Exploring the Synergy of AI and Blockchain in Insurance: A Bibliometric Mapping and Analysis of Research Trends

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ABSTRACT
Integrating artificial intelligence (AI) with blockchain in the insurance industry has transformed risk assessment, streamlined claims processing, and enhanced data security, resulting in more efficient and transparent operations. This study conducts a bibliometric analysis to examine the scholarly landscape on AI and blockchain applications in insurance, using Biblioshiny and VOSviewer software to analyze data from the Scopus database. Key metrics explored include Annual Scientific Production, Most Significant Authors, and Most Relevant Sources, shedding light on influential contributors and foundational publications. Additionally, we examined the Most Globally Cited Documents and Trend Topics to trace the evolution of research interest over time. Clustering methods such as Clustering by Coupling and Thematic Mapping provided insights into the structural composition of the field. By assessing the Co-occurrence of Keywords and the Citation Network of Authors, the analysis highlights prominent topics and collaborative patterns. The Co-Authorship by Country metric further reveals international partnerships in advancing AI and blockchain research for insurance. Through this study, several research gaps were identified, such as the need for deeper exploration of human-centered insurance applications and blockchain-based peer-to-peer models. These findings offer valuable insights for researchers and practitioners, guiding future studies and innovations in the field..

1. Introduction

Integrating artificial intelligence (AI) with blockchain technology in the insurance industry is transforming traditional processes and introducing unprecedented levels of efficiency, accuracy, and transparency.(Ahmad & Saxena, 2023). As insurers face increasing demands for fast, personalized services, AI offers powerful tools for data analysis, predictive modeling, and customer insights(Ayaz et al., 2023). With its ability to process vast amounts of information and learn from patterns, AI enables insurers to make more informed decisions on risk assessment, pricing, and claims management(Goyal et al., 2024). Meanwhile, blockchain's decentralized and tamper-proof ledger system addresses pressing issues of trust and data security in insurance, paving the way for more secure and streamlined transactions(Ahmad & Saxena, 2022).

AI's influence on the insurance industry is already apparent, especially in areas like fraud detection, underwriting, and claims processing(Ayaz et al., 2023). By automating these functions, AI reduces administrative costs and enhances the accuracy and consistency of decisions, leading to faster service for policyholders(Gürsev, 2023). Fraud detection, for instance, is strengthened by AI's machine learning algorithms, which can identify suspicious patterns and anomalies within claims data, minimizing the financial losses associated with fraudulent activities(Gomes et al., 2021; Schiller, 2006). Furthermore, AI-driven analytics allow insurers to offer personalized policies and recommendations, adapting to individual customers' needs and improving overall customer satisfaction(Eling et al., 2021).

Blockchain technology enhances AI by offering a secure framework for data sharing and management(Ahmad & Saxena, 2023; Raikwar et al., 2018). Its decentralized nature allows all stakeholders—insurers, policyholders, and regulators—to access a single source of truth, which reduces discrepancies, enhances transparency, and mitigates the risks associated with data breaches(Brophy, 2020; Kaur et al., 2023). Blockchain is particularly valuable for claims

processing, where it can verify data accuracy and automate payouts through smart contracts(Gatteschi et al., 2018; Kapadiya et al., 2022). These self-executing contracts enforce policy terms automatically when predefined conditions are met, ensuring prompt and trustworthy claims settlement without manual intervention, a significant enhancement to customer experience and trust in the industry(Raikwar et al., 2018).

While the integration of AI and blockchain presents significant opportunities for innovation, it also brings challenges that the insurance industry must address(Nimmagadda, 2021). Developing regulatory frameworks, maintaining data privacy, and upskilling employees to work with these advanced technologies are crucial for ensuring sustainable and ethical deployment(Tomar & Sharma, 2023). As research and development in this field continue, a growing body of literature highlights both the transformative potential and the complexities involved in implementing AI and blockchain in insurance("Adoption of Artificial Intelligence to Revolutionise the Insurance Industry," 2023). A bibliometric analysis of these studies can offer insights into emerging trends, key contributions, and future directions, supporting the industry in navigating this technological convergence effectively(Ali et al., 2022).

A bibliometric analysis using Biblioshiny and VOSviewer offers an effective way to explore and map this rapidly expanding research landscape(Husain & Mustafa, 2023; D. Kumar et al., 2023). Biblioshiny, a tool within the bibliometrix package in R, facilitates detailed exploration of bibliometric data, enabling analysis of citation counts, author impact, and collaborative networks(Fahamsyah et al., 2023; Racine, 2012; Salim et al., 2019). VOSviewer complements this by visualizing relationships between key elements such as keywords, authors, and institutions, revealing thematic clusters and collaboration patterns(R. Kumar et al., 2024; Van Eck & Waltman, 2009). Together, these tools enable a comprehensive examination of the scholarly output on AI and blockchain in insurance, helping to identify influential research, leading contributors, and significant trends.

The research objectives of this bibliometric study focus on examining the scholarly literature surrounding the application of blockchain technology and artificial intelligence (AI) in the insurance sector. The study aims to identify critical trends, quantify research output, and trace the growth of interest in this field over time, offering insight into its current state and trajectory. Additionally, the research seeks to pinpoint influential authors, organizations, and research institutions that are contributing significantly to this topic, enhancing understanding of the main knowledge producers and their contributions. Another objective is to explore collaboration patterns among researchers, institutions, and nations, which underscores the global nature of this research area. Furthermore, the study intends to highlight both popular and emerging research topics, subfields, and specific areas of interest within the integration of blockchain and AI in insurance, providing a view of evolving trends. To assess the field's influence, this study will evaluate journal impact factors, citation counts, and related metrics, allowing for an understanding of research impact. Finally, by creating visual representations, such as bibliometric maps and networks, the study aims to depict the research landscape comprehensively and illustrate connections across different research components, offering a cohesive view of the field's development.

2. Literature Review

Chang, Z. (2020) investigates how credit technology and blockchain might be used in the medical insurance industry. In addition to credit services like report generation, appraisal, and consulting, the study highlights the special qualities of blockchain, such as its retrospective, tamper-proof, and decentralized capabilities. The study emphasizes how combining these

technologies might help with common problems like asymmetric information between parties and false claims in medical insurance(Chang, 2020).

[26]Demir, M., Ferworn, A., and Turetken, O. (2020) explores the application of blockchain technology to disaster assistance, highlighting the significance of transparency and trust in the aftermath of a tragedy. The authors suggest a cutting-edge blockchain ecosystem that might encourage resilience in disaster aid, avoid possible fraud, and advance transparency. Additionally, they talk about how this blockchain system might incorporate new players like IoT, indicating a more comprehensive multidisciplinary approach(Demir et al., 2020).

