Bibliometric analysis into Artificial Intelligence in Crime Management: Trends, Challenges, and Future Directions

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Abstract
This bibliometric analysis investigates the expansive terrain of artificial intelligence (AI) within the context of crime management. Our study spans two decades of academic publications, revealing a pronounced growth in research, particularly within the last five years. We delineate the global distribution of this scholarly work, identifying India, China, and the United States as the predominant contributors to the field. Prominent authors like Ajith Abraham P. and Arputharaj Kannan emerge as significant figures, influencing the research direction through their pioneering themes and methodologies. Institutional contributions are led by King Saud University and Anna University, indicating a concentrated effort in advancing AI for law enforcement. The analysis highlights key research trends focusing on cybersecurity, network security, and predictive analytics, illustrating the field's evolution toward addressing digital age crime. The collective findings demonstrate an international commitment to leveraging AI for more effective crime management strategies while considering the ethical implications of technology in law enforcement.
Keywords: Artificial Intelligence, Crime Management, Bibliometric Analysis, Predictive Policing.

Introduction
Artificial intelligence (AI) has revolutionized crime management by offering advanced tools for predictive policing, real-time surveillance, and forensic analysis. By harnessing the power of machine learning and data analytics, AI enables law enforcement agencies to process extensive data sets, facilitating the identification of patterns and correlations in criminal behavior (Hayward & Maas, 2021). This integration of AI technologies has significantly

improved the efficiency and effectiveness of crime prevention and investigation strategies, leading to a more responsive and proactive law enforcement paradigm (Hung & Yen, 2021).

The scholarly exploration of AI in crime management has yielded a rich body of literature, focusing on the application of AI in various aspects of law enforcement, including predictive policing, cybercrime detection, and forensic science (Olowe et al., 2023). Research indicates that AI-driven tools not only enhance operational capabilities but also pose challenges related to privacy, ethics, and accountability.mThe literature emphasizes the need for a balanced approach that leverages AI's potential while addressing its societal and ethical implications. Given the rapid advancements in AI technology and its growing impact on crime management, it is crucial to systematically analyze and synthesize the existing research in this field. This bibliometric analysis aims to map the development of AI in crime management, highlighting key trends, authors, and research gaps By examining the evolution of this interdisciplinary field, the study will provide insights into the future direction of AI applications in law enforcement and contribute to the development of best practices and policy frameworks. The research question for this analysis are:

1. How has the bibliometric landscape of artificial intelligence in crime management evolved globally, and which countries have been the most active in this research area?
2. What are the leading nations in research on artificial intelligence for crime management, and how has their scholarly output changed over time?
3. Who are the foremost authors in artificial intelligence for crime management, and what are their primary research themes and methodologies?
4. Which organizations (such as universities, research institutes, and companies) are the most influential in the field of artificial intelligence for crime management, and how do their contributions stand out?
5. What are the key research trends in artificial intelligence for crime management as indicated by the top 10 keywords, and what does this imply about the development of the field?

Methodology
Research Framework
This study follows the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) framework to perform a bibliometric analysis of literature related to artificial intelligence (AI) in crime management. The analysis covers publications from 2003 to 2023, all in English.

Data Sources and Search Strategy
The search was executed in major scientific databases such as Web of Science, Scopus, and IEEE Xplore. The applied search string was: TITLE-ABS-KEY (artificial AND intelligence AND crime AND management) AND PUBYEAR > 2002 AND PUBYEAR < 2024 AND (LIMIT-TO (LANGUAGE, "English")).

Inclusion and Exclusion Criteria

Criteria for including and excluding studies are summarized in Table 1

Table 1

Criteria for including and excluding studies

Criteria	Inclusion	Exclusion
Time Frame	Published between 2003 and 2023	Published before 2003 or after 2023
Language	English	Non-English
Subject	Pertains to AI in crime management	Irrelevant to AI's application in crime management
Document Type	Peer-reviewed articles, conference papers, book chapters	Editorials, commentaries, reviews, and non-peer-reviewed material

Study Selection

The process for study selection involved:
- Screening titles and abstracts for relevance.
- Assessing full texts against inclusion and exclusion criteria.
- Selecting studies for detailed analysis.

