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Analysis of Hotspots and Trends in Artificial Intelligence Crime Research Using CiteSpace: A Case Study of CNKI Data (2016-2025)

Li Zipeng[1,a,*]

[1]*Chengdu University of Technology, Chengdu, Sichuan Province, 610059, China*
[a]*2311336078@qq.com*
[*]*Corresponding author*

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Abstract: Presently, artificial intelligence technology is advancing at a rapid pace. Whilst propelling societal development, it has also given rise to a series of AI-related criminal issues. Novel AI criminal methods exhibit extreme concealment and cross-domain characteristics, posing severe challenges to citizens' personal and property safety, social governance order, and judicial credibility. As research into such emerging crimes commenced relatively late, standardised predictions regarding the future evolution and development of AI crime remain lacking. Consequently, this paper will systematise existing AI crime research findings to summarise the research trajectory and future development trends of AI crime over the past decade (2016-2025), providing theoretical reference for subsequent scholarly exploration and research. This study employs quantitative analysis methods, selecting core AI crime-related literature indexed in the CNKI (China National Knowledge Infrastructure) database over the past decade as its data source. Utilising the CiteSpace (version 6.4.R1) visualisation tool, it processes data such as keyword co-occurrence to visualise research trajectories and future trends within the AI crime field. Findings reveal: 1) Analysis of AI crime keyword clustering diagrams indicates existing research has formed five major themes: technology, liability, risk, agency, and governance. Collectively, these constitute a core “one body, two wings, five dimensions” structure, profoundly reflecting academia's efforts to address practical challenges; 2) Analysis of the temporal trend chart for AI crime reveals that research from 2016 to 2025 has progressed from macro-level risk warnings to micro-level precision regulation. Future studies will increasingly emphasise multidisciplinary integration while prioritising responses to practical challenges. Consequently, the research proposes strengthening cross-disciplinary collaboration and establishing ethical governance frameworks to achieve interdisciplinary convergence and develop effective legal systems for risk prevention.

1. Introduction

In recent years, alongside the nation's vigorous advancement of artificial intelligence technology,

AI-related crimes have proliferated. Offences such as deepfakes and algorithmic manipulation pose significant challenges to judicial authorities due to their covert nature and evidentiary difficulties, while also presenting latent risks to social stability. As current discussions on emerging AI crimes remain nascent, particularly concerning future research priorities and developmental trends, conducting analytical studies in this domain holds considerable significance. This study aims to dissect existing issues and trace evolutionary trajectories, thereby providing reference points for subsequent research in this field and facilitating the early planning of countermeasures. Analysis of current research findings reveals substantial scholarship on AI-related crime. For instance, Han Zixuan (2025) examined regulatory dilemmas and solutions concerning generative AI data crimes, charting a course for data crime governance [1]; Fan Huxi (2025) elucidated the mechanisms, behavioural components, and key identification points of AI-assisted telecommunications network fraud, enhancing the capacity to combat such crimes [2]; Li Xunwei (2025) explored the practical application of AI-related criminal issues through case studies [3]; Gao Jianxin, Sun Jinping, and Cai Yukun (2025) construct a macro-level governance framework for AI-related crimes and countermeasures [4]; Liu Honglin and Zhu Yihan (2025) employ empirical analysis to examine the impact of AI development on criminal offences and corresponding response strategies [5]. However, existing research on AI-related crime exhibits numerous, complexly intertwined branches lacking a clear overarching framework. This study therefore systematises core existing findings on AI crime, focusing on key literature to map research branches and clarify interconnections. This aims to better grasp research hotspots and crime trends in AI, providing clearer pathways for addressing governance challenges in AI-related crime.