Sood, K., Kaur, R., and B. Kaur (2023) attempt to present an integrated perspective on the ways in which blockchain technology is impacting the insurance sector. The authors demonstrate the revolutionary impact of blockchain technology on fundamental insurance functions by conducting an extensive analysis of scholarly and industry publications. The experts predict that the future incorporation of AI will change the nature of clerical labour and allow for a more streamlined and effective approach in the sector(Kaur et al., 2023).

Ahmad, S., & Saxena, C. (2022)present a detailed analysis of how cutting-edge technologies, especially IoT and blockchain, are revolutionizing the insurance domain. The article sheds light on the myriad advantages these technologies offer to both insurers and insured individuals. It underscores the potential of blockchain in reducing administrative costs for insurers and expediting claims adjustments. Meanwhile, IoT's role in data sharing can provide deeper insights into clients and assist in risk mitigation. The authors also address the challenges faced by digital insurers, emphasizing the importance of transaction safety and combating identity theft(Ahmad & Saxena, 2022).

Ahmad, S. & Saxena, C. (2023) elaborates on the pivotal transformation the insurance industry is undergoing through the incorporation of cutting-edge technologies such as artificial intelligence (AI), Internet of Things (IoT), and blockchain. AI and blockchain are projected to significantly spur the growth of the insurance industry. The recent pandemic has unveiled certain inefficiencies in the traditional systems, highlighting the increasing importance of these technologies. The paper also dives into the advantages and challenges of digital insurance and the concerns that consumers have regarding their transaction security and potential identity theft(Ahmad & Saxena, 2023).

Gürsev, S. (2024) underlines the significant role artificial intelligence plays in modernizing various sectors, with a specific focus on the insurance industry. AI aids in providing competitive advantage through precise customer data analysis. The paper presents an alternative model based on practical data, advocating for innovative methods to drive digital transformation and AI implementations in insurance(Gürsev, 2023).

Rana, A., Bansal, R., & Gupta, M. (2022) This chapter acknowledges the revolutionary impact of big data on businesses, emphasizing its influence on the insurance sector. New analytical techniques are enabling companies to harness their data more effectively. The adoption of big data technologies can streamline workflows, reduce costs, and keep insurance companies competitive. Through case studies and literature analysis, the chapter highlights the transformative power of big data in the insurance sector, with AI playing a central role in reshaping the insurance value chain(Rana et al., 2022).

Kapadiya, K. et al. (2022) shed light on the imperative need for health insurance in today's era, given the rising health concerns. With the surge in electronic health data, there's been a noticeable rise in fraudulent activities. The authors propose a systematic approach using AI and blockchain to secure and detect health insurance fraud. This paper provides a comprehensive

survey and presents a blockchain and AI-empowered architecture for fraud detection in health insurance(Kapadiya et al., 2022).

Eling, M., Nuessle, D., &Staubli, J. (2022) analyze the influence of AI on the insurance sector through Porter's value chain model and Berliner's insurability criteria. The study reveals opportunities for cost efficiencies and new revenue avenues, suggesting a shift in the insurance business model. The research also provides insights into future directions for both academia and industry practitioners in the realm of AI and insurance(Eling et al., 2021).

3. Materials and Methods

We obtained the scientific publications related to the investigation from the Scopus database(Baas et al., 2020; Gavel & Iselid, 2008; Harzing & Alakangas, 2016). We conducted a search using specific keywords such as “Insurance” and “Artificial Intelligence” or “Blockchain”. The search was not restricted to any particular language, and the data included articles from peer-reviewed journals, book chapters, and conference papers. We collected 1908 articles from 1162 different sources, spanning 1985 to 2023. To ensure accuracy, we screened the Scopus records to remove any duplicates. The results were saved as a "CSV" file, and we performed bibliometric analysis on the data using VOSviewer version 1.6.19, and Bibloshiny software. Figure 1 provides a visual representation of the methodology employed in this study, while Table 1 contains detailed information regarding the key components and aspects of the investigation.

Figure 1: The methodology phases

Description	Results
Search Query	(TITLE-ABS-KEY ("insurance") AND TITLE-ABS-KEY ("Artificial Intelligence") OR TITLE-ABS-KEY ("Blockchain")) AND (LIMIT-TO (DOCTYPE , "ar") OR LIMIT-TO (DOCTYPE , "cp") OR LIMIT-TO (DOCTYPE , "ch"))
MAIN INFORMATION ABOUT DATA	
Timespan	1985:2023
Sources (Journals, Books, etc)	1162
Documents	1908
Annual Growth Rate %	-3.49
Document Average Age	4.14
Average citations per doc	11.89
References	54979
DOCUMENT CONTENTS	

Keywords Plus (ID)	9359
Author's Keywords (DE)	4324
AUTHORS	
Authors	5786
Authors of single-authored docs	239
AUTHORS COLLABORATION	
Single-authored docs	251
Co-Authors per Doc	3.62
International co-authorships %	20.75
DOCUMENT TYPES	
Article	849
book chapter	229
conference paper	830

Table 1. Key aspects of the investigation

4. Results and Findings

4.1.Annual Scientific Production

Figure 2 shows the Annual Scientific Production, which depicts the number of articles published each year. The production remained relatively low from 1985 until around 2011. After 2011, there is a significant increase in the number of articles, with a peak around 2021.