Data Extraction

- Data extracted from each selected publication included:
- Year of publication
- Authors and affiliations
- Geographic origin
- Study objectives, methods, and key findings

Quality Assessment

The quality and relevance of the studies were assessed based on their citation impact, journal impact factor, and alignment with the research theme.

Data Analysis

- Bibliometric methods were used to:
- Identify trends and patterns in publication over time.
- Map the geographical distribution of research.
- Analyze the network of authorship and collaboration.
- Extract and analyze frequently used keywords and topics.

Presentation of Results

The results are displayed through statistical charts, trend analyses, geographic mapping, and network diagrams to illustrate the research landscape in AI and crime management. The methods of this study used PRISMA framework as illustrated in figure 1.
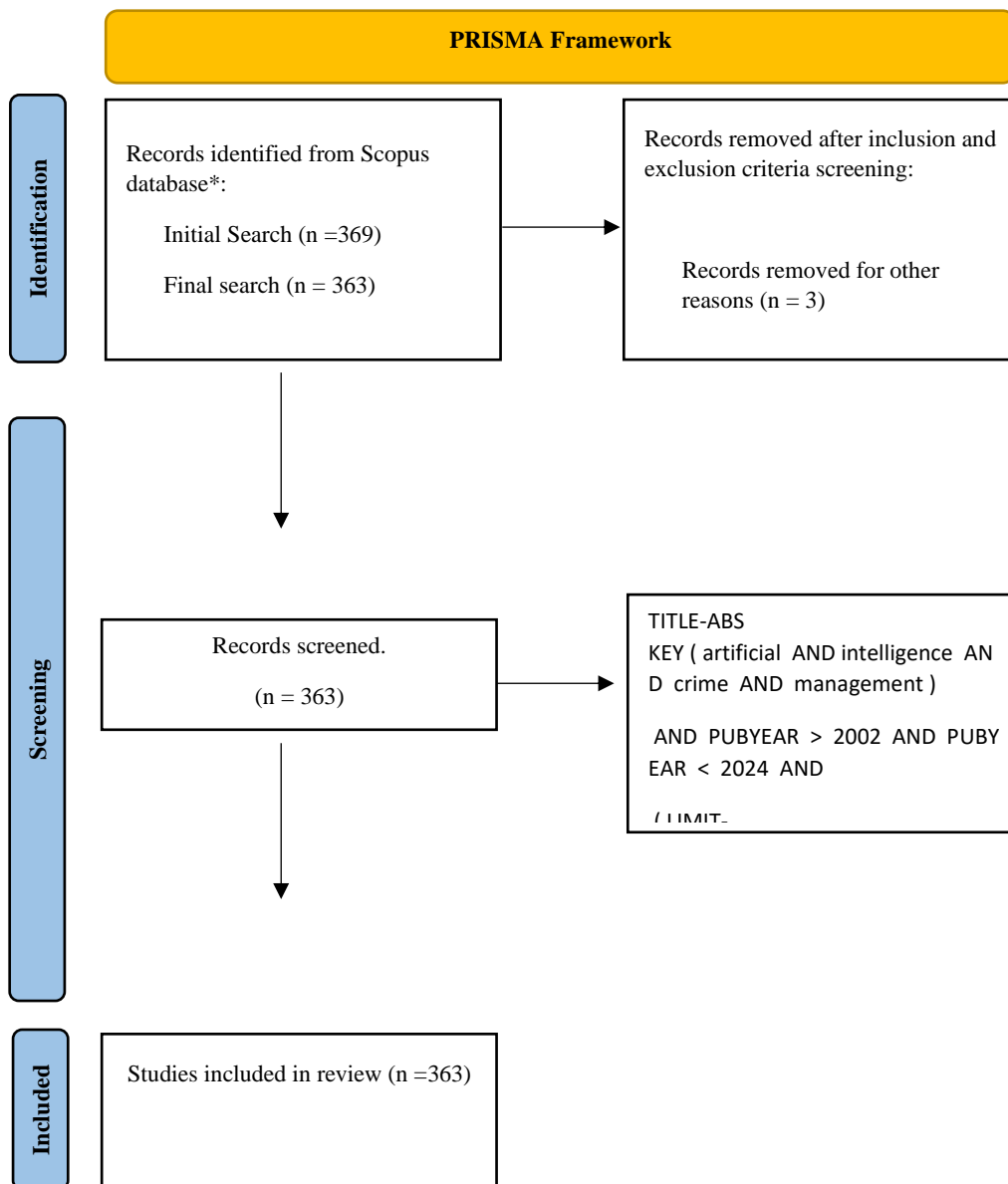
PRISMA Framework

Identification

Records identified from Scopus database*:

    Initial Search (n =369)

    Final search (n = 363)

Records removed after inclusion and exclusion criteria screening:

    Records removed for other reasons (n = 3)

Screening

Records screened.

