ARTIFICIAL INTELLIGENCE IN DIGITAL FORENSICS: A THEMATIC REVIEW OF OPPORTUNITIES AND CHALLENGES

by

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Artificial intelligence in digital forensics: A thematic review of opportunities and challenges

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Abstract

The integration of artificial intelligence (AI) into digital forensics has created both opportunities and challenges for law enforcement agencies. While AI improves efficiency in processing large volumes of digital evidence, the use of Strong AI platforms, also known as Artificial General Intelligence (AGI), remains largely theoretical within digital forensic investigations. This research examines factors contributing to the limited use of AGI in digital forensic investigations, including the impact of training methodologies and datasets on AI performance. The study examines the strengths and limitations of AGI alongside Weak AI, known as Narrow AI, in the collection, categorization, and analysis of digital artifacts. In addition, ethical concerns related to the potential use of AGI in criminal investigations are explored, along with implementation barriers such as resource limitations, lack of validation frameworks, and governance challenges that restrict adoption and practical evaluation.

Keywords: artificial intelligence, digital forensics, law enforcement, artificial general intelligence, narrow AI

Introduction

In recent years, criminal investigations have become highly complex due to the growing use of technology in criminal activity. In a widely publicized homicide case, digital evidence from a Fitbit device was validated for inclusion and used to reconstruct the victim's activity timeline (*State v. Dabate*, 2025). Digital forensics exists to identify, preserve, and analyze technological evidence from criminal investigations (Jusas et al., 2017). With the introduction of smartphones, vehicle infotainment systems, wearable devices, and Internet of Things (IoT) technologies, the amount of digital evidence gathered has rapidly increased due to the large number of digital artifacts generated by these sources (Zhang et al., 2021). This increase also introduces challenges related to data volume, diversity, and complexity in traditional digital forensic methods (Tageldin & Venter, 2023). Furthermore, investigators often struggle to keep pace with rising caseloads and the need for properly trained personnel (Horsman & Dodd, 2024). Despite these challenges, digital evidence has become essential to modern investigations, appearing in nearly 90% of court cases (Miller, 2023). As a result, agencies have turned to artificial intelligence (AI) to support evidence triage, assist in automated analysis, and improve case efficiency, which has reduced workloads and decreased human error rates.

In numerous digital forensic laboratories, most forensic systems utilize Narrow AI, also known as Weak AI. Narrow AI possesses limited autonomy but excels in task-specific functions (Bory et al., 2024). In contrast, Artificial General Intelligence (AGI), also known as Strong AI, exhibits adaptive reasoning and autonomous learning capacities that closely mirror human cognition (Slavin, 2023). Although AGI offers a theoretical advantage through logical reasoning capabilities, its use within digital forensics remains largely conceptual. Several obstacles persist, including processing inefficiency, explainability limitations, and the lack of standardized validation frameworks suitable for courtroom application (Fähndrich et al., 2023). For this study, AGI is treated as an emerging category that includes AI systems that show some features of general reasoning, since fully developed AGI does not yet exist in operational forensic environments. This approach keeps the study grounded in current AGI capabilities and limitations.

The large gap in potential performance between Narrow AI and AGI underscores the need to understand why AGI has not been preferred for implementation in digital forensics. A thematic review of existing literature is necessary to synthesize findings on AI performance, training methodologies, and ethical and legal considerations. The goal of this review is to summarize the factors discussed in previous research that influence AGI adoption within digital forensic investigations. However, no comprehensive thematic review has been identified to synthesize performance, training, ethical, and institutional factors that constrain AGI's role in digital forensics.

Despite AGI's potential to independently acquire, analyze, and interpret digital evidence from diverse sources, most AI-enhanced digital forensic platforms continue to rely on Narrow AI, with minimal progress in AGI research toward implementation. Coupled with limited trained personnel and longer case turnaround times, the question of why AGI research and implementation continue to face resistance remains unanswered (Bory et al., 2024). Although AGI could enhance the categorization and analysis of evidence, ongoing concerns about transparency, reproducibility, and explainability raise issues of admissibility (Fähndrich et al., 2023).

While several studies have explored these challenges, few reviews organize themes connecting AGI, Narrow AI, and their roles in digital forensic investigations. Ethical and legal implications are examined by Stoykova and Franke (2023) and Mamak (2024), and institutional or technical barriers within digital forensic practice are noted by Horsman and Dodd (2024). This study addresses the lack of integrated thematic analysis exploring the obstacles and prospects for AGI adoption in digital forensics.