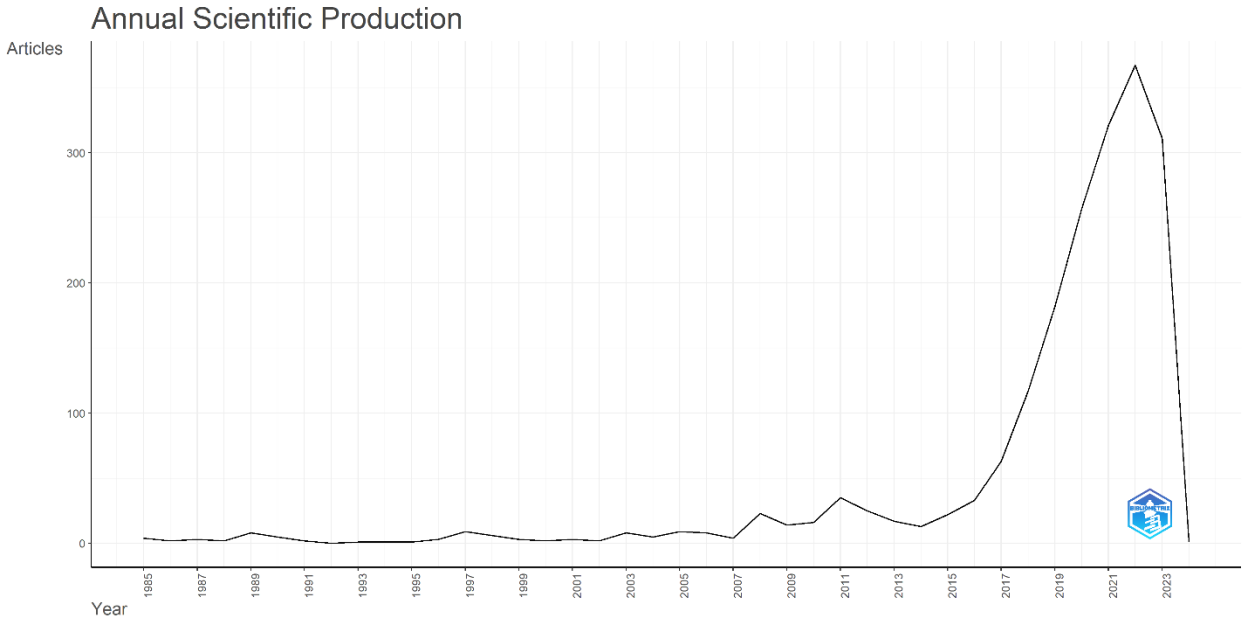

Figure 2. Annual scientific article production from 1985 to 2023

4.2.Most Significant Authors

Figure 3 Most Relevant Authors," showcases the number of documents associated with various authors. "LIU Y" is the most prolific with 13 documents, followed closely by "LI Y" with 11 documents. Both "GUPTA S" and "LI Z" have contributed to 10 documents each. Five authors, namely "KUMAR S," "LIU X," "LU Y," "WANG J," "WANG L," and "WANG S," have each authored 9 documents. The chart visually represents these numbers with horizontal bars, using the number of documents as the metric on the X-axis.

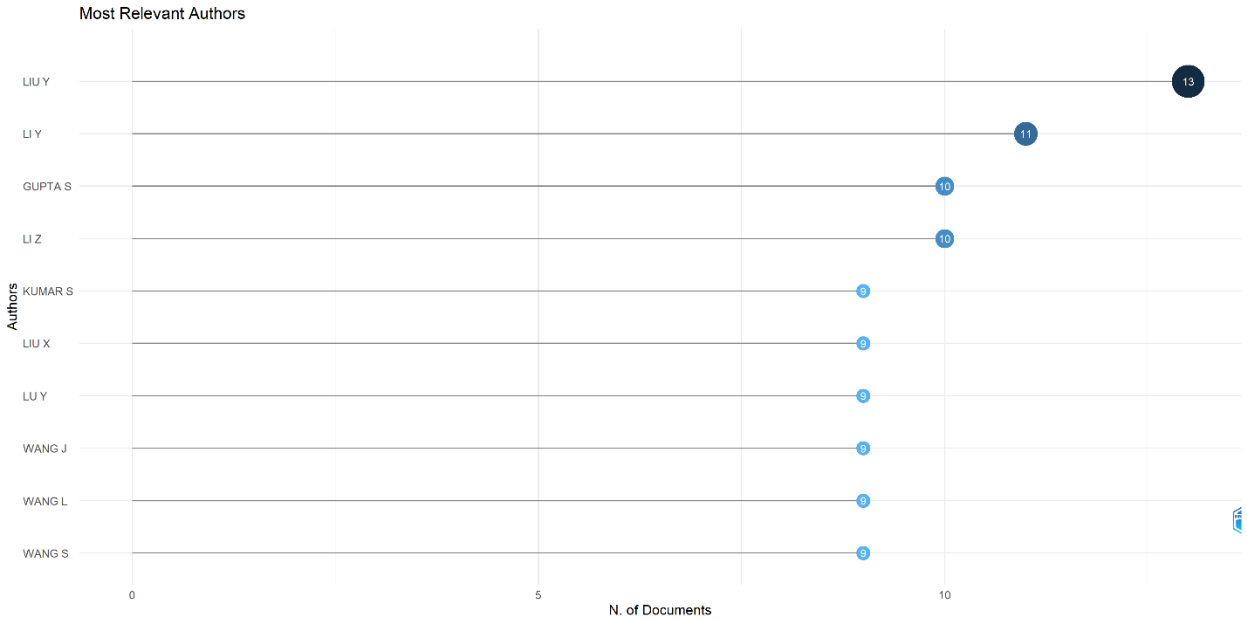

Figure 3 Most relevant authors

4.3.Most Relevant Sources

Figure 4 illustrates the Most Relevant Sources and presents the number of documents associated with various academic and research sources. The source "Lecture Notes in Computer Science (including subseries)" stands out as the most frequently cited with 67 documents. Following this, "Lecture Notes in Networks and Systems" has 38 documents. "Communications in Computer and Information Science" has contributed to 31 documents. "ACM International Conference Proceeding Series" has 26, while "IEEE Access" accounts for 22 documents. "Advances in Intelligent Systems and Computing" has 21 documents. The "2011 2nd International Conference on Artificial Intelligence" has been cited in 16 documents, and the "Journal of Medical Internet Research" has 15. Lastly, "Lecture Notes in Electrical Engineering" and "Studies in Health Technology and Informatics" have 14 and 11 documents, respectively. The horizontal bars visually depict these numbers, with the count of documents represented on the X-axis.