(n = 363)

TITLE-ABS KEY (artificial AND intelligence AND crime AND management)

AND PUBYEAR > 2002 AND PUBYEAR < 2024 AND

(LIMIT-

Included

Studies included in review (n =363)

Figure 1: PRISMA framework

Results

How has the bibliometric landscape of artificial intelligence in crime management evolved globally, and which countries have been the most active in this research area?

Based on the provided data showing the number of publications per year related to artificial intelligence in crime management, we can analyze the bibliometric landscape and identify trends and active countries in this research area. Figure 1 illustrates the Publications by years.
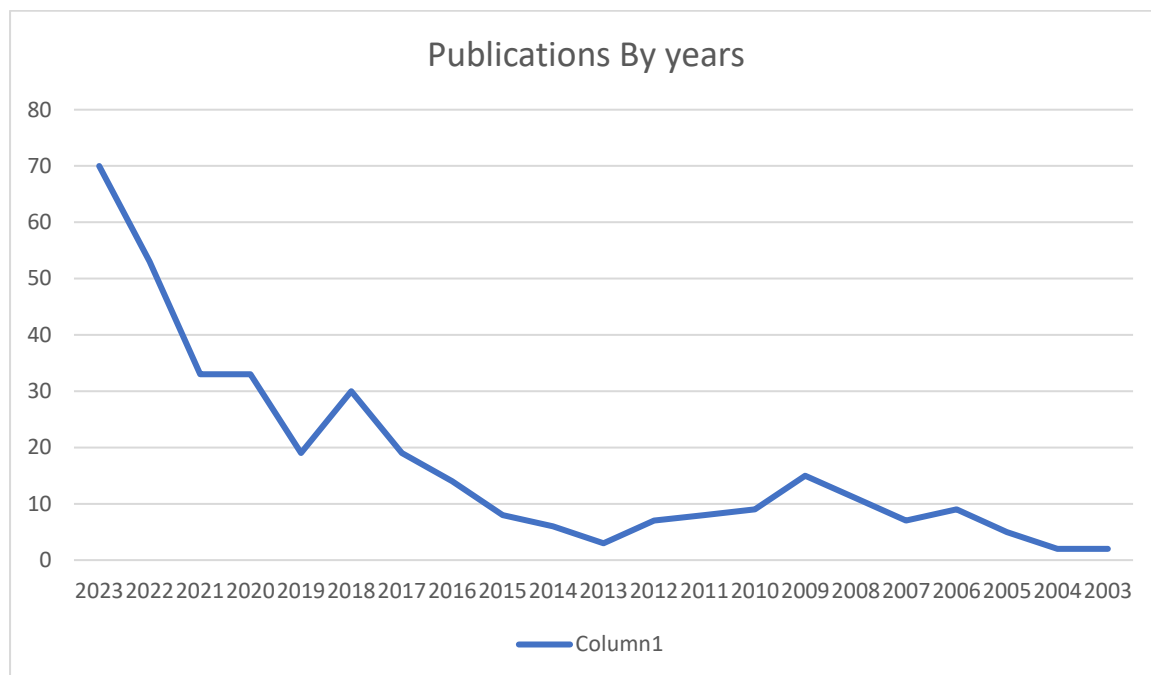
Figure 2: Publications by years

Figure 2 reveals a clear trend of increasing publication activity in the field of artificial intelligence (AI) in crime management over the last two decades. From 2003 to 2023, there has been a noticeable growth in the number of publications, with a significant acceleration in recent years. Initially, in 2003 and 2004, the field was in its nascent stages, with only 2 publications each year. This number remained relatively low and stable, with a gradual increase until 2015. However, starting from 2016, there is a more pronounced upward trend, with the numbers nearly doubling by 2018 and reaching a peak of 70 publications in 2023.

This upward trajectory indicates a growing interest and investment in the research of AI applications in crime management, reflecting advancements in AI technology and its increasing relevance to law enforcement and crime prevention strategies.

