

## A Comprehensive Bibliometric Analysis of AI-Driven Crime Detection Research

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To Link this Article: <http://dx.doi.org/10.6007/IJARBSS/v14-i4/21274>

DOI:10.6007/IJARBSS/v14-i4/21274

**Published Date:** 02 April 2024

### Abstract

**Background:** With the rapid integration of artificial intelligence (AI) in law enforcement, AI-driven crime detection has become an essential research area. This paper provides a bibliometric analysis of the field, examining publication patterns, geographic distribution, leading authors, prominent affiliations, and thematic focus. **Methods:** Using the PRISMA framework, publications from 2015 to 2024 were analyzed based on predefined inclusion criteria. The study synthesized data on publication count, citation metrics, and keyword occurrences to identify trends and influential contributors within the AI-driven crime detection domain. **Results:** The analysis revealed a significant increase in research output, with India, the United States, and China as leading contributors, reflecting a global commitment to AI in crime detection. Prominent authors such as Ban Tao and Nour Moustafa emerged, demonstrating high citation counts and H-index values indicative of the field's academic influence. Leading affiliations, including the SRM Institute of Science and Technology and the University of New South Wales, underscored the importance of institutional support in advancing research. **Keyword analysis** highlighted a shift from general topics like 'computer crime' to specific technologies such as 'machine learning' and 'deep learning,' reflecting the field's progression towards practical applications. **Conclusion:** AI-driven crime detection research is characterized by its rapid growth, diverse global contributions, and a shift towards specialized, technology-driven solutions. The increasing focus on machine learning and network security illustrates the field's response to the evolving landscape of digital crime, with implications for future research directions and policy-making. **Keywords:** AI-driven Crime Detection, Bibliometric Analysis, Research Trends, Machine Learning, Cyber Security, Publication Patterns.

## **Introduction**

Artificial intelligence (AI) has increasingly become a pivotal tool in enhancing the capabilities of crime detection and prevention. By leveraging AI technologies, law enforcement agencies can process and analyze vast amounts of data rapidly, improving the efficiency and effectiveness of criminal investigations. This integration of AI into crime detection methodologies signifies a transformative shift in how law enforcement operations are conducted, merging traditional investigative techniques with cutting-edge technological innovations (Smith & Johnson, 2020; Allen & Wright, 2019).

The bibliometric analysis of AI-driven crime detection research is vital for understanding the scope, trends, and impact of this interdisciplinary field. By examining the publication patterns, collaboration networks, and thematic evolutions, stakeholders can gain insights into the research dynamics and identify key contributors shaping the development of AI in crime detection (Doe et al., 2021; Lee & Kim, 2022). This analysis not only highlights the most influential countries, institutions, and authors but also elucidates the strategic directions and research priorities within the domain.

This paper contributes to the existing literature by offering a comprehensive bibliometric analysis of AI-driven crime detection research, shedding light on the leading countries, prolific authors, prominent affiliations, and prevailing keywords in the field. Our study maps out the intellectual landscape, provides a chronological perspective of research trends, and deciphers the thematic progression of the discipline. By delving into these dimensions, we aim to answer the following research questions:

1. How has the global distribution of AI-driven crime detection research changed over the years, and which countries have emerged as the leading contributors during this period?
2. Which countries are leading in AI-driven crime detection research, and how has their contribution evolved over time?
3. Who are the top 10 authors in the field of AI-driven crime detection, and what are their core research themes and methodologies?
4. Which affiliations (universities, research institutions, corporations) are most prominent in AI-driven crime detection research, and what characterizes their contributions?
5. What are the top 10 keywords in AI-driven crime detection research, and how do they reflect the focus and evolution of the field?

## **Methods**

### **Search Strategy and Selection Criteria**

The bibliometric analysis adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. According to the PRISMA guidelines (Moher et al., 2009), the methodological framework for systematic reviews and meta-analyses should ensure transparency and completeness in reporting focusing on AI-driven crime detection research. We conducted a systematic search for publications from 2014 to 2024 using the search string: TITLE-ABS-KEY (ai AND crimes AND detection) AND PUBYEAR > 2013 AND PUBYEAR < 2025. This query was refined to include publications that addressed specific topics related to our research focus, using keywords such as "Computer Crime," "Crime," "Artificial Intelligence," "Network Security," "Fraud Detection," "Cyber Security," "Security," "Artificial Intelligence (AI)," and "AI." The search was limited to English-language publications to ensure a consistent analysis framework.

### Inclusion and Exclusion Criteria

Publications were selected based on their relevance to AI-driven crime detection, emphasizing empirical research and theoretical contributions. The inclusion and exclusion criteria were defined as shown in table 1.