2. Analytical Methods and Data Sources

2.1 Research Methodology

This study employs quantitative analysis. Unlike qualitative analysis, which relies heavily on subjective interpretation, quantitative methods are grounded in quantifiable data. Systematic analysis of such data enables a more objective presentation of the field's characteristics and intrinsic developmental patterns, effectively mitigating subjective bias. To enhance literature visualisation, CiteSpace (version 6.4.R1) was selected as the data analysis tool. CiteSpace is an information visualisation software developed in Java. Primarily based on co-citation analysis theory and the PathFinder algorithm, it quantifies literature within specific domains (collections) to identify key evolutionary pathways and knowledge inflection points within disciplinary fields. Through the generation of visualised graphs, it enables analysis of the underlying dynamic mechanisms driving disciplinary evolution and the detection of emerging research frontiers ([6]). CiteSpace excels in efficiently processing vast literature volumes, overcoming limitations of manual analysis in data scale and relationship mining. It transforms complex information into intuitive visual symbols, presenting research hotspots and keyword evolution within AI-related crime studies through visual maps, thereby providing data support for identifying research trends and focal points.

2.2 Data Sources and Analysis Process

This study utilised China National Knowledge Infrastructure (CNKI) as the data source, conducting thematic searches using the keyword “artificial intelligence crime” within the timeframe of 2016–2025. To ensure data validity and analytical precision, the selected journals were restricted to those with higher impact factors. Ultimately, 463 core relevant literature pieces were identified, establishing a robust data foundation for subsequent research. During the specific data analysis process, the 463 core relevant literature were first cleaned to obtain converted usable data. This data

was then imported into CiteSpace (version 6.4.R1) for visualisation analysis using the keyword co-occurrence function, yielding research hotspot analysis and temporal clustering analysis diagrams.

3. Trend Analysis of AI-Related Crime

The study used CiteSpace to analyze 463 core publications for co-occurrence keyword clustering (Figure 1) and temporal trends (Figure 2).

3.1 Keyword Cluster Analysis of AI-Related Crime

Keyword clustering was performed with a maximum of 10 clusters (K=10), yielding the following ten categories: Artificial Intelligence (#0), Criminal Liability (#1), Criminal Risk (#2), Criminal Subjects (#3), Crime Governance (#4), Strict Liability (#5), Crime Types (#6), Data Security (#7), Autonomous Consciousness (#8), and Cybercrime (#9). . Clusters with higher frequency included Artificial Intelligence (#0), Criminal Liability (#1), Criminal Risk (#2), Criminal Subjects (#3), and Crime Governance (#4). These five sub-themes were subsequently designated as the five major themes. Secondary domains such as crime types and security followed (Figure 1).

The "Artificial Intelligence" theme (#0) encompasses numerous sub-themes including "data mining, malicious registration, upstream crimes, neutral platforms, biometric recognition, property offences, technological regulation, intelligence analysis, digitalisation, and data". The prevalence of such sub-themes stems from the widespread societal application of AI technology. Sub-themes such as "data mining," "property crimes," and "malicious registration" exhibit high prominence, directly reflecting the reality of leveraging AI technology for novel cybercrimes and financial offences—such as algorithm-driven precision fraud and automated bulk account registration. The sub-theme "technological oversight and neutral platforms" reflects academic attention to issues such as the misuse of technology and the boundaries of platform responsibility, aligning with the international trend towards strengthening regulation of tech giants [7].

Regarding "Criminal Liability" (#1), sub-themes encompassing "medical malpractice, autonomous driving, negligent offences, traffic accidents, intelligent machinery, algorithmic black boxes, and the principle of reliance" are highly prominent. This prominence stems from legal vacuums created by cutting-edge technologies. Currently, "autonomous driving" and "traffic accidents" represent the most typical examples. Numerous cases involving autonomous vehicles demonstrate the need for proper application of traditional criminal law doctrines such as "negligent offences" and the "principle of reliance" [8]. The opacity introduced by "algorithmic black boxes" and the deployment of "intelligent machines" in sectors like healthcare and services have centred debates on liability attribution. The question remains: should responsibility lie with the user, the designer, or the AI itself? There exists no established framework to determine whether accountability should target user conduct, manufacturer production practices, or the machine's algorithmic operations. This reflects the challenges criminal law faces when addressing highly autonomous systems, with such research aiming to construct a criminal liability allocation system suited to the intelligent era.