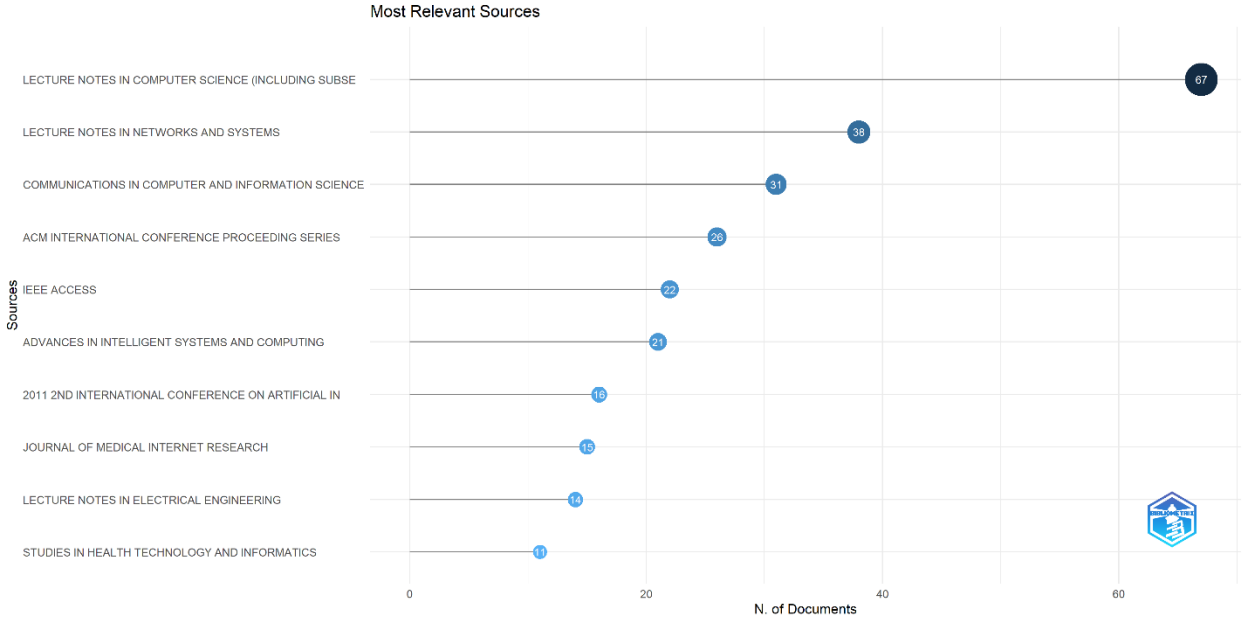

Figure 4. Most relevant Sources

4.4.Most Global Cited Documents

Table 2 illustrates the most cited documents worldwide at the intersection of insurance and AI, highlighting several key studies that have significantly influenced research in this field.Kusner et al. (2017) lead with 632 total citations, highlighting its influential contributions, particularly in AI frameworks and neural information processing. With an impressive TC per Year of 90.29 and a Normalized TC of 12.4, this study's foundational methodologies have propelled advancements in AI applications across various fields, including insurance. Dorri et al. (2017) ranks closely, emphasizing AI's integration with blockchain, as indicated by 82.43 TC per Year and a Normalized TC of 11.32. Such work underscores the critical role of secure, decentralized systems in insurance processes. Tanwar et al. (2020) stand out with the highest TC per Year (133) and Normalized TC (32.99), reflecting its recent, impactful insights into AI-enhanced security applications, crucial for managing sensitive insurance data. Other notable contributions include Ling et al. (1998) and Finlayson et al. (2019), which offer early advancements in data mining and security for AI systems. These studies continue to shape current methodologies for risk assessment, fraud detection, and customer data handling in insurance. This collection of highly cited works illustrates a trend toward integrating robust AI and blockchain systems to enhance efficiency, transparency, and security in the insurance industry.

Paper	Total Citations	TC per Year	Normalized TC
KUSNER M, 2017, ADV NEURAL INF PROCES SYST	632	90.29	12.4
DORRI A, 2017, IEEE COMMUN MAG	577	82.43	11.32
TANWAR S, 2020, J INF SECUR APPL	532	133	32.99
LING CX, 1998, PROC INT CONF KNOWL DISCOVERY DATA MINING, KDD	505	19.42	5.57
LIANG X, 2017, IEEE INT SYMP PERSON INDOOR MOBILE RADIO COMMUN PIMRC	453	64.71	8.89
FINLAYSON SG, 2019, SCI	447	89.4	27.89
DATTA A, 2016, PROC - IEEE SYMP SECUR PRIVACY, SP	407	50.88	12.78
DAI J, 2017, J INFO SYST	366	52.29	7.18
GATTESCHI V, 2018, FUTURE INTERNET	326	54.33	8.57
CHEN L, 2019, FUTURE GENER COMPUT SYST	324	64.8	20.22

Table 2. Most globally cited documents.

4.5.Trend Topics

Trend topics depicted in Figure 5 offer insights into the evolution of trend topics over time. Notably, post-2010s, there's a clear emergence of topics such as "Healthcare - electronic health", "Mental health - blockchain", and "Machine learning - deep learning". These topics have seen a significant surge in popularity in recent years. Additionally, "Artificial intelligence" and "risk assessment" have also shown substantial growth, particularly after the mid-2010s. In contrast, some topics, like "classification (of information)", "decision support system", and "clinical decision support systems", have maintained a relatively steady frequency throughout the years, indicating their consistent relevance. Interestingly, earlier computing and administrative concepts, such as "computer program", "administrative data processing", and "expert systems", were more prevalent around the 1980s and early 1990s. However, their prominence has either stabilized or declined in the subsequent decades. The same trend can be observed for "Managed

care programs" and "computer system workload". In particular, the term "Blockchain - human insurance" stands out, witnessing a sharp increase in the late 2010s to early 2020s. Overall, this graph paints a comprehensive picture of the shifting interests within the research and tech community over the years.