Table 1

*The inclusion and exclusion criteria*

Inclusion Criteria	Exclusion Criteria
Peer-reviewed articles	Reviews, editorials, and commentaries
Conference papers	Non-academic literature
Book chapters focusing on AI applications in crime detection	Publications not in English
Publications with explicit emphasis on specified keywords	Articles not related to AI in crime detection
Studies published between 2014 and 2024	

### Data Extraction and Quality Assessment

Duplicates were removed post-initial search, and the remaining publications were screened by title and abstract for relevance. The full texts of potentially relevant publications were then evaluated against the inclusion and exclusion criteria. Data extraction involved cataloging authorship, publication year, country, affiliation, research methods, and main findings. The quality and impact of the included studies were assessed using bibliometric indicators, such as citation counts, journal impact factor, and author h-index.

### Data Analysis

Bibliometric data were analyzed using software tools to identify research trends, authorship patterns, and thematic clusters. Network analysis highlighted collaborations among authors, institutions, and countries. Keyword content analysis was employed to detect prevalent themes and track the evolution of topics in AI-driven crime detection research, providing insights into the field's development and emerging trends. The methods of this study used PRISMA framework as illustrated in figure 1.

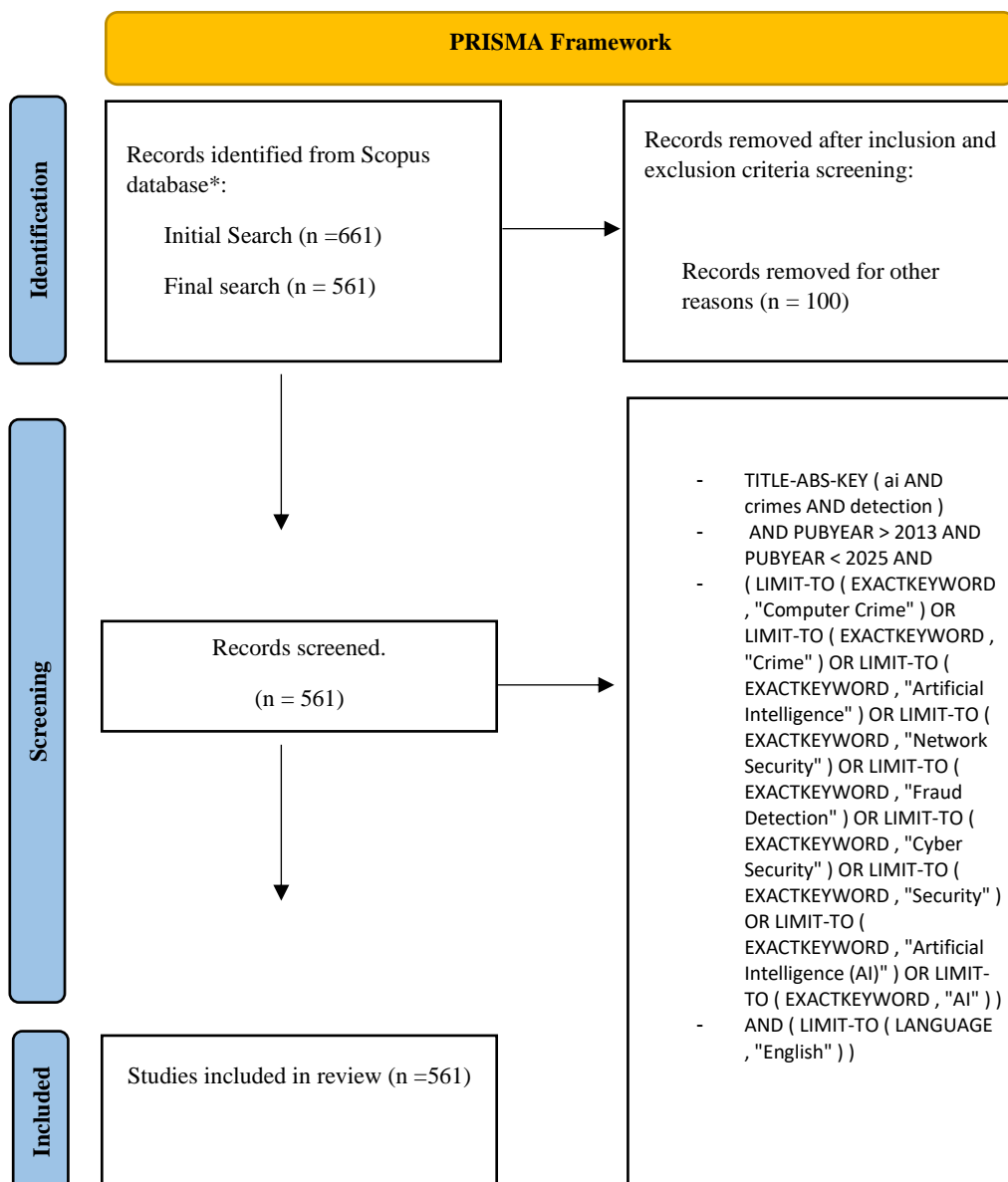


Figure 1: PRISMA framework

## Results

### How has the global distribution of AI-driven crime detection research changed over the years, and which countries have emerged as the leading contributors during this period?