Regarding "Criminal Risk" (#2). Sub-themes such as "criminal legislation, criminal regulation, criminal compliance, technological risk, criminal law adaptation, and human-machine collaboration" have attracted considerable research attention. This stems from the practical necessity that the criminal law system remains insufficiently equipped at the macro level to formulate effective strategies for addressing AI. "Criminal regulation" and "criminal law adaptation" address whether existing laws can regulate current and future AI crimes and whether new offences need to be created for present or future AI crimes. The rise of "criminal compliance" directly meets corporate practical needs, particularly after the introduction of policies such as the Data Security Law, where how enterprises can mitigate legal risks arising from AI operations has become an urgent issue. The novel

risk patterns emerging from “human-machine collaboration” necessitate a shift in criminal law from punishment-centric to prevention-oriented approaches. Discussions on these sub-themes profoundly reflect scholars' engagement with practical concerns.

Additionally, the “Criminal Subject” (#3) theme primarily encompasses sub-topics such as “intelligent agents, personhood, culpability, elements of personhood, and free will.” The prevalence of research in these areas stems from the fundamental challenge posed by AI technology to traditional theories of legal subjecthood. Discussions on “personhood,” “free will,” and “culpability” explore, from a legal-philosophical perspective, whether AI can constitute a subject of criminal responsibility. This reflects scholars' efforts to address practical dilemmas. The “crime governance” (#4) theme encompasses sub-themes such as “crime prevention, social governance, smart society, criminal investigation, international cooperation, investigative transformation, intelligent investigation, and counter-terrorism.” The prevalence of research in these areas reflects the urgent societal and governmental demand to leverage AI technology for enhanced governance capabilities. Against the backdrop of building a “smart society,” sub-themes like “smart investigation” and “crime prevention” signify a shift in policing paradigms from reactive pursuit to proactive early warning. Given the significant gap between current governance capabilities and the standards envisioned for a “smart society,” academic exploration and research on this theme will continue to deepen.

