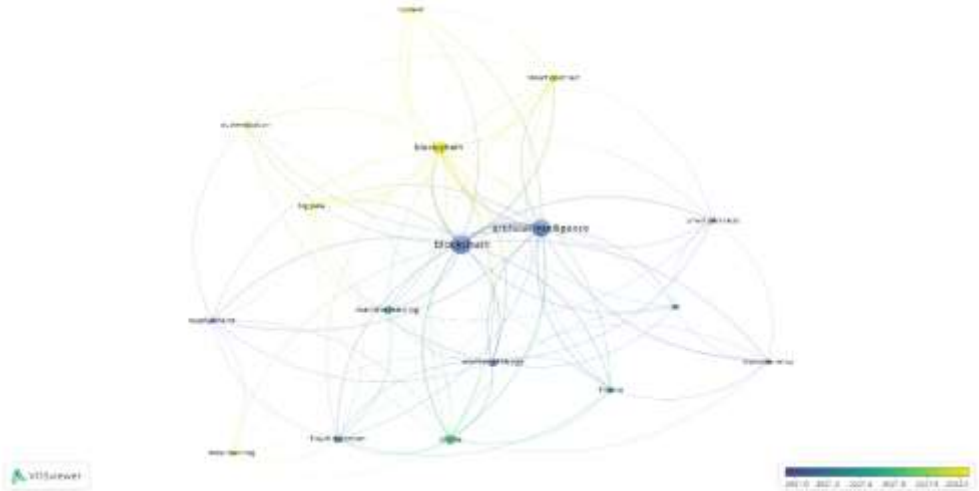

Figure 10. Network Visualization Vos Viewer (Co Occurance)

12. Density Visualization

Further analysis using VosViewer was conducted to validate the findings of the systematic literature review conducted with Biblioshiny. Figure 11 presents a selection of authors relevant to artificial intelligence and blockchain technology. It is evident that artificial intelligence and blockchain emerge prominently as the most frequently studied themes. This suggests that there is ample opportunity for future research to explore this topic further, as it has not been extensively investigated by previous researchers.

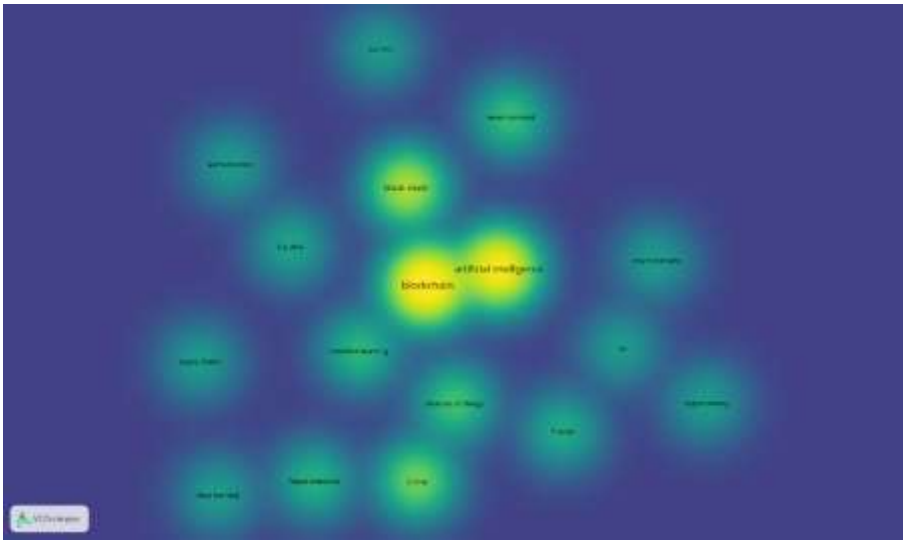

Figure 11. Network Visualization Vos Viewer (Co Occurance)

CONCLUSION

Articles exploring the intersection of artificial intelligence and blockchain technology, initially published in 2017, continue to remain pertinent topics for research. Over the span of approximately a decade, these articles have stemmed from 83 distinct sources, encompassing 27 articles, 2 books, 8 book chapters, 29 conference papers, 10 conference reviews, 1 editorial, 1 note, and 5 review results. Involving a total of 277 authors, it is noteworthy that 9 articles were authored by individuals who did not collaborate with others. Notably, the artificial intelligence journal exhibits the highest representation of Indonesian researchers. However, none have been registered yet, underscoring the potential for this research to serve as a valuable reference, particularly for Indonesian researchers seeking to engage in international publications on similar themes.

It's imperative to acknowledge certain limitations within this study. Primarily, the research heavily relies on keyword-based data processing without accompanying explanations for the selection of these keywords. Furthermore, the data utilized is restricted to articles published exclusively on Scopus. Indonesian researchers are encouraged to broaden their collaboration networks by engaging with more researchers from other countries, especially those who are highly productive in this thematic

domain. Expanding collaboration opportunities may enhance the prospects for international publications, particularly targeting journals that have previously featured works from Indonesian researchers

Articles with the theme of artificial intelligence and blockchain technology were published in 2017 and are still interesting themes to be researched so far. For about a decade, it originated from 83 sources in the form of 27 articles, 2 books, 8 book chapters, 29 conference papers, 10 conference reviews, 1 editorial, 1 note, and 5 review results. There are 277 authors, with the number of authors who do not collaborate as many as 9 authors on 9 articles. The artificial intelligence journal has the most coverage of Indonesian Researchers. None have been registered yet, so this research is expected to be able to provide references, especially for Indonesian Researchers who will conduct international publications on similar themes. Limitations this research is mostly based on data processing keywords that are not accompanied by reasons for selecting these keywords. In addition, the data used is limited to articles published on Scopus. Indonesian Researchers are advised to collaborate with more researchers from other countries with very productive researchers related to this theme. Opportunities for international publications will also be bigger if the publication targets journals that have published many works from Indonesian Researchers.

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