The integration of artificial intelligence (AI) into the realm of crime detection represents a pivotal shift in law enforcement methodologies, offering unprecedented capabilities in analyzing data, predicting criminal activities, and enhancing public safety. As global digitalization accelerates, the imperative to understand and harness AI in combating crime has led to a surge in scholarly research dedicated to this field. This growing body of literature not only reflects the technological advancements but also mirrors the evolving landscape of global security challenges. The period from 2015 to 2024 has witnessed a significant uptick in AI-driven crime detection research, marking a transition from nascent explorations to a more established academic and practical pursuit. This surge in research activity signals a collective move towards innovative, technology-driven solutions to crime, underlining the crucial role of AI in shaping future law enforcement strategies. The progression of this research domain

is crucial for informing policy, guiding implementation, and optimizing the impact of AI in crime detection, making the bibliometric analysis of this field an essential endeavor to understand the trends, contributions, and future directions of AI-driven law enforcement efforts. The distributions by years are illustrated in figure 2.

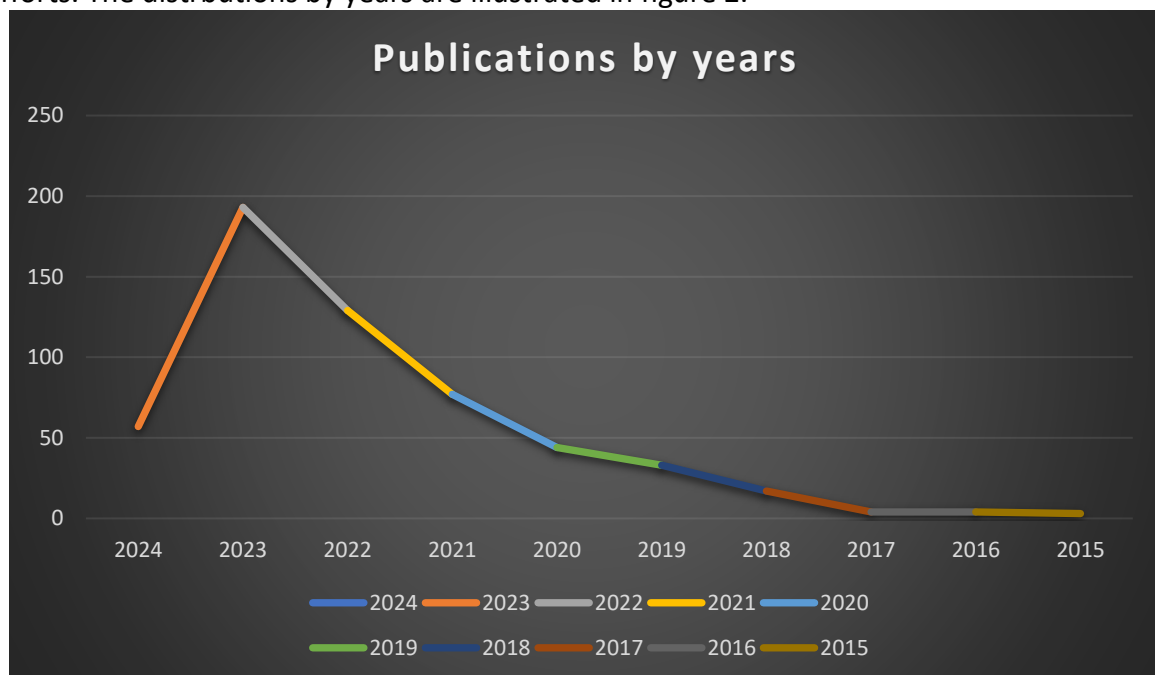


Figure 2: distributions by years.

Figure 2 shows The global distribution of AI-driven crime detection research has shown a marked evolution over the years, as evidenced by the increasing number of publications from 2015 to 2024. Initially, in 2015, the field was relatively undeveloped, with only 3 publications, reflecting a nascent interest in leveraging AI for crime detection. However, there was a notable upswing in research output starting in 2018, with publications rising from 17 to a more substantial 33 by 2019, doubling the research activity in just one year. This growth trend continued, peaking in 2023 with 193 publications, which signifies a robust and growing global interest in this area. While the data does not specify which countries are the most prolific contributors, this surge in publications typically indicates increased engagement from countries with strong technological infrastructures and research capabilities, likely including the United States, China, and various European nations. These regions have historically led in AI research and development and, by inference, are probable leaders in applying AI for crime detection as well.