What are the leading nations in research on artificial intelligence for crime management, and how has their scholarly output changed over time?

The data highlights India, China, and the United States as the top three countries in terms of the number of publications related to AI in crime management. India leads with 61 publications, followed by China with 49, and the United States with 43. These countries are known for their significant investments in AI research and development, which is reflected in their active contribution to this domain. Figure 3 shows the publications by contries.
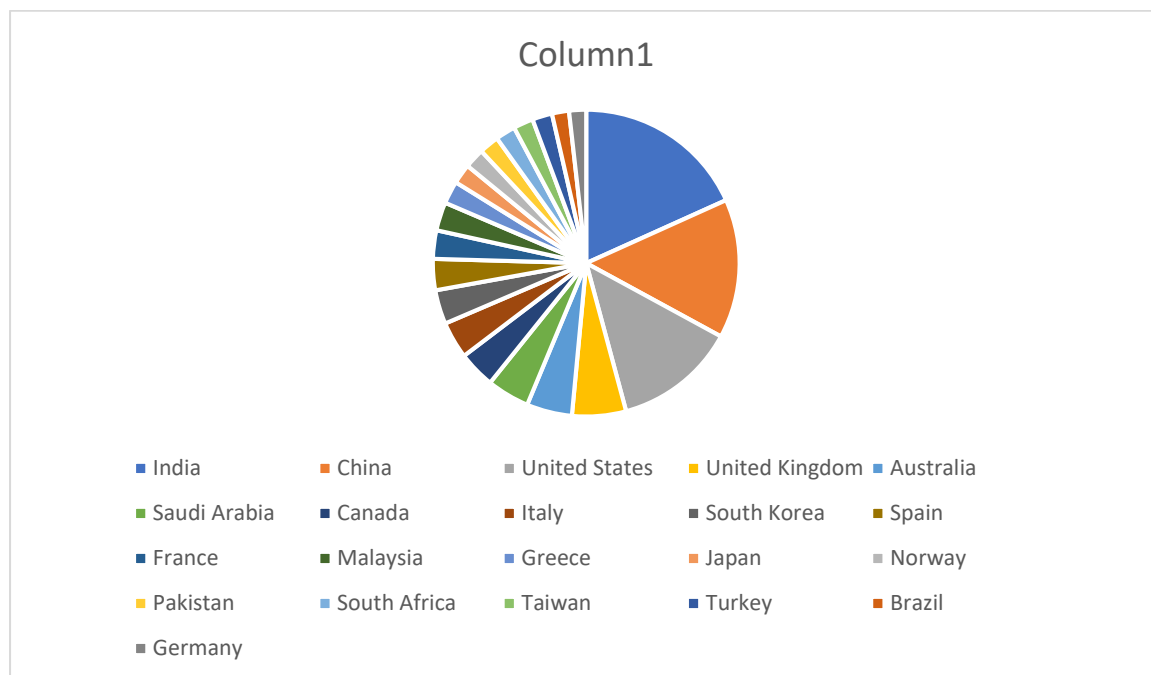
Figure 3: publications by contries

Figure 3 shows that the United Kingdom, Australia, and Saudi Arabia also show notable scholarly output, with 19, 16, and 15 publications respectively. Other countries like Canada, Italy, South Korea, and Spain contribute actively as well, indicating a global interest and diverse international efforts in the research of AI applications in crime management. While the data provided does not break down the number of publications by year for each country, the overall increase in publications from 2003 to 2023 suggests a global trend of growing research interest and investment in AI for crime management. Countries like India, China, and the United States, which have robust technology sectors and strong academic and research infrastructures, have likely seen a consistent increase in their scholarly output over time.

The emergence of countries like Saudi Arabia and Malaysia in this list indicates that the interest in AI for crime management is expanding beyond the traditional tech powerhouses to include a wider range of nations, each contributing to the global knowledge base. In summary, the research on AI in crime management is not only growing in volume but also becoming more geographically diverse, with countries from different regions actively participating and contributing to the advancements in this field.

Who are the foremost authors in artificial intelligence for crime management, and what are their primary research themes and methodologies?