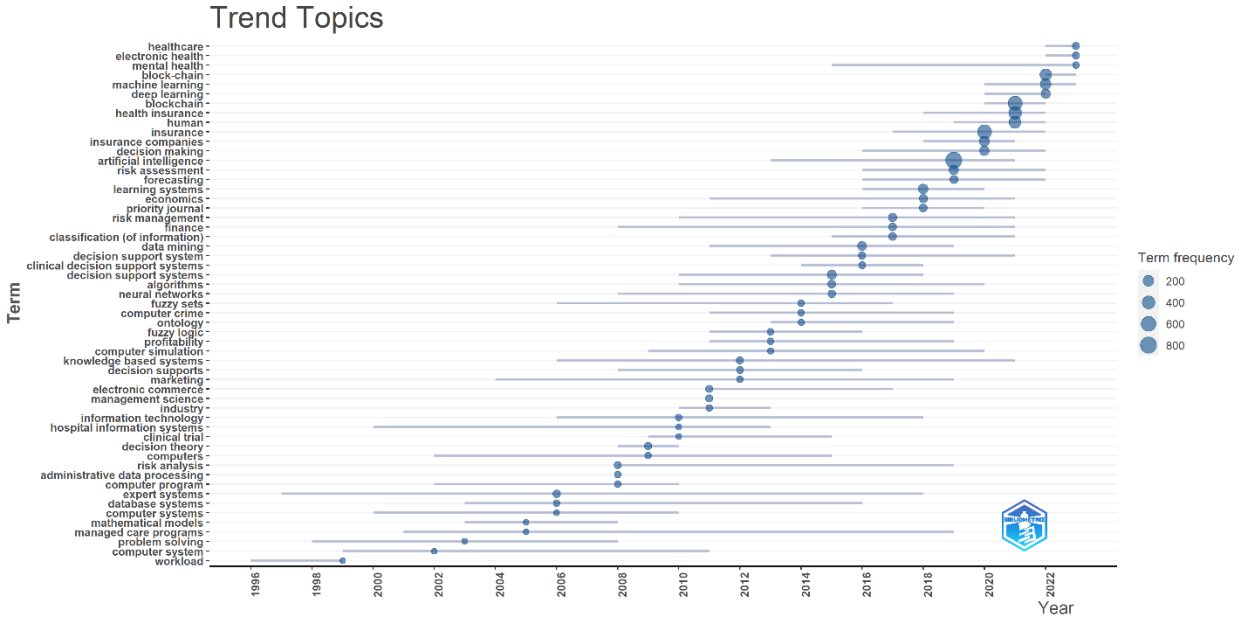

Figure 5. A visual representation of the popularity of various topics

4.6.Clustering by Coupling

Figure 6 provides a detailed visualization of clusters based on document coupling, segmented across the dimensions of Impact and Centrality. Four predominant topics emerge: "blockchain", "block-chain", "health care", and "insurance". In the top-left quadrant, which signifies greater impact but lesser centrality, topics such as "blockchain" (26.6% confidence), "block-chain" (31.1% confidence), and "health care" (44.7% confidence) are found. These are influential within the document clusters but might not be at the heart of most discussions. Conversely, the top-right quadrant, representing high values on both axes, includes "blockchain" (45.2% confidence), "insurance" (47.5% confidence), and "block-chain" (32.4% confidence). These topics are not only impactful but also recurrent themes in the documents. The bottom-right quadrant, denoting recurrent but less influential topics, encompasses "blockchain" (9.6% confidence), "health care" (19.1% confidence), and "block-chain" (9.5% confidence). Meanwhile, the bottom-left quadrant, which highlights topics with lower scores on both axes, contains "blockchain" (7.3% confidence), "block-chain" (13.5% confidence), and "insurance" (11.5% confidence). An interesting observation is the standalone topic "internet of things" with a confidence of 18.9%, positioned between the high centrality quadrants, suggesting its emerging significance. In essence, the graph offers an insightful understanding of the interplay between the centrality and impact of various subjects within the analyzed document clusters.

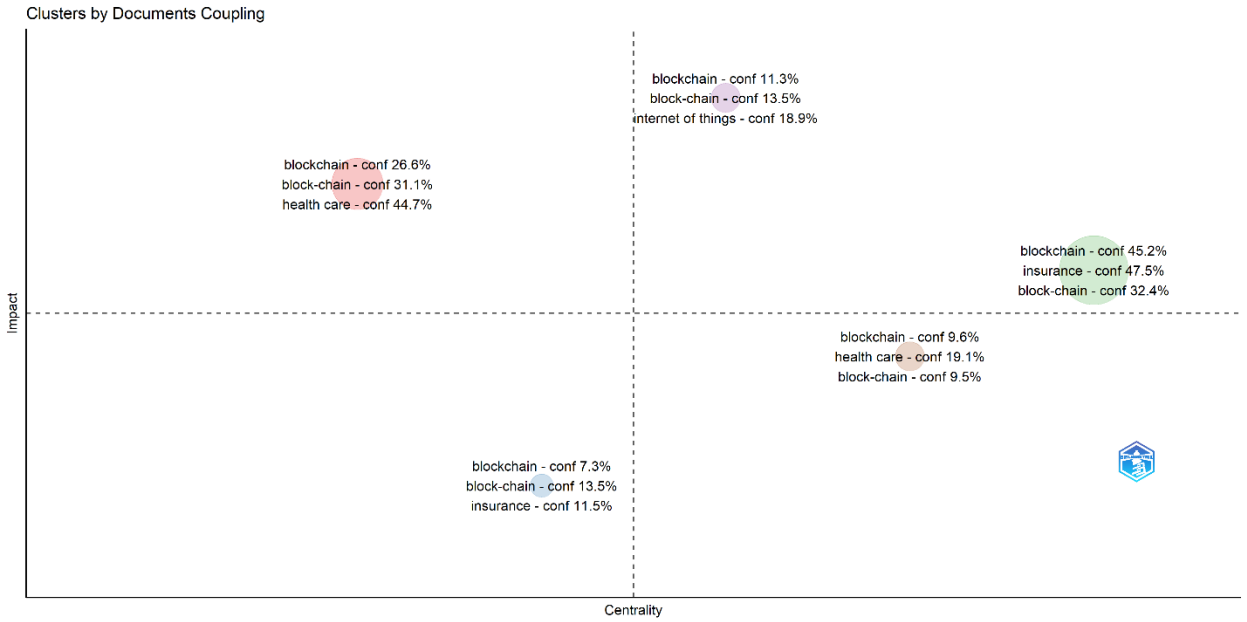

Figure 6. Clustering by coupling

4.7.Thematic Map

Figure 7 elucidates on various themes based on their Development Degree (Density) and Relevance Degree (Centrality). On the top-left quadrant, labeled as "Niche Themes", we can observe three main topics: "artificial intelligence", "health insurance", and "human". These topics, while highly developed or specific, may not be central to the general discussions in the dataset. Conversely, the top-right quadrant, labeled "Motor Themes", remains vacant, suggesting that there aren't any themes that dominate both in specificity and centrality. The bottom-right quadrant, tagged as "Basic Themes", comprises three principal subjects: "blockchain", "insurance", and "block-chain". These themes are central and recurrent but perhaps not as densely developed or specialized. Lastly, the bottom-left quadrant is termed "Emerging or Declining Themes", and interestingly, it doesn't feature any topics, implying that there aren't any subjects that are both low in development and relevance in the present dataset. In summary, the graph offers a comprehensive understanding of how different themes stand in terms of their development and centrality within the analyzed set.