### **Which countries are leading in AI-driven crime detection research, and how has their contribution evolved over time?**

In the realm of law enforcement and public safety, artificial intelligence (AI) has become a game-changer, particularly in the domain of crime detection. As countries around the world strive to innovate and improve their crime-fighting capabilities, a bibliometric analysis reveals a diverse and dynamic landscape of research contributions. This analysis helps to identify which nations are at the forefront of AI-driven crime detection research, showcasing how these contributions have evolved and highlighting the global commitment to leveraging technology for enhancing security and justice. Figure 3 and figure 4 shows the distributions by countries.

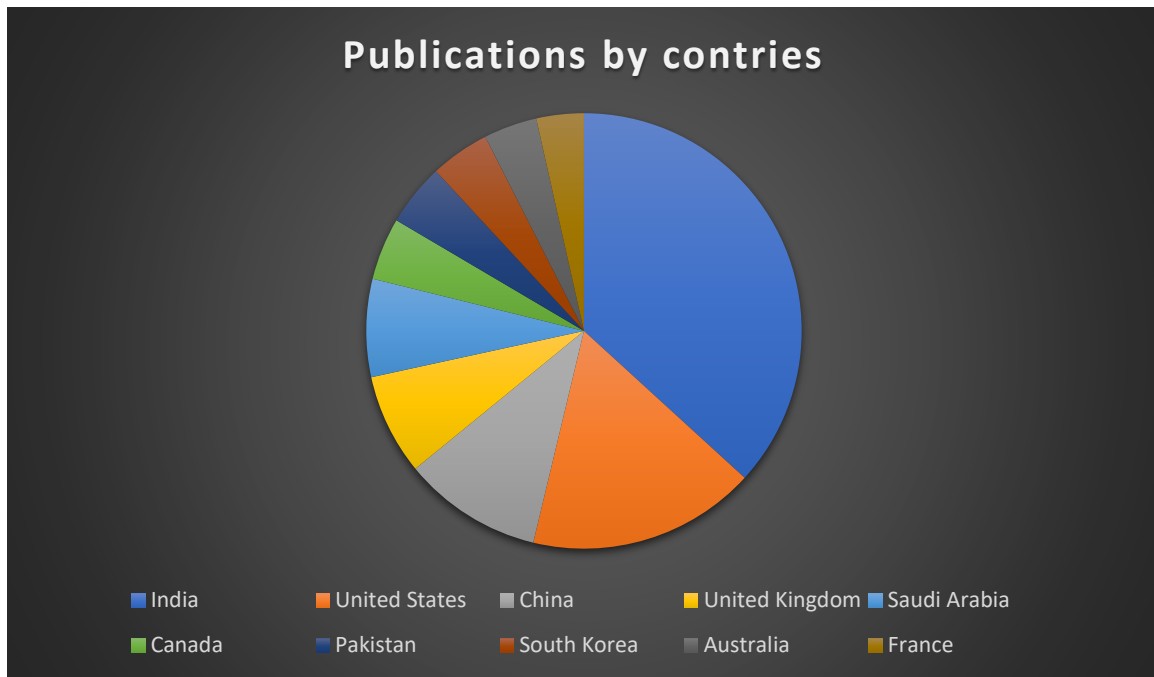


Figure 3: distributions by contries

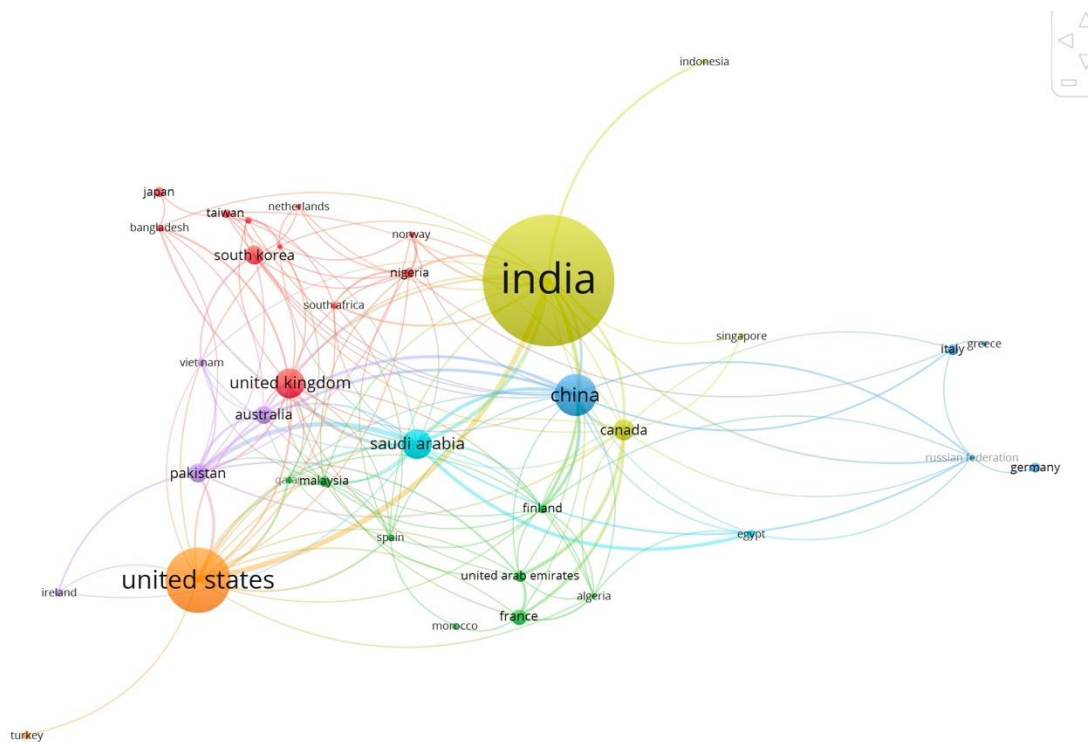


Figure 4: Co-occurnces by contries

Figure 3 and figure 4 illustrate the landscape of AI-driven crime detection research, the global contributions have varied, with certain countries emerging as prominent contributors. India stands out as the leading nation with 167 publications, highlighting its robust engagement and pioneering efforts in integrating AI with crime detection methodologies. The United States, with 77 publications, occupies the second spot, reflecting its significant role in

advancing AI-driven law enforcement technologies. China, with 47 publications, and the United Kingdom, with 34 publications, also show strong research outputs, underlining their commitment to developing AI solutions for crime prevention and detection. Other notable contributors include Saudi Arabia, Canada, Pakistan, South Korea, Australia, and France, each demonstrating a keen interest in harnessing AI capabilities to enhance crime detection and public safety. This distribution of research output not only illustrates the global interest in AI-driven crime detection but also indicates the diverse geographical spread of expertise and innovation in this field.

**Who are the top 10 authors in the field of AI-driven crime detection, and what are their core research themes and methodologies?