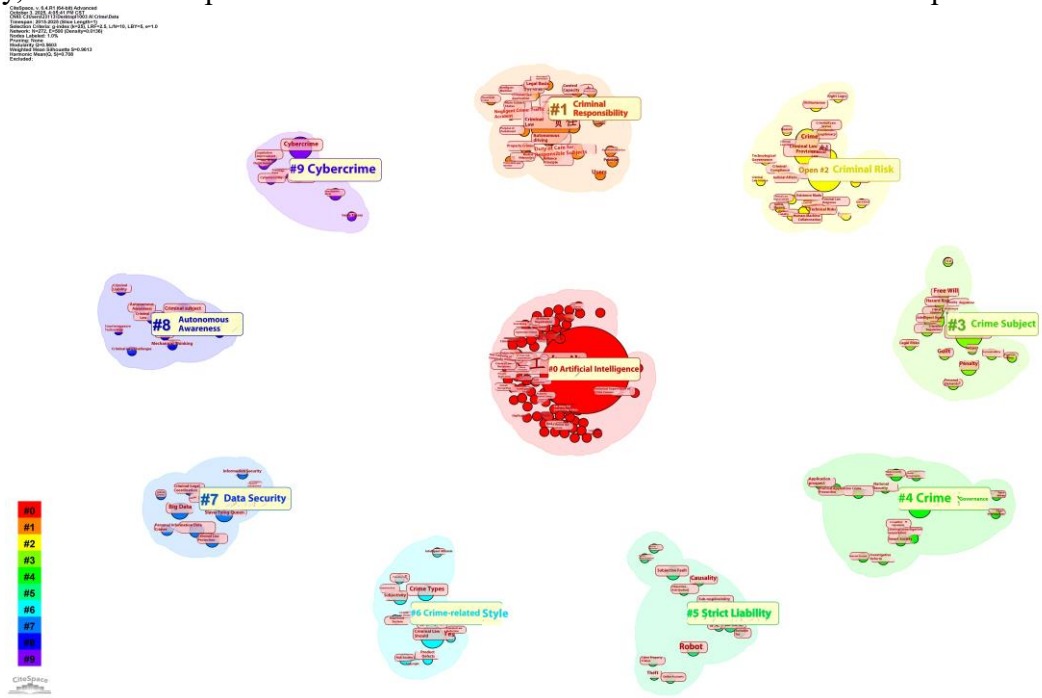

Figure 1 Keyword Clustering (Co-occurrence) Map for AI-related Crime

3.2 Temporal Trend Analysis of AI Crime Research

The past decade (2016–2020) saw a substantial volume of AI crime-related literature. During this period, widespread implementation of AI technologies drew academic attention to AI crime issues. However, as illustrated in Figure 2, research volume has declined since 2020, indicating the field has entered a “deep-water zone.” This shift stems from two primary factors: firstly, under policy guidance prioritising “new quality productive forces,” AI technologies have become closely integrated with the real economy, shifting research focus from general risk warnings to specific industry regulations; Secondly, foundational legal analytical frameworks established in earlier research have enabled greater focus on specific criminal law studies—such as criminal liability and risk prevention—

attracting broader scholarly participation. This has consequently reduced macro-level publication volumes on “artificial intelligence crime”.

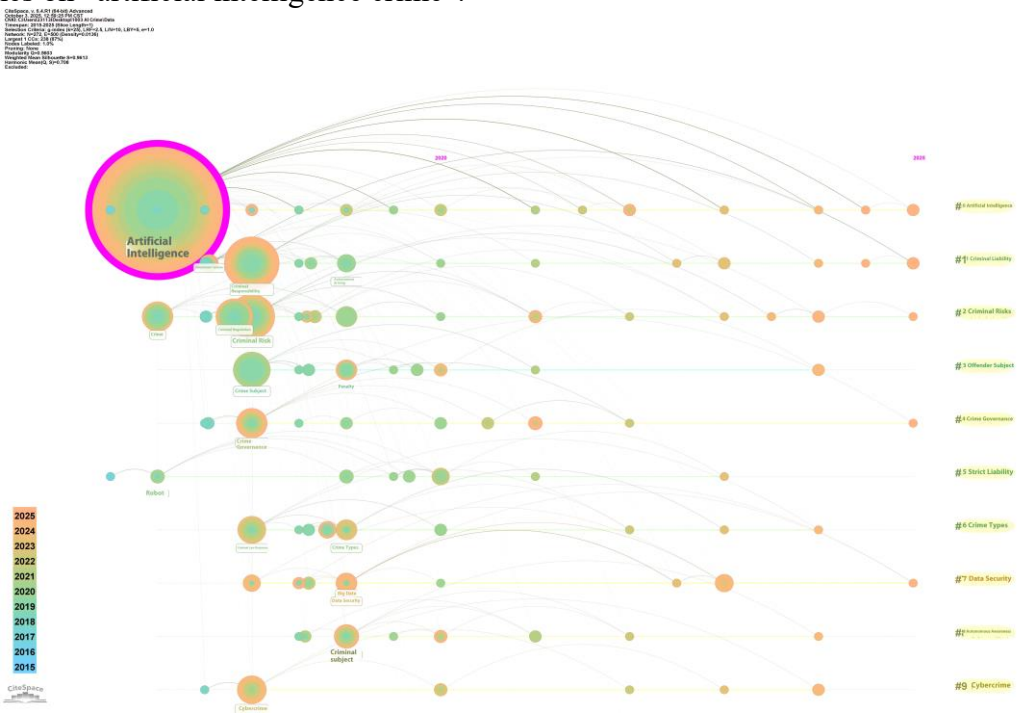

Figure 2 Temporal Trend Analysis of AI-Related Crime

Regarding “artificial intelligence” (#0), while it remained a hot topic throughout 2016-2025, its focus shifted slightly. Specifically, from 2017 to 2019, research on “artificial intelligence” (#0) primarily addressed “technological regulation” and “criminal factors”, with 2017 seeing far more studies on this theme than all other years combined. This surge stemmed from the Shaoxing police's successful resolution of China's first AI-enabled crime case, the Ministry of Public Security-supervised “2017.01.03” infringement of citizens' personal information case [9]. This high-profile case rapidly elevated academic research on AI crime, creating a short-lived peak. By 2020, research focus shifted towards the “tool attributes” of AI, transitioning further to “legal regulation” by 2025. This evolution stems from AI's progression from conceptual theory to practical application, where its negative effects transformed from theoretical risks into tangible challenges for social governance. Consequently, academia shifted from examining “what it is” to addressing “how to regulate it,” ultimately striving to define legal and ethical boundaries for technological innovation.