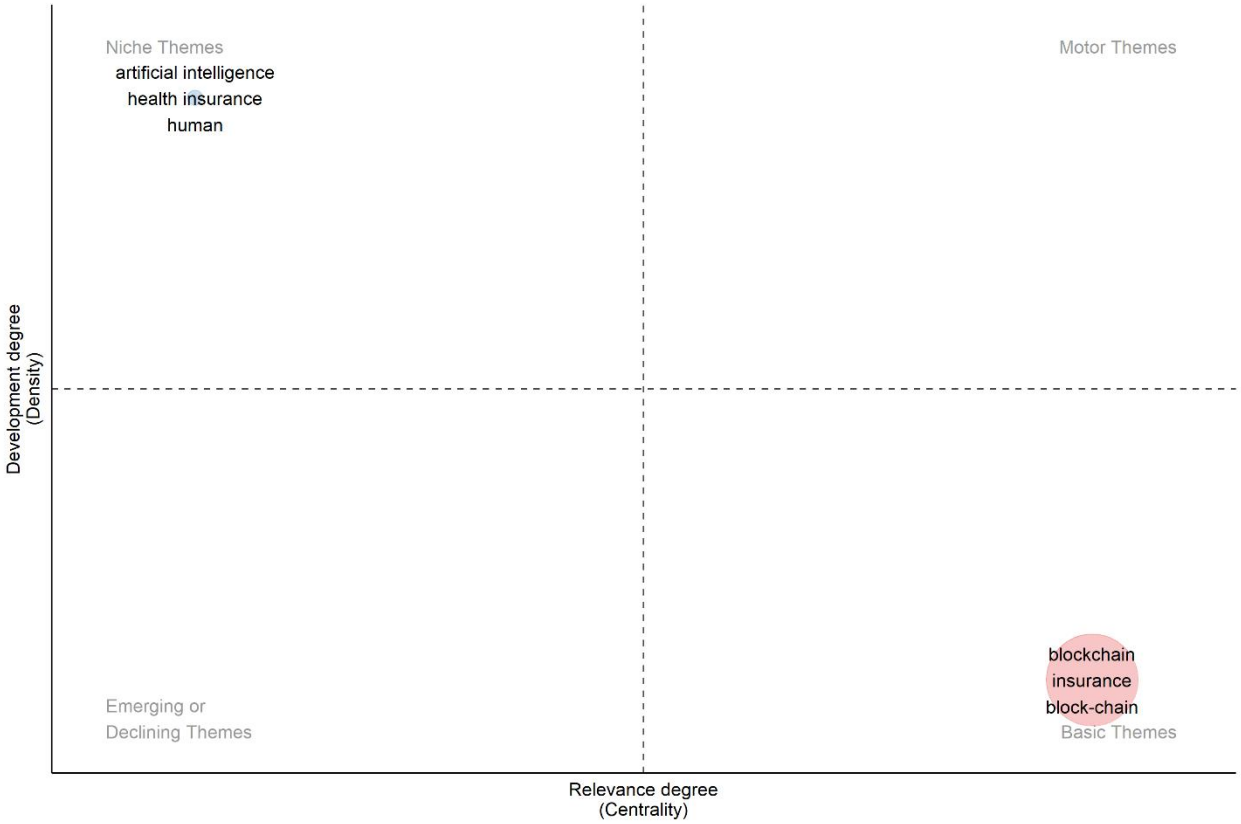

Figure 7. Thematic map

4.8.Co-occurrence of all keywords

Figure 8 presents a keyword co-occurrence map, revealing the intricate relationships between various terms in the dataset. Dominant terms like "blockchain," "health insurance," "artificial intelligence," and "human" stand out, signifying their high occurrence. The "blockchain" cluster in green includes related concepts such as "smart contracts" and "digital storage," highlighting the association between blockchain technology, data storage, and decentralized application development. Nearby, the "health insurance" cluster in yellow is closely tied with "healthcare" and "telemedicine," underlining its importance in healthcare administration and policy. The "artificial intelligence" cluster in red encompasses terms like "decision making" and "algorithms," indicating AI's central role in analytics and decision processes. The "human" cluster in blue, connected with "demographics" and "mortality," reflects a focus on human health and demographic studies. The map's interwoven lines suggest interconnected themes, exemplifying the multifaceted nature of the subject matter and the overlap between AI, healthcare, blockchain, and human-centric studies.