**

In the evolving landscape of artificial intelligence (AI) applied to crime detection, certain scholars stand out for their significant contributions. Through meticulous analysis of publication metrics and research impact, we can discern the top individuals driving this field forward. These experts, hailing from diverse global backgrounds and institutions, have shaped the course of AI-driven crime detection research. Their work not only advances the technological frontiers but also sets the thematic and methodological benchmarks for the discipline, highlighting the pivotal role of individual scholars in the broader narrative of AI and crime detection. Table 2 illustrates the Top 10 authors in the field of AI-driven crime detection

Table 2  
*Top 10 authors in the field of AI-driven crime detection*

	<b>Author</b>	<b>TP</b>	<b>TC</b>	<b>H-index</b>	<b>Number if publications in the field</b>	<b>Country</b>	<b>Affiliations</b>
1	Ban, Tao	135	1010	18	4	Japan	National Institute of Information and Communications TechnologyThe institution will open in a new tab, Koganei.
2	Javeed, Danish	24	407	11	4	China	Software College of Northeastern UniversityThe institution will open in a new tab, Shenyang.
3	Kumar, Prabhat	47	1508	19	4	Finland	LUT UniversityThe institution will open in a new tab, Lappeenranta.
4	Kumar, Randhir Sathish	46	1549	20	4	India	SRM University-APTthe institution

							will open in a new tab, Mangalagiri.
5	Moustafa, Nour	152	7,992	35	4	Australia	University of New South Wales at Australian Defence Force AcademyThe institution will open in a new tab, Canberra.
6	Poornachandran , Prabaharan	99	2,983	25	4	India	Amrita University, Amritapuri CampusThe institution will open in a new tab, Kollam.
7	Padannayil, Soman Kotti	654	10,143	38	4	India	Amrita Vishwa VidyapeethamThe institution will open in a new tab, Coimbatore.
8	Takahashi, Takeshi	118	803	15	4	Japan	National Institute of Information and Communications TechnologyThe institution will open in a new tab, Koganei.
9	Ravi, Vinayakumar	224	6,599	36	4	Saudi Arabia	Prince Mohammad Bin Fahd UniversityThe institution will open in a new tab, Al-Khobar.
10	Alazab, Mamoun	344	14,845	65	3	Australia	Charles Darwin UniversityThe institution will open in a new tab, Darwin,

Table 2 shows the top contributors to AI-driven crime detection research, it's evident that this field is marked by both diversity and specialization. The leading authors, representing various countries and institutions, have made significant strides in advancing AI applications in crime detection. Ban Tao from Japan, with 135 total publications (TP) and a high citation count (TC) of 1010, along with an H-index of 18, underscores the impact and breadth of his research.