The purpose of this research is to synthesize existing literature on the factors that limit the use of AGI in digital forensic casework. This study examines existing research that discusses performance differences between AGI and Narrow AI, as well as the impact of training methodologies and datasets on AI performance. In addition, ethical, legal, and institutional concerns that influence AGI adoption in law enforcement investigations are addressed. The study seeks to answer the following research question:

RQ: What themes will emerge from the literature to address challenges with AGI and Narrow AI use in digital forensics?

Review of the Literature

This review of the literature examines how AI supports evidence identification, classification, and analysis within forensic processes. The literature was analyzed and organized into themes based on recurring patterns identified in the coding process. These themes reflect key areas related to AI integration, model performance, ethical and legal considerations, and implementation barriers.

Integration of Artificial Intelligence into Digital Forensic Processes

During its early development, digital forensic investigations were limited in scope and primarily focused on cybercrime (Dweikat et al., 2021). However, the rise of social media, digital currency, and widespread access to mobile and IoT devices led to an expansion of digital forensics within law enforcement investigations (Klasén et al., 2024). Digital forensics is now recognized as a branch of forensic science centered on the acquisition, analysis, and preservation of digital evidence to ensure its legal admissibility in court (Mahmood et al., 2024). Narrow AI helps reduce case turnaround times by allowing faster identification and extraction of relevant artifacts (Faqir, 2023). Hall et al. (2022) suggest that Narrow AI forensic systems can process and correlate large volumes of digital evidence at scales and speeds that are impractical for human examiners while identifying relationships between digital artifacts that may not be easily recognized by digital forensic investigators.

Beyond Narrow AI, studies also discuss the potential for AGI to extend these capabilities by applying reasoning beyond task-specific functions (Casino et al., 2022). Although theoretically promising, AGI remains largely conceptual (Fähndrich et al., 2023). Slavin (2023) notes that AGI requires a layered system architecture with technological, social, and ethical dimensions, reflecting the complexity of developing such systems. This complexity presents additional challenges for applying AGI within operational forensic environments.

Impact of Training on Performance of AI Models in Digital Forensics

Although AI platforms have been employed in digital forensics for several years, the scope and quality of their performance vary significantly. Narrow AI typically performs best when trained on datasets that are consistent and task-specific, which allows these systems to automate clearly defined forensic functions (Fähndrich et al., 2023). In contrast, AGI models rely on broader learning strategies that extend beyond preset algorithms, supporting a more adaptable form of reasoning and contextual interpretation (Butz, 2021). Studies show that large and diverse forensic datasets improve overall accuracy, while limited or biased datasets can create significant performance issues (Gogia & Rughani, 2022). Earlier forensic tools often relied on small, narrowly focused datasets, such as metadata or hash values, which restricted their usefulness in large-scale examinations (Jusas et al., 2017). More recent approaches incorporate transformer-based models that use structured training to learn relationships among data points, improving accuracy in approximate matching and digital artifact comparison across large collections of evidence (Uhlig et al., 2023).

AGI training methodologies further expand performance potential by incorporating broader, experience-based learning intended to support adaptive, context-aware reasoning. Butz (2021) explains that AGI seeks to approximate human-like cognitive functions through training methods that promote flexible problem-solving across a wide range of tasks. Prudkov (2025) adds that AGI learning aims to mirror human reasoning processes that support adaptive, goal-directed reasoning. These distinctions in training and performance provide a basis for evaluating how AI models can better support digital forensic investigations involving complex digital evidence.

Ethical and Legal Issues in AI Implementation

Even with the global acceptance of AI platforms, significant uncertainty remains within the criminal justice system regarding their ethical and legal implications. Prosecutors and investigators face challenges in explaining how automated outputs are validated, raising concerns about explainability, admissibility, and reliability (Miller, 2023). Overill and Collie (2021) emphasize the importance of quantifying digital forensic results, highlighting the need for measurable and reliable outcomes in forensic investigations. Stoykova and Franke (2023) introduce the Reliability Validation Enabling Framework (RVEF), which enhances transparency by recording the datasets, tools, and methods used throughout digital forensic processing. Although not AI-specific, Horsman (2019) proposes the Digital Evidence Reporting and Decision Support (DERDS) framework, which stresses consistent documentation, structured reporting, and methodological clarity to support findings that can withstand legal scrutiny.