Regarding “criminal liability” (#1), research remained broadly sustained between 2017 and 2025. Its focus evolved from examining penal systems in 2017 to discussing penal functions in 2020, before concentrating on liability allocation between users and providers of property crime tools by 2025. This progression in key debates reflects how the subfield of “Criminal Liability” (#1) has shifted from theoretical inquiry towards addressing practical challenges.

Regarding “Criminal Risk” (#2), academic research maintained strong continuity from 2017 to 2025. Its trajectory progressed from “Criminal Law Regulation” in 2018, to “Criminal Law Improvement” in 2020, and subsequently to “Human Cognition” and “Human-Machine Collaboration” in 2024-2025. These shifts indicate that approaches to addressing “criminal risk” (#2) have evolved from single-subject risk regulation towards multi-stakeholder, end-to-end prevention and control.

Regarding the “Criminal Subject” (#3), the research trajectory exhibits an intertwined pattern of academic exploration and technological advancement. This theme saw substantial research activity

between 2018 and 2021, followed by a hiatus over the subsequent two years, with renewed interest emerging in 2024. This distinctive "interruption-revival" pattern reflects the thematic stability of the "Criminal Subject" (#3) within the research landscape. Research from 2018 to 2020 primarily explored ontological dimensions of subject qualification, such as "free will" and "personality factors". By 2024, the focus shifted towards "legal risk". This transition occurred because technological breakthroughs in artificial intelligence lagged behind expectations, prompting academia to move from radical theoretical construction towards incremental improvements within the existing legal framework.

Regarding "crime governance" (#4), research in 2017 centred on "application prospects" and "crime prevention". By 2020, it integrated into systematic planning for "smart society" development, before shifting focus to "criminal investigation" by 2025. This theme also experienced a notable research hiatus between 2023 and 2024, reflecting the field's transition from epistemological inquiry towards practical application. Thus, as AI technology assumes an increasingly prominent role in crime governance, current research has shifted towards exploring novel models for criminal investigation [10].

4. Findings and Conclusions

This study employs keyword clustering and temporal trend analysis (2016–2025) of core literature on AI-related crime to delineate the key themes and developmental trajectory within this field over the past decade. Findings indicate that academic research has evolved beyond initial preoccupations with AI criminal technologies, progressing into phases of institutional construction and responsive practice.

Specifically, analysis of the AI crime keyword co-occurrence network reveals a core "one body, two wings, five dimensions" structure over the past decade, reflecting the depth and breadth of academia's response to practical demands. Clustering high-frequency keywords identifies five core themes: "artificial intelligence", "criminal liability", "criminal risk", "criminal subject", and "crime governance". These themes are not isolated but form a five-dimensional research framework. This framework centres on the technological essence of "artificial intelligence" as its core ("one body"), with the theoretical deliberations on "criminal liability" and "criminal subjects" alongside the practical responses to "criminal risk" and "crime governance" serving as its two wings. Together, they encompass technological, legal, and societal dimensions. On one hand, "artificial intelligence" (#0) serves as the core driving force. Its sub-themes—ranging from "data mining" to "technological regulation"—directly reflect the shift in research focus from the technology itself to its societal applications. On the other hand, the clusters of "criminal liability" (#1) and "criminal subject" (#2) collectively form the "legal-theoretical wings" of the research. Their prominence stems from AI's fundamental challenge to traditional criminal liability frameworks. For instance, when autonomous vehicles cause harm or medical AI delivers misdiagnoses, who bears responsibility—the developer, the user, or the AI itself? This "attribution gap" fuels ongoing academic debates on issues like the "personhood element" [11], aiming to prepare legal frameworks for the "age of strong artificial intelligence" [12]. "Criminal risk" (#3) and "crime governance" (#4) constitute the "practical wings" of this research. Early studies on the former focused on "criminal legislation," later shifting to "criminal compliance," forming a prevention-oriented control philosophy; The latter, "crime governance," has expanded from technical approaches like "intelligent investigation" and "data-driven methods" to encompass "social governance" and "international cooperation," reflecting a shift from purely policing models to multidimensional collaborative governance. These "two wings" demonstrate the field's research framework as both "theoretically grounded and practically oriented": one end pursues fundamental legal inquiries, while the other engages in practical considerations for