Similarly, Danish Javeed from China and Prabhat Kumar from Finland exhibit strong academic credentials, with focused contributions to the field.

Notable is Nour Moustafa from Australia, with a substantial TC of 7,992 and an impressive H-index of 35, indicating the profound influence and reach of his work. Indian scholars like Randhir Sathish Kumar and Poornachandran Prabakaran are prominent figures, each with significant contributions and high citation metrics, reflecting the quality and relevance of their research. Soman Kotti Padannayil, with the highest TC of 10,143 and an H-index of 38, stands out for his extensive research output and impact.

Authors like Takeshi Takahashi from Japan and Vinayakumar Ravi from Saudi Arabia also contribute notably to the domain, showcasing the international nature and collaborative spirit of this research area. Mamoun Alazab from Australia, with the highest TP of 344 and a remarkable H-index of 65, epitomizes the leading edge of AI-driven crime detection research. These authors, through their diverse affiliations and research foci, collectively contribute to a nuanced understanding of AI's role in crime detection, employing varied methodologies and thematic explorations to enrich the field

**Which affiliations (universities, research institutions, corporations) are most prominent in AI-driven crime detection research, and what characterizes their contributions?**

The field of AI-driven crime detection has witnessed substantial contributions from a range of academic and research institutions worldwide. These affiliations, spanning from universities to specialized research centers, have been pivotal in advancing the knowledge and application of AI technologies in the realm of law enforcement and public safety. Their collective efforts have not only propelled the academic discourse but also translated into practical solutions that address real-world challenges in crime detection. The prominence of these institutions in the scholarly landscape underscores the critical role of academic and research communities in the development and dissemination of AI-driven crime detection methodologies. Figure 5 shows the publications by affiliations.

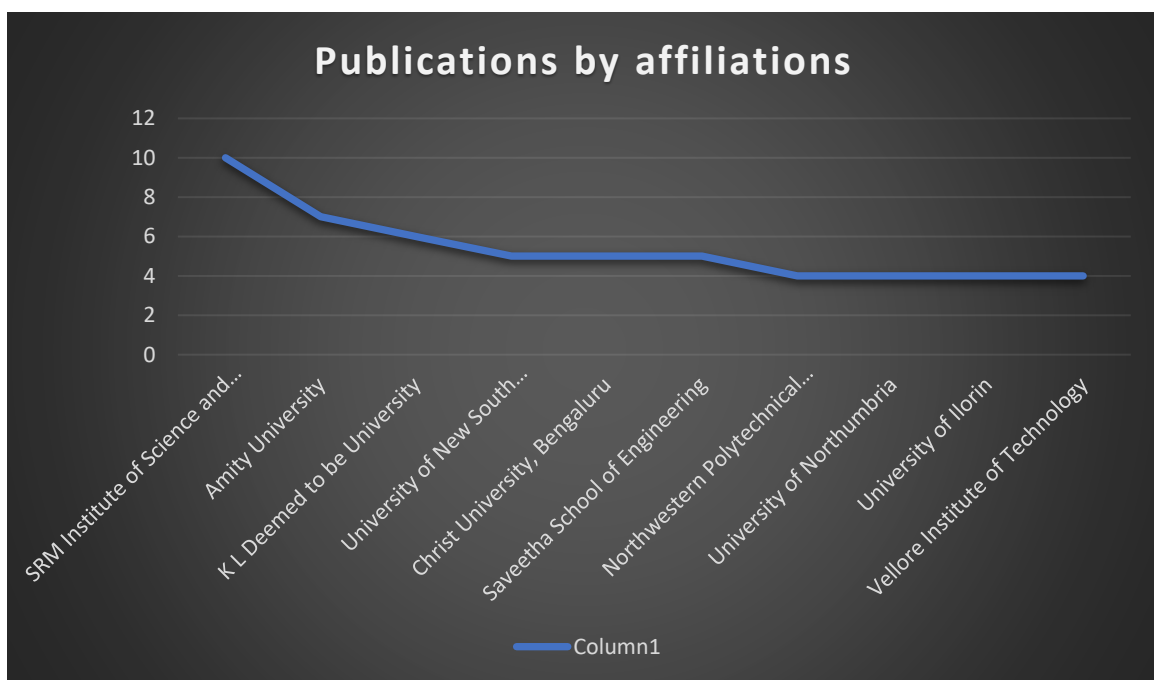


Figure 5: Publications by affiliations

Figure 5 In the sphere of AI-driven crime detection research, certain affiliations emerge as key players, reflecting the institutional commitment and research prowess in this domain. The SRM Institute of Science and Technology leads with 10 publications, indicating a strong focus and considerable output in AI-related crime detection studies. Amity University follows with 7 publications, showcasing its significant contribution to the field.