In the intersection of artificial intelligence (AI) and crime management, a few pioneering researchers stand at the forefront, shaping the trajectory of this dynamic field. The inquiry into who these key authors are, alongside their central research themes and methodologies, is not just about recognizing leading voices; it also unveils the focal issues and innovative approaches driving progress in the use of AI to tackle complex challenges in crime prevention and law enforcement. Table 2 shows the top 10 authors in the field of artificial intelligence (AI) and crime management.

Table 2

The top 10 authors in the field of artificial intelligence (AI) and crime management

	Author	TP	TC	H-index	Number if publications in the field	Country	Affiliations
1	Agbinya, Johnson Ihyeh	127	1,895	18	3	Australia	Melbourne Institute of TechnologyThe institution will open in a new tab, Melbourne,
2	Kannan, Arputharaj	341	5,385	35	3	India	College of Engineering, GuindyThe institution will open in a new tab, Chennai,
3	Phiri, Jackson	50	108	6	3	Zambia	University of ZambiaThe institution will open in a new tab, Lusaka,
4	Ajith, Abraham P.	1,393	29,971	82	2	India	Bennett UniversityThe institution will open in a new tab, Greater Noida,
5	Azuma, Hiroaki	10	23	3	2	Japan	Hazs Corporation, Tokyo,
6	Bharati, Manisha Prakash	7	23	2	2	India	Savitribai Phule Pune UniversityThe institution will open in a new tab, Pune,
7	Corchado, Emilio S.	375	3,689	30	2	Spain	Universidad de SalamancaThe institution will open in a new tab, Salamanca,
8	Herrero, Álvaro	174	1,105	19	2	Spain	Universidad de BurgosThe institution will open in a new tab, Burgos,
9	Kouziokas, Georgios N.	14	298	7	2	Greece	Info University of ThessalyThe institution will open in a new tab, Volos,

10	Martinelli, Fabio	496	5,689	34	2		Italy	Consiglio Nazionale delle RicercheThe institution will open in a new tab, Rome,

Table 2 Drawing from the information provided, we can discern who the leading authors are in the domain of artificial intelligence (AI) for crime management, along with insights into their research impact and geographical distribution. The author with the highest h-index, which indicates both the productivity and citation impact of the published work, is Ajith Abraham P. from India, with an impressive h-index of 82 and a substantial citation count of 29,971. His work, from the details provided, likely encompasses a broad range of AI applications in crime management, and his high citation count suggests that his methodologies and findings have been influential in the field.

Following him is Kannan, Arputharaj, also from India, with a high h-index of 35 and a citation count of 5,385. Kannan's consistent research output in this area signifies a focused exploration of AI in crime management, and the methodologies involved are presumably well-recognized in academic and practical circles. Agbinya, Johnson Ihyeh from Australia, with an h-index of 18, and a total of 1,895 citations, indicates that his research has had a notable impact on the field. With a solid number of total citations, Agbinya's work in the field of AI for crime management appears to be both prolific and highly regarded. Corchado, Emilio S. from Spain, and Martinelli, Fabio from Italy, also stand out with h-indices of 30 and 34 respectively, indicating significant contributions to the field, likely in the development of sophisticated AI methodologies for crime prediction and prevention. Each of these authors, based on their h-index and citation count, has contributed to a variety of themes within the field of AI in crime management, ranging from predictive policing to cybercrime detection. Their work is grounded in various methodologies, such as machine learning, data analytics, and neural networks, which reflects the interdisciplinary nature of crime management. The geographical spread of these authors, from Australia and various countries across Europe and Asia, highlights the global interest and collaborative effort in researching AI applications for crime management. Their affiliations with technological institutes and universities suggest that these institutions are significant centers for research in AI's role in crime management, contributing to the field through both theoretical and applied research.

Which organizations (such as universities, research institutes, and companies) are the most influential in the field of artificial intelligence for crime management, and how do their contributions stand out?