Moreover, Mamak (2024) argues that AGI's capacity for context-aware reasoning may require new legal structures to determine responsibility and oversight, especially if AGI becomes involved in interpretive or autonomous elements. Human oversight remains essential to protect privacy expectations and ensure that relevant data is distinguished from non-relevant information during digital forensic analysis (Horsman, 2022). In practice, peer review in digital forensics is often limited to report review rather than verification of findings and methodology (Bauge et al., 2025). Bias and limitations in AI models present ethical concerns in digital forensics, as automated systems may misclassify or overlook evidence without

adequate transparency or examiner oversight (Hall et al., 2022). Stoykova and Franke (2023) further caution that evidence generated without examiner scrutiny risks falling short of the ethical standards required in judicial settings. Collectively, these concerns highlight the need to evaluate how validation frameworks, accountability measures, and continued human oversight can support the lawful and ethical use of AI within digital forensic investigations.

Barriers to AGI Implementation

Realistically, AGI remains largely theoretical because of the complexity of its operational requirements, which exceed the support capabilities of current forensic environments (Butz, 2021). When coupled with ongoing staffing shortages and heavy caseloads in digital forensic units, many agencies are limited in their capacity to introduce new or advanced systems (Wilson-Kovacs & Wilcox, 2023). Many agencies are not currently positioned to support AGI within digital forensic environments (Fähndrich et al., 2023). Smaller departments encounter further obstacles, including limited staffing, reduced budgets, fewer available forensic tools, and minimal internal expertise, all of which limit their ability to adopt more advanced AI systems (Wilson-Kovacs & Wilcox, 2023).

Additionally, the National Institute of Justice (2020) acknowledges the need for more formalized and consistent procedures within digital forensic units, but agencies vary widely in their policy development. These limitations reflect broader challenges associated with AI adoption, including governance, trust, and integration into existing operational systems (Dwivedi et al., 2021). At an institutional level, the effective implementation of AGI requires transparent governance structures capable of addressing oversight, documentation, and decision accountability (Raman et al., 2025). Investigators can show reluctance to depend on AI tools when the system's decision process is unclear or difficult to interpret (Phillips et al., 2021). This hesitation becomes more apparent during on-scene triage, where unpredictable environments, time limitations, and limited equipment increase operational difficulty (Horsman, 2022). Overall, the literature displays consistent patterns related to Narrow AI capabilities, the theoretical potential of AGI, and the challenges that affect their use in digital forensic investigations.

Methodology

Because AGI has not achieved a realistic operational level in a typical forensic environment, this study used a narrative literature review to evaluate current research on AGI and Narrow AI in digital forensic investigations. A qualitative approach supported the interpretation and synthesis of existing information to identify patterns and meaning across studies (Creswell & Poth, 2018). This approach supported the examination of how researchers describe both AI platforms, including their capabilities and limitations, performance and training considerations, legal and ethical issues, and the influence of institutional factors. The approach aimed to synthesize existing research and identify recurring themes that explain how AGI and Narrow AI were discussed within a forensic environment. The analysis was conducted using thematic analysis to identify and organize recurring patterns within the literature (Braun & Clarke, 2006). The thematic structure helped organize prior research into key areas. By identifying commonly observed consistencies and challenges, a clearer understanding of the practical implementation of AGI in digital forensic investigations was achieved.

Research Design and Search Strategy

Since AGI remains largely conceptual and has not been functionally deployed in operational forensic laboratories, reviewing published literature was the most effective way to evaluate how AGI is discussed, how it differs from Narrow AI, and what conditions influence its readiness for use in the field of digital forensics. This research design aligned with Braun and Clarke's (2006) approach, which emphasizes

identifying repeated ideas, grouping those ideas into themes, and interpreting the resulting larger patterns. This design was appropriate for this study because it did not require access to sensitive investigative data or restricted digital evidence systems.

Peer-reviewed studies were located through Google Scholar, GALILEO, ScienceDirect, and IEEE Xplore. The search included the terms “artificial intelligence,” “digital forensics,” and “law enforcement,” followed by additional terms such as “automation,” “machine learning,” “strong AI,” “weak AI,” “triage,” and “digital evidence.” The search process included Boolean strings such as:

1. ("artificial intelligence" OR "machine learning") AND "digital forensics"
2. ("digital forensics" AND "artificial general intelligence") AND "narrow artificial intelligence”
3. ("law enforcement" OR “investigation” OR “triage”) AND “artificial intelligence”

The search was limited to articles published between 2015 and 2025 to ensure recency and relevancy. During the initial review, the search results were examined using titles and abstracts, then reviewed in full to determine relevance for inclusion.