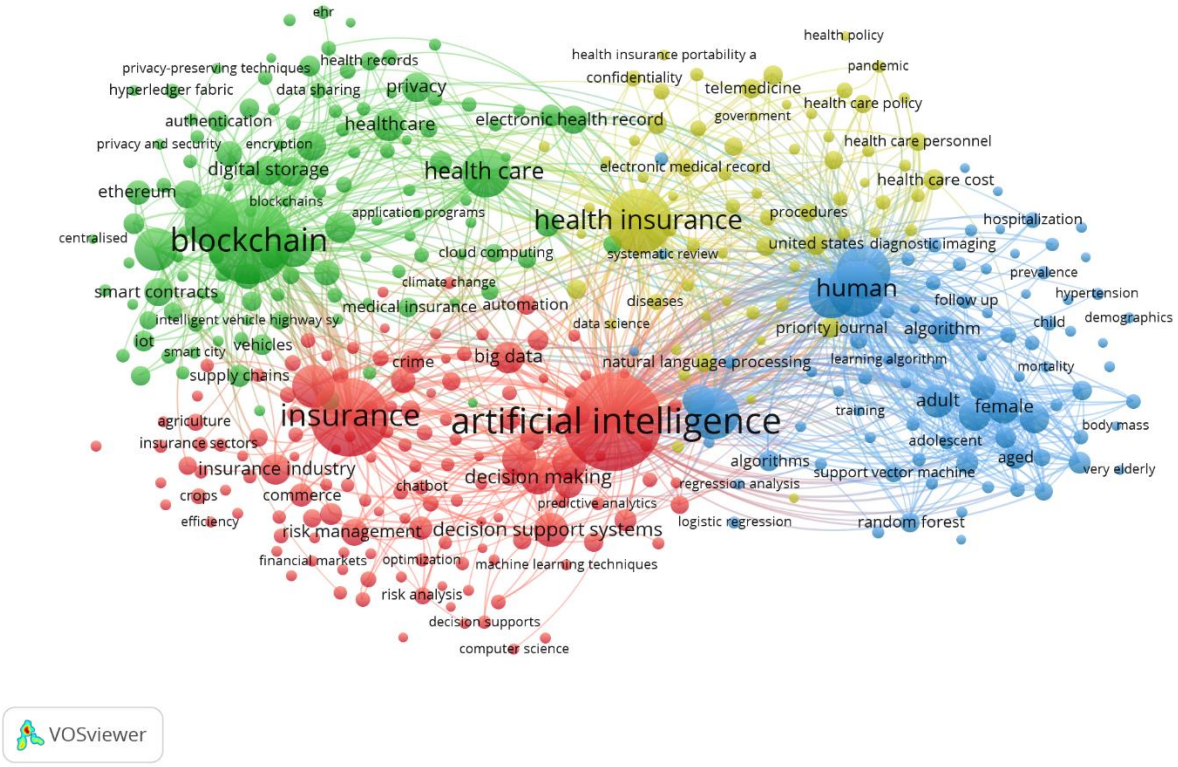

Figure 8. Co-occurrence network map of all keywords

4.9.Citation network of authors

Figure 9 presents a citation network of authors, revealing how frequently their works are cited together. Central to this network are notable authors such as "thakora.v. (2020)", indicating a significant contribution from this author in 2020. The collaboration between "dorri a.; steger m.; kanhere s." is evident, showcasing a joint research effort. Another collaboration spotlighted is "dai j.; vasarhelyim.a. (2017)", emphasizing their combined research endeavors in 2017. Similarly, the group "beckera.s.; marcon m.; ghafoo" stands out, suggesting a collective academic pursuit. Additional clusters of significance include "finlaysons.g.; bowers j.d." and "kusner m.; loftus j.; russell". "datta a.; sen s.; zick y. (201)" and "ling c.x.; li c. (1998)" also emerge as noteworthy collaborations. The intricate web of interconnections between these clusters provides a glimpse into the academic relationships and influences among these researchers, underscoring the interplay of their works within the scholarly realm.

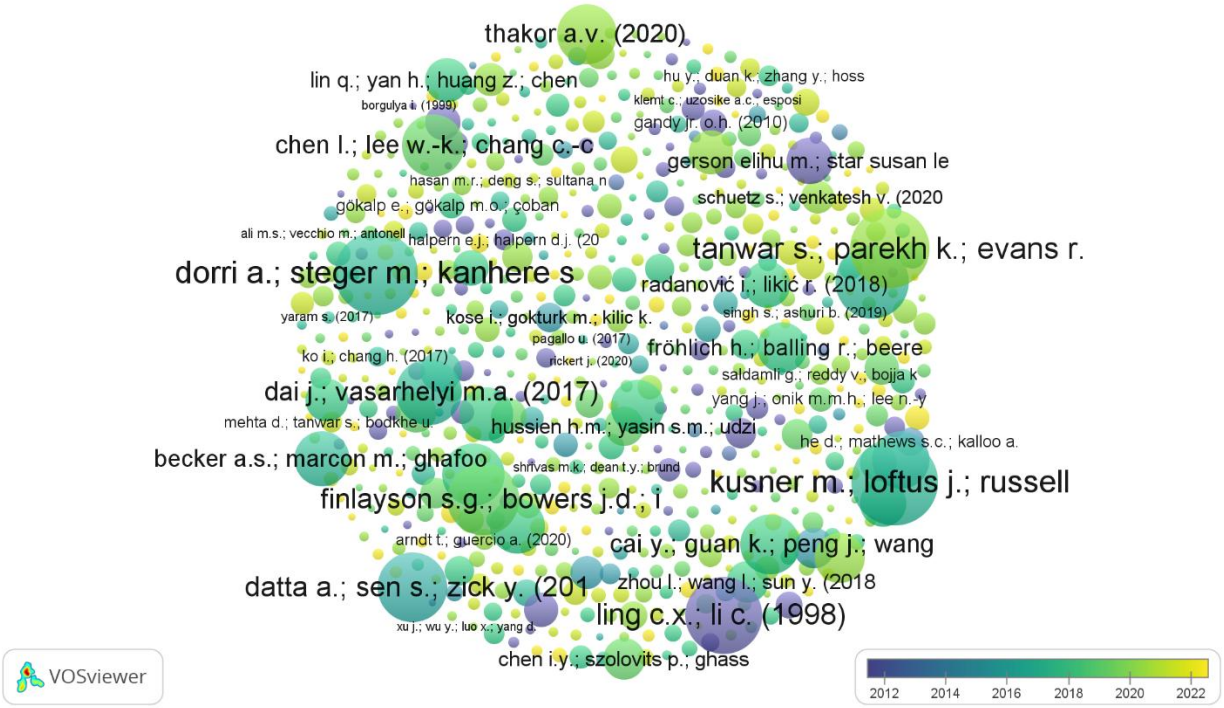

Figure 9. Citation network of authors

4.10. Co-Authorship Country

The visualization in Figure 10 showcases a comprehensive network map, delineating intricate connections between various countries. Predominant countries like China, India, the United States, and the United Kingdom are central nodes, implying substantial interactions or collaborations with other nations. Surrounding these central hubs are clusters of other countries which indicate regional affiliations or commonalities. For instance, in the Asian region, notable connections exist between South Korea, Japan, China, and Malaysia. In the European sector, Germany, Italy, Spain, and the United Kingdom form a dense nexus. North American ties are evidenced by the close links between the United States and Canada. Moreover, smaller nodes such as Estonia, Israel, and Bahrain suggest more specialized or limited interactions. The web of interconnections provides a vivid illustration of global collaborations, alliances, or interactions, underscoring the interconnectedness of the modern world.