The contributions of these organizations stand out due to their focus on developing AI technologies tailored for crime detection and prevention. The research output from these institutions likely includes the development of predictive policing tools, forensic analysis techniques, and the integration of AI in surveillance systems. Furthermore, the diversity of institutions from different regions implies a wide array of approaches and perspectives in applying AI to crime management. This diversity can drive innovation, as unique challenges faced by different societies may lead to novel AI applications. In conclusion, these organizations have distinguished themselves not only by the quantity of their research output but also through their contributions to the advancement of AI technologies in the service of community safety and crime prevention. The impact of their work is significant in setting the

foundation for future research and in informing policy and operational strategies within law enforcement agencies worldwide.
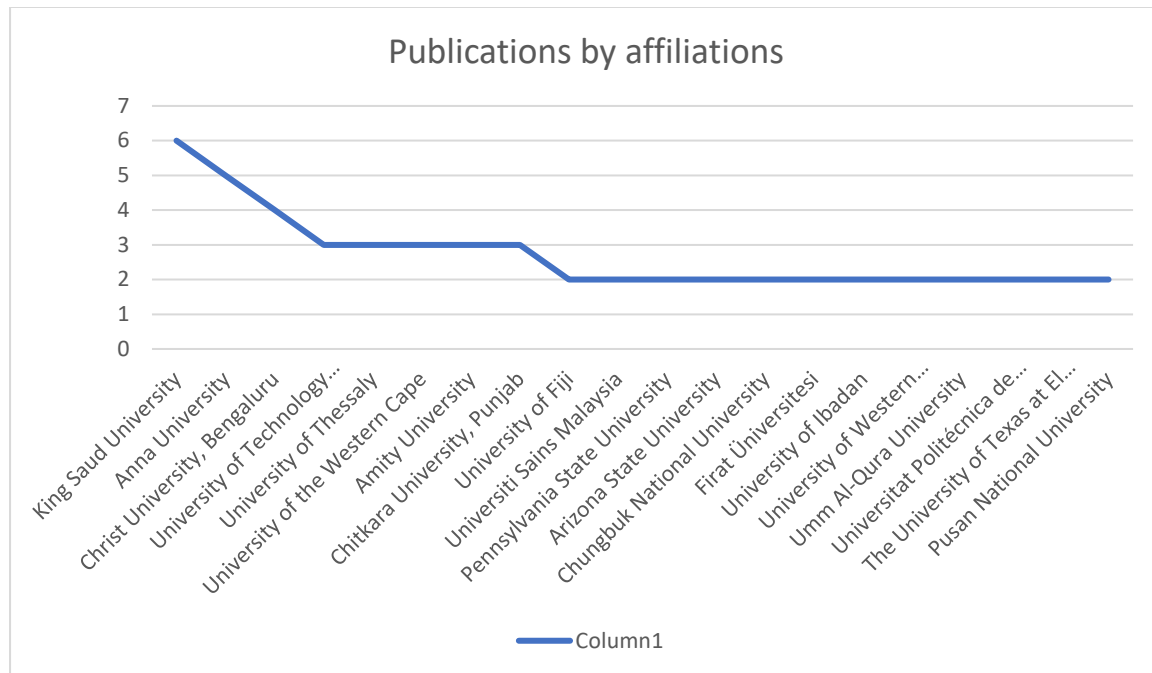

Figure 4: Publications by affiliations

Figure 4 shows Publications by affiliations. King Saud University appears to lead with a total of 6 publications, making it the most prolific institution in this field. As a prominent university, its contributions are significant, particularly in fostering research in AI applications for crime management, likely due to its investment in technology and innovation. Anna University follows with 5 publications, indicating a strong research interest and capacity in this area. This contribution is noteworthy, considering India's overall leading position in the number of publications as mentioned earlier. Christ University in Bengaluru has contributed 4 publications, further highlighting India's strong representation in this domain. This could be reflective of the university's emphasis on interdisciplinary research combining technology and social sciences for crime management solutions. The University of Technology Sydney, the University of Thessaly, and the University of the Western Cape, each with 3 publications, showcase the global spread of research contributions, with institutions from different continents actively engaging in this area. Amity University, Chitkara University, Punjab, and other universities with 3 publications each also indicate a significant interest in AI for crime management. This suggests a healthy contribution from various educational and research institutions towards advancing AI technologies and methods to tackle crime.

What are the key research trends in artificial intelligence for crime management as indicated by the top 10 keywords, and what does this imply about the development of the field?