Criteria for Inclusion and Quality Appraisal

For inclusion, articles were selected if they were peer-reviewed and addressed the use of artificial intelligence in investigations, digital forensics, or law enforcement, and discussed training methods, performance outcomes, ethical or legal issues, or institutional or governance barriers. Conversely, studies were excluded if they were not peer-reviewed, lacked relevance to digital evidence processing or investigative practice, focused solely on commercial or industrial AI applications, or lacked methodological clarity. Articles were excluded if they did not provide enough detail for evaluation. According to the Critical Appraisal Skills Programme (CASP) qualitative studies checklist, qualitative research should clearly state its purpose, describe its methodology with sufficient transparency, and support its findings with appropriate evidence (Critical Appraisal Skills Programme [CASP], 2024). Using the CASP criteria as a screening tool, each article underwent a basic quality review to determine if the requirements were met for inclusion. Only studies that met these criteria were retained for thematic analysis.

Data Extraction and Review Procedure

After articles were selected for inclusion, those that met the inclusion criteria were reviewed to extract information related to AI capability, performance, training methodology, ethical or legal issues, and governance or implementation challenges. Statements were identified if they discussed how AGI or Narrow AI systems function, how training influenced model performance, how accuracy or adaptability was evaluated, or how legal or institutional concerns affected adoption. These statements formed the initial dataset for coding. The review procedure focused on identifying patterns across studies rather than evaluating the effectiveness of individual AI systems. This approach aligned with the purpose of the study, which was to understand how AGI is currently positioned within digital forensic environments.

The initial database searches produced approximately 28,000 articles related to artificial intelligence and digital investigations across multiple academic databases, including Google Scholar, GALILEO, ScienceDirect, and IEEE Xplore. Duplicate articles were removed, and the remaining articles were screened using titles and abstracts. Studies that did not align with the focus of the study were excluded during this stage. The remaining articles were then reviewed in full to determine relevance to the research questions and overall methodological clarity, resulting in a final selection of 30 studies included in the thematic analysis.