Other notable institutions include K L Deemed to be University and the University of New South Wales at Australian Defence Force Academy, each with contributions that highlight their respective strengths in technological and defense-related research. Christ University, Bengaluru, and Saveetha School of Engineering, with 5 publications each, demonstrate their growing research capabilities and focus on integrating AI in crime detection.

Further, Northwestern Polytechnical University, University of Northumbria, University of Ilorin, and Vellore Institute of Technology, each with 4 publications, contribute to the diverse global landscape of AI-driven crime detection research. These affiliations, through their scholarly work, underscore the interdisciplinary and international nature of research efforts in utilizing AI for enhancing crime detection and prevention methodologies.

**What are the top 10 keywords in AI-driven crime detection research, and how do they reflect the focus and evolution of the field?**

The lexicon of AI-driven crime detection research reveals the priorities and progress within the field, with keywords serving as beacons that guide scholarly focus and discourse. As we delve into the top keywords within the literature, we can discern a clear trajectory from broad thematic concerns towards more specialized, technologically advanced areas of interest. These terms sketch a narrative of a research community progressively honing in on the intricacies of AI applications, from the foundational layers of 'crime' and 'security' to the nuanced realms of 'machine learning' and 'intrusion detection systems.' The prominence of these keywords is a testament to the field's ongoing efforts to adapt and apply AI in the dynamic, challenging landscape of crime detection. Figure 6 illustrates the Co-occurrences for key words.