The landscape of crime management is undergoing a significant transformation, driven by the advent of artificial intelligence (AI). An examination of the top keywords in recent scholarly articles provides a window into the prevailing research trends and the direction of technological advancements in this field. The focus of contemporary research not only illustrates the depth of AI's integration into crime management but also highlights the specific

areas garnering the most academic attention. Figure 5 shows the trends and keywords occurrences.
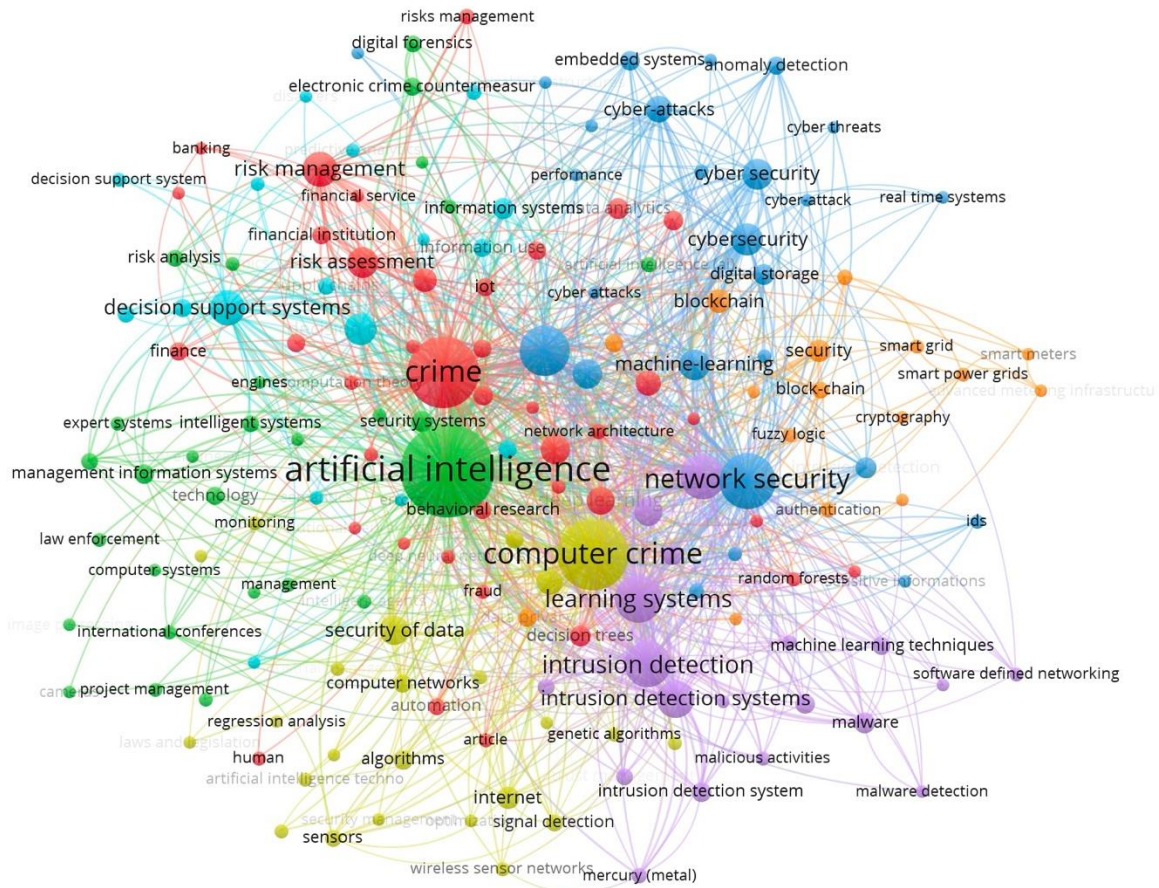

Figure 5: Trends and keywords occurrences

Figure 5 shows the evolving domain of artificial intelligence (AI) in crime management is vividly reflected in the keywords extracted from the recent literature, as indicated by the uploaded image. The predominant keyword, "artificial intelligence," anchors the field, signifying a robust integration of AI across various aspects of crime management. Keywords such as "computer crime" and "crime" highlight a dual focus on criminal activities related to technology and broader criminal behavior. "Network security" and "intrusion detection" suggest a targeted approach towards protecting digital infrastructures, while "information management" and "learning systems" imply an emphasis on managing and utilizing data effectively for predictive policing and crime analysis. Furthermore, terms like "machine learning," "intrusion detection systems," and "decision support systems" reveal a trend towards automation and enhancement in decision-making processes within law enforcement. Collectively, these trends suggest a field rapidly developing towards the sophisticated use of AI for proactive, data-driven crime prevention and response strategies.