Thematic Coding and Analysis

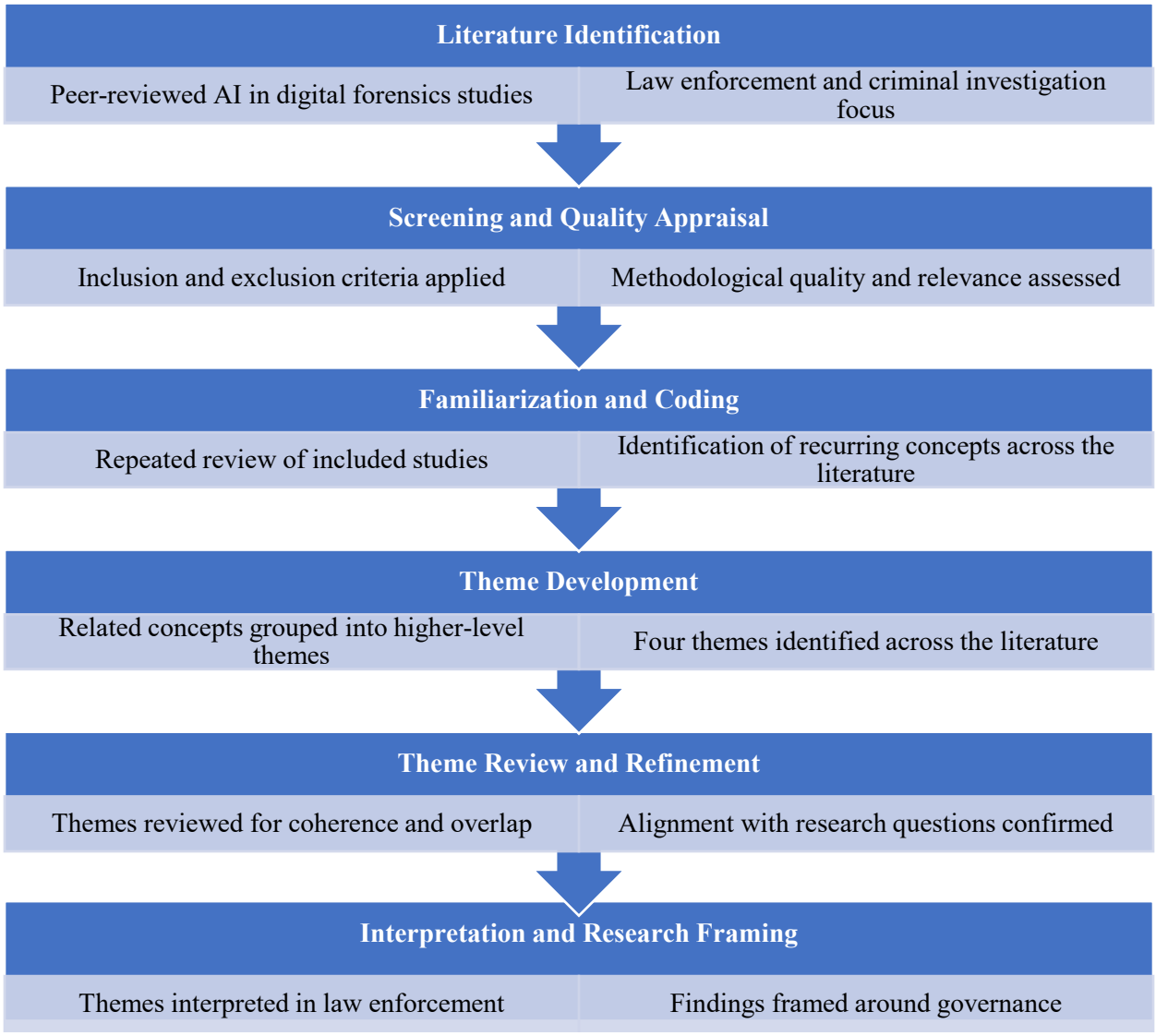
For the thematic coding process, the approach outlined by Braun and Clarke (2006) was followed. The analysis began with familiarization with the included articles, during which all selected studies were reviewed and initial notes were recorded. The coding process was conducted manually through repeated review and comparison of the selected studies, without the use of specialized qualitative analysis software. During the initial coding phase, recurring concepts were identified within the literature, and statements were coded based on ideas such as explainability, dataset bias, validation concerns, model performance, staffing limitations, and governance challenges. As coding progressed, related concepts were grouped and refined into broader categories as patterns became more consistent across the literature. Reflexive notes were maintained throughout the process to track the development of themes and to reduce the influence of personal bias. This process allowed the study to organize the literature into higher-level thematic groupings representing common issues and trends identified across the reviewed studies. After reviewing and refining the coded material, four major themes were identified: (1) AI integration and performance, (2) training and model development, (3) ethical and legal issues, and (4) implementation barriers within law enforcement. These themes provided the structure for the Results and Discussion sections. Each study was reviewed using the same coding approach to maintain consistency across the analysis.

Methodological Limitations

This methodology had several limitations. Because AGI remains conceptual, most of the available studies discuss theoretical applications or early-stage development rather than operational use in forensic cases. The review also depended on the availability and quality of published research, which may not fully represent the challenges encountered by law enforcement agencies in practice. Despite these limitations, the methodology allowed for the identification of recurring issues in the literature and supports the evaluation of how current research describes the potential role of AGI in digital forensic investigations.

Figure 1

Thematic Analysis Workflow



Note. Figure created by the author to illustrate the thematic analysis workflow used in this study.

Results

Theme 1: AI Integration and Performance

Regarding the Research Question, the reviewed studies indicated that the integration of AI into digital forensics supported key forensic capabilities while also presenting limitations within forensic environments. The areas most influenced by AI integration include evidence triage, digital artifact identification, and preliminary classification (Jusas et al., 2017). The findings also indicated that AI platforms are most effective during the early stages of digital forensic investigations. By supporting early-stage forensic processing, AI platforms reduce examiner workload and help streamline forensic examinations (Gogia & Rughani, 2022). Narrow AI was presented as the more widely utilized of the two platforms integrated into forensic environments. Narrow AI systems demonstrate high proficiency in task-

specific functions and are practical for investigative application. However, they remain constrained by their inability to perform beyond those defined tasks. In contrast, AGI demonstrates potential for human-level cognitive ability, which may extend to complex tasks such as digital artifact interpretation (Raman et al., 2025). Despite this, AGI adoption remains limited due to challenges related to practical implementation and its largely theoretical nature (Fähndrich et al., 2023). In practice, AI improves efficiency in digital forensic investigations, with Narrow AI driving current use while AGI remains limited in practice.