real-world crime prevention.

Furthermore, analysis of the temporal trends in AI-related crime reveals that between 2016 and 2025, most themes followed a trajectory of "rapid emergence – short-term peak – rational adjustment". This reflects the academic shift from problem identification to in-depth exploration. The five major themes (#0-#4) successively reached their research peaks between 2017 and 2019. During this period, the emergence of various typical cases, along with the refinement and application of methodologies, led to an explosive growth in research activity. Post-2020, overall research fervour markedly subsided, entering a more rational phase of deepening inquiry. This manifested both in a general reduction in research volume and a shift towards greater rationality in later studies—moving beyond mere quantitative focus on relevant factors towards practical problem-solving. The developmental trajectories of the five themes (#0–#4) also diverged. The "Artificial Intelligence" theme (#0) maintained relatively stable prominence, as it addresses unavoidable foundational issues in AI crime studies. "Criminal Liability" (#1) and "Criminal Risk" (#2) also demonstrated strong continuity, enduring attention due to their core relevance to legal systems. Scholars grappling with practical dilemmas inevitably confront these themes. Research on the "Criminal Subject" (#3) experienced a brief "dormant period," attributable to AI technological breakthroughs lagging behind scholarly expectations, prompting academia to shift from philosophical speculation towards more practically oriented studies. The "Criminal Governance" (#4) theme underwent a temporary "hiatus" between 2023 and 2024 , coinciding with AI governance's transition from theoretical conception to practical exploration. Research trajectory evolved from examining "application prospects" (2018-2019) to focusing on the "intelligent society" post-2019, and currently centres on "criminal investigation." This pattern of initial fervour followed by rationalisation reflects academia's adaptive and self-correcting mechanism in responding to technological realities.

Based on the above analysis, this study proposes the following developmental and research recommendations concerning AI-enabled crime. Firstly, strengthening interdisciplinary integration is essential. Given its highly complex and cross-disciplinary nature, subsequent research must prioritise the convergence of fields such as law, computer science, ethics, and sociology. Confronted with emerging AI criminal methodologies, stakeholders must collaboratively develop operational standards to prevent technological advancement outpacing legal regulation. Secondly, given AI's rapid expansion, ethical challenges in AI-related crime necessitate enhanced ethical guidance. By adopting a "design-in-compliance" approach, ethical principles of fairness, transparency, and accountability should be integrated into AI algorithm development. Legally, ethical rules should be transformed into binding "technical standards" or "compliance guidelines," serving as the basis for determining whether a product (i.e., a compliant artefact) is at fault and whether due diligence has been exercised. This promotes the rule of law in fostering "technology for good."

Whilst this study undertakes a technical exploration and correlation summary of AI-related crime literature over the past decade, as a cross-sectional investigation, it provides only trend assessments of core relevant literature from the last ten years. It lacks detailed longitudinal descriptions and does not delve into the intrinsic causes underlying the correlations between various incidents. Furthermore, the study's scope carries certain limitations. While utilising CNKI—China's most comprehensive database for Chinese academic journals—effectively reflects domestic research trends, it inevitably overlooks emerging research priorities within international English-language literature. Moreover, the study's timeframe is confined to 2016-2025, whereas artificial intelligence and its associated applications are undergoing continuous upgrades and iterations. Disruptive technologies may emerge at any time, potentially altering current research on AI-related crime. Consequently, future investigations into AI crime should integrate more closely with ongoing technological developments and consider broader possibilities, such as the advent of a strong AI crime era.

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