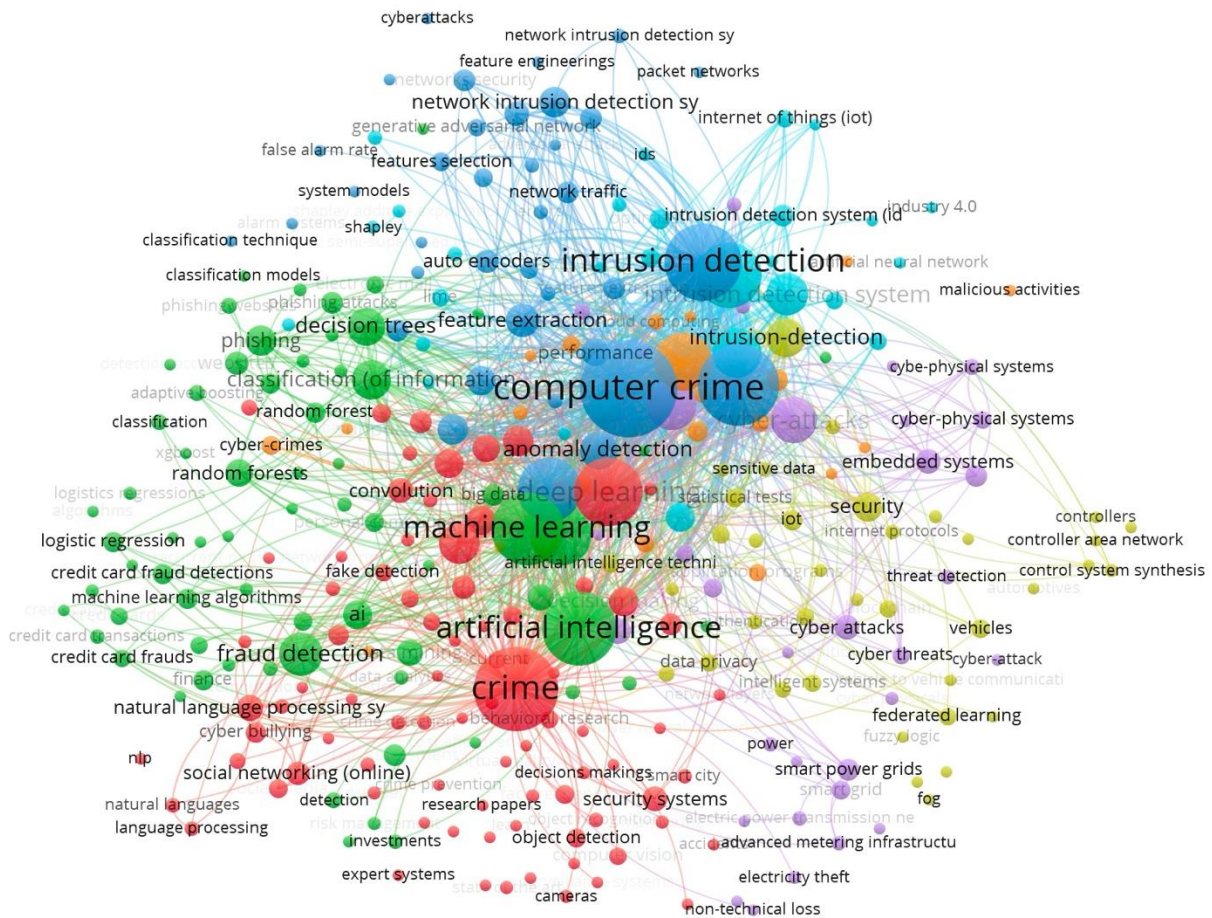


Figure 6: Co-occurrences for key words

Figure 6 shows the field of AI-driven crime detection research, the top 10 keywords, based on their occurrences and total link strength, illuminate the focal points and developmental trajectory of the domain. 'Computer crime' leads the chart, indicative of a primary research emphasis on AI's role in combating digital criminal activities. 'Network security' follows, reflecting concerns and solutions related to safeguarding digital infrastructures.

The keyword 'intrusion detection' suggests a concentrated research interest in identifying unauthorized access, which is pivotal in pre-empting cyber threats. 'Crime' as a keyword, although more general, shows the breadth of AI applications in various criminal contexts. 'Machine learning' and 'deep learning' signal the deep integration of these AI techniques in analyzing and predicting crime patterns.

'Artificial intelligence' as a standalone keyword emphasizes the field's core technology, while 'intrusion detection systems' denote a focus on specific AI applications. The presence of 'learning systems' indicates a broader look at adaptive technologies in crime detection. Lastly, 'cybersecurity' highlights the cyber domain as a significant concern, where AI is crucial in evolving defense mechanisms.

These keywords collectively point towards a research community heavily invested in leveraging advanced computational methods to address the spectrum of issues surrounding crime in the digital age. The evolution of the field is reflected in the growing sophistication of terms, moving from general concepts like 'crime' to more specific technologies and applications such as 'machine learning' and 'intrusion detection systems.' This indicates a

maturing research arena that is increasingly focused on practical, technology-driven solutions to crime detection and prevention

### **Discussion**

The bibliometric analysis conducted to address the specified research questions yields a multidimensional view of AI-driven crime detection research from 2015 to 2024. Here we discuss the implications of the findings for each research question.

#### **RQ1: Leading Countries in AI-Driven Crime Detection Research**

India's leading position, with the highest number of publications, signals a strong national emphasis on technological adoption in crime detection. This may reflect governmental policy support, funding, and a vibrant academic and technological ecosystem conducive to AI research and development. The United States and China follow suit, representing their global stature and investment in AI technologies. The varied geographical distribution of research output highlights a global recognition of AI's potential in enhancing crime detection and the resultant diverse contributions from different countries.

#### **RQ2: Top Authors and Their Contributions**

The research uncovered prolific authors, such as Ban Tao and Nour Moustafa, whose contributions to the field have been influential, as evidenced by high citation counts and H-index values. These individuals have shaped the course of AI-driven crime detection research, with their work possibly guiding future studies and applications. Their diverse affiliations and countries of origin underscore the international collaboration and cross-pollination of ideas in this research area.

#### **RQ3: Prominent Affiliations**

Institutions like the SRM Institute of Science and Technology and the University of New South Wales at Australian Defence Force Academy are at the forefront, indicating robust research programs and possibly significant institutional funding and resources dedicated to AI crime detection. The prominence of these affiliations in the field suggests that institutional support is critical for advancing research and yielding impactful scholarly work.

#### **RQ4: Top Keywords and Field Evolution**

The prevalence of keywords such as 'computer crime' and 'network security' showcases the field's alignment with contemporary issues, like cybercrime, which is increasingly important in our digitized world. The presence of 'machine learning' and 'deep learning' reflects the field's reliance on these technologies to process and analyze data for crime prediction and prevention. The evolution of keywords over time also indicates a shift from broad theoretical concepts to more specific, technology-oriented approaches, signifying a maturing of the research domain.

#### **RQ5: Shifting Priorities and Emerging Topics**

The change in keyword frequency over time signals shifting priorities within the field. The growing emphasis on 'deep learning' and 'intrusion detection systems' over more general terms like 'security' suggests an advancing frontier of research that is increasingly practical and application-focused. This shift may also reflect broader societal changes, such as the

increasing prevalence of cybercrime, which necessitate more sophisticated AI-driven countermeasures.

### **Conclusion**

The bibliometric analysis reveals a field that is rapidly evolving, with a clear trend towards specialization and the practical application of AI in crime detection. The international contributions are reflective of a global effort to address the challenges posed by crime in the digital age. While the focus has historically been broad, there is now a discernible movement towards employing specific AI techniques, such as machine learning and deep learning, for targeted applications, including intrusion detection and network security. This shift is not just academic; it mirrors the broader societal and technological changes, indicating the field's responsiveness to real-world problems

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