Theme 2: Training and Model Development

Regarding the Research Question, the reviewed studies showed that training methodologies significantly shape AI performance within digital forensic investigations. Differences in accuracy and adaptability are directly correlated to the quality, size, and structure of training datasets (Serhal & Le-Khac, 2021). The findings showed that Narrow AI systems perform most effectively when trained on well-defined, task-specific datasets. Studies also noted that limitations in training data can negatively affect accuracy and restrict the ability of Narrow AI systems to generalize beyond their intended functions. The literature described AGI training methodologies as broader and more complex, with an emphasis on adaptability and context-aware learning rather than task-specific training (Butz, 2021). However, the findings indicated that testing of AGI using these training approaches remains largely theoretical within digital forensic environments. While Narrow AI development progresses more quickly due to structured and narrowly focused training, AGI development remains limited due to its complexity and the lack of practical implementation within digital forensic environments (Fähndrich et al., 2023). Training directly affects AI performance, with Narrow AI benefiting from structured approaches while AGI remains more complex and limited.

Theme 3: Ethical and Legal Issues

Regarding the Research Question, the reviewed studies identified ethical and legal concerns as a major challenge associated with AI in digital forensic investigations. Issues related to transparency, explainability, and reliability were commonly cited as factors that affect the acceptance of AI-assisted forensic evidence in the reviewed literature (Stoykova & Franke, 2023). The findings revealed that limitations in explaining how AI systems generate results raise concerns related to accountability and the reliability of digital evidence. As a result, legal scrutiny often centers on whether AI-supported findings are sufficiently explained, reviewed, and justified during judicial proceedings. The reviewed studies also reflected concerns related to bias and human oversight (Hall et al., 2022). In relation to AGI, the findings showed that ethical and legal concerns are more pronounced than for Narrow AI.

Theme 4: Implementation Barriers

Regarding the Research Question, the reviewed studies revealed several institutional and organizational factors that affect AI integration in digital forensics. Limitations related to resources, infrastructure, and personnel were cited as barriers to effective implementation (Wilson-Kovacs & Wilcox, 2023). Many agencies lack personnel with the technical knowledge required to understand, validate, and oversee digital forensics, including the use of AI-assisted tools (Humphries et al., 2021). The literature highlighted governance-related challenges, including the absence of standardized policies and formal validation frameworks for AI in digital forensics (Stoykova & Franke, 2023). This lack of guidance contributes to inconsistent implementation practices and limits wider integration. When combined with unresolved legal and ethical concerns, these factors limit the introduction of more advanced AI systems within digital forensic investigations.

Table 1

Summary of Key Studies Included in the Thematic Review

Author	Year	Study Focus	Method / Approach	Key Findings
Jusas et al.	2017	Digital forensic triage tools	Survey	Triage improves evidence prioritization
Butz	2021	Artificial General Intelligence development	Conceptual analysis	AGI emphasizes generalized learning but remains theoretical
Overill & Collie	2021	Evaluation of forensic investigations	Literature review	Need metrics for forensic effectiveness
Serhal & Le-Khac	2021	Smartphone file triage	Experimental study	ML improves artifact classification using metadata
Humphries et al.	2021	Mobile forensics training challenges	Educational analysis	Training gaps affect investigations
Zhang et al.	2021	Mobile forensic framework	Design science research	Integrated AI forensic framework
Casino et al.	2022	Digital forensics research trends	Review of reviews	AI emerging in forensic research
Hall et al.	2022	Explainable AI in digital forensics	Conceptual analysis	Explainable AI supports forensic analysis with human validation
Faqir	2023	AI in digital investigations	Literature review	AI improves investigative efficiency
Fähndrich et al.	2023	Strong AI in digital forensics	Structured literature review	AGI is largely theoretical in practice
Stoykova & Franke	2023	Forensic reliability framework	Framework development	Need validation standards
Tageldin & Venter	2023	ML in forensic investigations	Systematic review	ML supports evidence classification
Uhlig et al.	2023	Transformer matching techniques	Experimental study	Transformers improve artifact similarity detection
Miller	2023	Prosecutor use of digital evidence	Survey	Growing reliance on digital evidence
Wilson-Kovacs & Wilcox	2023	Policing digital forensic demand	Policy analysis	Resource constraints limit forensic capacity
Horsman & Dodd	2024	Competence in digital forensics	Analytical study	Examiner training affects reliability

Note. This table summarizes the key studies included in the thematic review. These sources were used in the coding process and support the themes discussed in the Results section.