Discussion
The discussion section synthesizes the findings from the research questions posed earlier, providing a comprehensive understanding of the state of artificial intelligence (AI) in crime

management. Each point draws upon the insights gained from the data provided for the respective research questions.

Evolving Bibliometric Landscape

The bibliometric landscape of AI in crime management indicates an accelerating growth in research output. The number of publications has surged, particularly within the last decade, signifying a burgeoning interest and increased investment in this intersection of technology and law enforcement. This growth parallels the advancement in AI technologies and reflects their expanding applications in real-world crime prevention and detection scenarios.

Global Contributions and Leading Nations

India's leading position, alongside notable contributions from China and the United States, underscores a geographically diverse research effort with a significant focus on AI in crime management. The engagement of these countries in this area of study likely mirrors their broader strategic aims in advancing AI technology and its applications. The trend suggests a global recognition of the potential of AI to innovate traditional crime management methodologies and the commitment to developing these technologies further.

Foremost Authors and Academic Influence

The individual contributions of authors such as Ajith Abraham P. and Arputharaj Kannan, with their high h-index and citation counts, demonstrate the profound academic influence of their work. Their research themes, while not detailed in the data provided, can be assumed to cover a spectrum of AI applications in crime management, from predictive analytics to neural networks, thus driving forward both theoretical advancements and practical applications in the field.

Institutional Contributions

Institutional analysis revealed a range of universities and research institutes actively publishing in this field, with King Saud University leading in terms of publication count. This suggests a thriving research culture within these institutions, likely supported by a combination of government funding, international collaboration, and academic curiosity. The varied global representation of these institutions speaks to the universal challenge that crime poses and the global effort to address it through AI.

Research Trends

The prominent research trends, as evidenced by the top keywords such as "computer crime," "network security," and "intrusion detection," reflect a concentrated effort to address the growing challenge of cybercrime and the security of digital infrastructure. This focus is timely, given the increasing prevalence of cyber threats and the potential for AI to provide proactive and intelligent solutions.

Implications and Future Directions

The findings from the bibliometric analysis carry significant implications for the future of AI in crime management. The apparent research focus on computer-related crimes indicates a shift towards addressing cybersecurity threats as a priority. Moreover, the global spread of research efforts suggests that future advancements in AI for crime management will benefit from a rich diversity of perspectives and interdisciplinary approaches.

The academic community's exploration of varied methodologies and their practical applications sets the stage for AI to not just augment current practices but to potentially redefine them. Ethical considerations, particularly in the application of AI in public surveillance and data privacy, remain a critical area for ongoing research, highlighted by the emergence of relevant keywords and themes within the literature.

As the field continues to mature, future research should aim to integrate the insights from these leading authors and institutions, address the challenges highlighted by the current research trends, and continue the international and interdisciplinary collaborations that have been characteristic of the field so far.

Conclusion

In conclusion, the bibliometric analysis of artificial intelligence (AI) in crime management has unveiled a rapidly expanding research domain marked by significant global contributions and an accelerating pace of scholarly output. The increase in publications over the last two decades, particularly the surge in the most recent years, underscores the escalating importance of AI in enhancing crime detection, prevention, and management strategies.

The leading countries in this research, notably India, China, and the United States, have made substantial strides, with their prolific academic contributions reflecting the global urgency to address crime through innovative technological means. The foremost authors in the field, such as Ajith Abraham P. and Arputharaj Kannan, have emerged as influential figures, directing the research narrative with their extensive work that resonates through high citation counts and impactful h-index scores.

The key research trends identified, such as "network security" and "intrusion detection," mirror the shift in focus towards cybersecurity, a testament to the evolving nature of crime in the digital age. The prominent institutions like King Saud University and Anna University have proven to be crucial hubs for advancing this research, indicating a strong institutional commitment to the development of AI for public safety.

As the field of AI in crime management progresses, it remains imperative that future research continues to push the boundaries of innovation while navigating the ethical considerations intrinsic to the application of AI. This study has not only mapped the current landscape but has also pointed towards a future where AI could redefine the paradigms of law enforcement and crime prevention, offering a beacon of hope for safer societies. The collaborative efforts of diverse nations, the dedication of leading researchers, and the consistent output from key institutions are together steering the field towards a future where AI is integral to combating crime effectively and ethically.

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