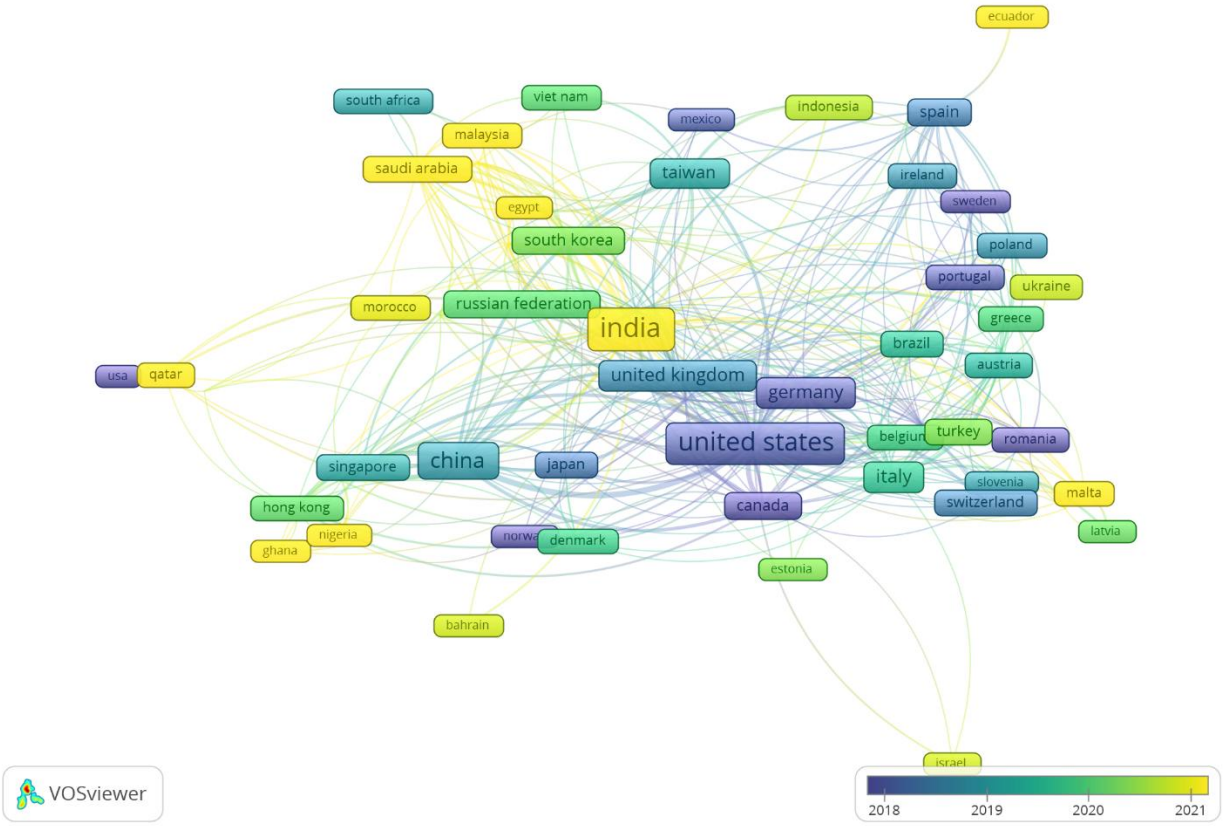

Figure 10. Co-authorship of countries

5. Discussions

In assessing the "Most Significant Authors" data, several intriguing patterns emerge that illuminate the broader landscape of this research domain. A striking observation is the prevalence of authors with surnames such as "LIU", "LI", and "WANG". This concentration suggests a possible trend highlighting Asia's—particularly China's—growing significance in the field, underscoring potential regional hubs of research and innovation. Furthermore, this trend may also hint at interdisciplinary collaborations among these authors, an indication of collective efforts towards more comprehensive research. Shifting the lens to the sources of these research papers, platforms like "Lecture Notes in Computer Science" and "Lecture Notes in Networks and Systems" take the limelight, emphasizing their pivotal role in shaping academic discourse in this area. Their dominance implies a commitment to rigorous peer reviews and content quality, resonating with the research community's needs. However, perhaps what stands out most vividly is the evolving trajectory of research topics over time. Post-2010, there's a conspicuous gravitation towards the confluence of healthcare and technology, seen in the rise of topics like "Healthcare - electronic health" and "Mental health - blockchain". Additionally, the increasing significance of "Machine learning - deep learning" accentuates the rapid advancements in AI techniques. While these emerging areas of interest are undeniably vital, the consistent relevance of foundational areas such as "classification (of information)" and "decision support system" should not be overlooked. Yet, as we trace the evolution of computing concepts, it's evident that once-dominant topics from the 1980s and 1990s, like "computer program" and "administrative data processing", are gradually being overshadowed. A notable spike in terms such as

"Blockchain - human insurance" during the late 2010s and early 2020s may be heralding the next frontier in research and applications. As we navigate this dynamic terrain, these trends offer invaluable insights for stakeholders, from academic institutions to industry professionals, guiding them to remain at the forefront of this evolving domain.

6. Research Gaps

This analysis reveals several research gaps that highlight areas needing further exploration and development. Based on trend topics, we observe a growing focus on advanced applications like "Healthcare - electronic health," "Mental health - blockchain," and "Machine learning - deep learning" post-2010s. This indicates a shift towards specialized uses of AI and blockchain in sectors related to insurance, such as healthcare and mental health, yet there is limited research on how these applications can be adapted specifically for insurance purposes. Particularly, the unique intersection of blockchain with "human insurance" is an emerging trend, yet this field lacks comprehensive studies on the practical integration of these technologies within traditional insurance frameworks. Investigating how blockchain can enhance trust, transparency, and efficiency in human insurance policies could bridge an important gap.

The thematic map further identifies "artificial intelligence," "health insurance," and "human" as niche themes, suggesting they are well-developed in specialized contexts but are not central to the broader discourse on AI and blockchain in insurance. This points to an opportunity for research that integrates these niche themes into core insurance discussions, examining how AI and blockchain can improve insurance processes beyond isolated applications. For instance, AI and blockchain's impact on personalized health insurance models, human-centered risk assessment, and predictive analytics in life insurance remain underexplored yet promising areas. Since the top-right "Motor Themes" quadrant is vacant, it highlights the absence of any topics that dominate the field both in development and relevance, underscoring a gap in universally central and highly developed themes that could drive the future discourse on AI and blockchain in insurance.

Basic themes like "blockchain," "insurance," and "block-chain," identified in the bottom-right quadrant, are central to the field but appear less specialized. While these topics are foundational, the lack of nuanced development suggests that more specialized research is needed to delve deeper into blockchain's specific applications in insurance. For example, there is an opportunity to explore blockchain's role in claims processing, fraud prevention, and smart contracts, as these applications remain essential but are underdeveloped in comparison to broader AI and blockchain applications. Moreover, the absence of any themes in the "Emerging or Declining Themes" quadrant signals a lack of innovation in peripheral areas that could diversify and expand the field. Further research could identify and develop emerging topics, such as blockchain-powered peer-to-peer insurance and AI-driven regulatory compliance, to introduce new perspectives and fill this thematic void.

Conclusion

This bibliometric analysis reveals that AI and blockchain have made substantial contributions to improving risk assessment, claims processing, and data security in the insurance industry. Key insights from the study highlight influential authors, emerging trends, and critical areas in need of further research, as evidenced by theme clustering and citation networks. While foundational themes like fraud prevention and data transparency are well-covered, more exploration is needed in areas such as human-centered insurance applications and blockchain-enabled peer-to-peer insurance models. To address these gaps, it is recommended that future research focus on developing specialized applications tailored to enhance customer experience and engagement in

insurance. Additionally, establishing stronger interdisciplinary collaborations between AI experts, blockchain developers, and insurance professionals can foster innovative and holistic solutions. Finally, regulatory frameworks need to evolve in tandem with technological advancements, ensuring a secure, compliant environment that encourages innovation. These recommendations aim to advance AI and blockchain integration in insurance, supporting the industry's shift toward greater transparency, efficiency, and customer-centric services.

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