Discussion

With AI platforms becoming a common component of modern forensic investigations, the findings of this thematic review demonstrate the importance of AI in digital forensic investigations, where efficiency and accuracy influence investigative outcomes. According to Tageldin and Venter (2023), the rise in data sources and the volume of data collected have exceeded the capabilities of digital forensic investigators, making AI platforms a necessary tool. Particularly in the areas of early-stage triage, artifact identification, and classification, the use of AI platforms has been established to increase the effectiveness of digital forensic investigations (Jusas et al., 2017). This improvement is driven by faster filtering of large data volumes and reduced time required for initial analysis (Faqir, 2023). Narrow AI systems benefit from task-specific training and structured datasets (Serhal & Le-Khac, 2021). Through established validation practices, Narrow AI platforms can be better supported by verified reliability and admissibility in digital forensic investigations (Stoykova & Franke, 2023). Furthermore, Narrow AI has practical application in digital forensic investigations but is limited to predefined tasks, which may restrict its ability to adapt to new or complex investigative scenarios (Fähndrich et al., 2023). The literature consistently emphasizes practical considerations related to evidence handling, examiner accountability, and legal scrutiny, demonstrating the need for human validation and oversight when interpreting AI-supported findings (Hall et al., 2022). As a result, the distinction between operational tools and conceptual systems remains central to understanding the current reliance on Narrow AI and the limited practical application of AGI in forensic practice.

Although the literature highlights AGI's theoretical potential through broader reasoning and adaptability, the findings show that this potential is limited by significant institutional and governance impediments. Because of the autonomous and human-like reasoning capabilities of AGI, new definitions for legal frameworks may need to be developed (Mamak, 2024). Limitations related to validation frameworks prevent AGI from meeting the operational and evidentiary requirements of forensic environments (Stoykova & Franke, 2023). Issues with explainability further limit its use, particularly in situations where results must be explained and justified during legal proceedings (Hall et al., 2022). Alternatively, a human-based framework, such as DERDS, may provide a more appropriate approach for evaluating AGI outputs within digital forensic investigations, particularly in ensuring that results are interpreted and reported in a manner consistent with forensic standards (Horsman, 2019). When all themes are considered together, they indicate that the divide between Narrow AI and AGI is not only technological, but also shaped by the potential of AGI to drastically alter the digital forensic landscape, while current advancements remain dependent on improvements to Narrow AI systems.

Conclusion

This thematic literature review examined how AI is used in digital forensic investigations, focusing on the current role of Narrow AI and the potential use of AGI as reflected in practical implementation and ongoing research within operational and theoretical forensic settings. Across the reviewed studies, Narrow AI is well established in operational forensic practice due to its task-specific design, structured training approaches, and compatibility with existing forensic processes. This supports consistent performance in defined investigative tasks, while AGI remains largely conceptual. The findings indicate that numerous challenges, including limitations in validation frameworks, explainability, and governance structures, limit AGI's suitability for evidentiary use in digital forensic investigations.

The findings of this review are limited by the availability of published literature, which restricts evaluation of how AI systems perform under actual forensic conditions such as evidence triage, artifact interpretation, and examiner decision-making. This also limits the ability to determine whether the results would remain

consistent under real investigative demands, since AGI has not been operationally deployed within forensic environments. As a result, conclusions regarding AGI are based on theoretical analysis rather than measurable outcomes such as accuracy, error rates, or evidentiary reliability, which limits direct comparison between theoretical capability and actual performance. In addition, this study relied on peer-reviewed sources and did not include data from operational environments, where agencies must address training requirements, validation procedures, resource limitations, and the use of proprietary forensic tools and internal systems.

Future research should focus on the development and evaluation of validation frameworks, governance models, and explainability approaches that support consistent validation and independent assessment of AI-generated results suitable for forensic application. Additional studies should examine how advanced AI systems can be assessed under conditions that measure reliability, reproducibility, and the ability to support explanation in legal proceedings. These studies should also determine whether these systems can meet expectations related to admissibility, examiner accountability, and existing legal and evidentiary standards. Further research on oversight requirements and accountability structures would also support the evaluation of AGI functionality in digital forensic investigations.

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