Audit Financiar, XXII, Nr. 4(176)/**2024**, *724-741*
ISSN: 1583-5812; ISSN on-line: 1844-8801

Professional Judgment and Skepticism Amidst the Interaction of Artificial Intelligence and Human Intelligence

Abstract

Artificial Intelligence (AI) has revolutionized various industries by learning from data, mimicking human behavior, and making autonomous decisions. However, despite AI's advancements in data processing and decision-making, it cannot fully replicate human attributes such as emotional understanding and ethical judgment. This paper explores the intersection of AI and Human Intelligence (HI) within the audit profession, focusing on the implications for the auditor's professional judgment and skepticism. The integration of AI in auditing promises enhanced efficiency, precision, and data processing capabilities beyond human limits. However, it also raises ethical concerns regarding data privacy, algorithmic bias, and accountability. These concerns highlight the importance of maintaining human oversight and ethical standards in audit practices. Through a comprehensive literature review, this study compares the cognitive abilities, functional capabilities, and ethical implications of AI and human auditors. Key findings underscore AI's potential to complement human auditors by improving accuracy and uncovering anomalies, while recognizing the irreplaceable role of human judgment in complex decision-making processes. The study provides insights into the transformative impact of AI on the audit profession, advocating for a balanced approach that harnesses AI's capabilities while preserving the integrity and critical thinking of human auditors. The findings contribute to a deeper understanding of AI's integration into auditing, informing best practices and guiding future research in maintaining the profession's standards amidst technological advancements.

Key words: *digitalization; digital transformation; Artificial Intelligence; human intelligence; professional judgment; professional skepticism; auditor; audit profession;*

JEL Classification: *M42, O33, L84*

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To cite this article:
Deliu, D., (2024), Professional Judgment and Skepticism Amidst the Interaction of Artificial Intelligence and Human Intelligence, *Audit Financiar*, vol. XXII, no. 4(176)/2024, pp. 724-741, DOI: 10.20869/AUDITF/2024/176/024

To link this article:
http://dx.doi.org/10.20869/AUDITF/2024/176/024
Received: 28.06.2024
Revised: 10.07.2024
Accepted: 6.09.2024

1. Introduction

Digitalization and digital transformation are at the forefront of the modern business landscape, revolutionizing the way organizations operate and interact with their environments. As part of this shift, Artificial Intelligence (AI) has become an increasingly popular topic in recent decades, characterized by the ability of machines to imitate human behavior and learn and adapt to new situations (Carter & Nielsen, 2017). Technological advances have enabled the development of systems capable of performing tasks previously reserved for humans. AI systems can now be trained to identify patterns and make decisions based on these patterns without explicit programming.

While AI excels at repetitive and predictable tasks, it lacks the flexibility and creativity inherent in human intelligence (HI). Despite AI's impressive capabilities in data processing and decision-making (Pomerol, 1997; Tiron-Tudor *et al.*, 2024), it cannot fully replicate human attributes such as understanding emotions (Martınez-Miranda & Aldea, 2005; Kurzweil, 2006; Luckin, 2018; De Cremer & Kasparov, 2021; Korteling *et al.*, 2021) or making ethical and moral decisions (Embretson, 2004; Carter & Nielsen, 2017; Luckin, 2018; Spector & Ma, 2019; Korteling *et al.*, 2021; Satyawan & Iswati, 2023). Moreover, algorithmic bias can occur when the data used to train a machine learning algorithm reflect the default values of the people involved in the collection, selection, or use of that data. Thus, AI is susceptible to errors and biases, which can arise from the way it is programmed and trained (Tiron-Tudor & Deliu, 2022; Tiron-Tudor *et al.*, 2024). This leads to the pressing question: *How closely can AI get to the HI?*

As AI continues to evolve and improve, its impact on society must be carefully considered. AI holds the potential to bring significant advancements across various industries. However, we must also acknowledge the potential downsides, such as job displacement and increased dependence on computer systems. Furthermore, there is a risk that AI could be misprogrammed or misused, leading to erroneous decisions and unintended consequences (Aitkazinov, 2023). Thus, it is crucial to balance the benefits of AI with a mindful approach to its implementation, ensuring that HI continues to play a vital role in oversight and decision-making processes (Embretson, 2004; Kurzweil, 2006; Carter & Nielsen, 2017; Luckin, 2018; Spector & Ma, 2019; De Cremer & Kasparov, 2021). As AI integrates into various aspects of professional and personal life, it is crucial to examine the challenges that arise from the interaction between AI and HI (Korteling *et al.*, 2021). The integration of AI in various professional fields has sparked significant interest and debate, fundamentally altering the landscape of many professions (Goto, 2021), including the accounting and audit profession (Tiron-Tudor *et al.*, 2024).

In this context, the audit profession is undergoing a seismic shift as AI technologies begin to integrate with traditional auditing practices (Farcane & Deliu, 2020; Chowdhury, 2021; Aitkazinov, 2023; Tiron-Tudor *et al.*, 2024). This integration heralds a new era characterized by the potential for enhanced efficiency, precision, and data processing capabilities beyond human limits (Chowdhury, 2021; Tiron-Tudor & Deliu, 2022). The promise of AI in auditing extends beyond mere automation; it offers a transformative synergy between HI and algorithmic precision that could redefine the essence of auditing practices (Munoko *et al.*, 2020; Deliu, 2024).

Accordingly, the introduction of AI into the audit profession has been met with both enthusiasm and caution, since it introduces both opportunities and challenges (Omoteso, 2012; Farcane & Deliu, 2020; Gultom *et al.*, 2021; Tiron-Tudor & Deliu, 2021, 2022; Fedyk *et al.*, 2022). The benefits of AI, such as time savings, faster data analysis, increased levels of accuracy, and more in-depth insight into business processes, are well-documented (Munoko *et al.*, 2020; Chowdhury, 2021; Aitkazinov, 2023). However, the ethical implications and unintended consequences of AI use in auditing are gradually coming to light, necessitating a thorough examination of its impact on professional ethics (Munoko *et al.*, 2020; Tiron-Tudor *et al.*, 2024).

Moreover, while AI has been shown to have a strong positive relationship with professional skepticism and judgment, enhancing the detection of errors and material misstatements, there are concerns about the potential limitations of AI when it comes to complex judgments that require professional skepticism (Smith, 2019; Spaulding, 2020; Puthukulam *et al.*, 2021). For example, the evaluation of management estimates remains a complex audit task that may be less amenable to AI assistance (Munoko *et al.*, 2020; Chowdhury, 2021). PCAOB (2023) has also recognized the challenges posed by the increasing reliance on technology-based tools in auditing, including the potential for bias in technology-assisted analysis and the need for auditors to remain vigilant in

their skepticism. As algorithms become more prevalent in audit processes, the quality of the output is dependent on a variety of factors, including the quality of the inputs and the inherent perceptions about technology that can lead to bias (Fedyk *et al.*, 2022; Li, 2022). AI technologies, through Big Data & Data Analytics, promise to enhance the efficiency and accuracy of auditing processes by rapidly processing large volumes of data, identifying patterns, and performing repetitive tasks with consistency (Chowdhury, 2021; Aitkazinov, 2023). However, *the ability of AI to fully replicate the nuanced professional judgment and skepticism of human auditors* remains a critical question (Puthukulam *et al.*, 2021; Tiron-Tudor & Deliu, 2022; Deliu, 2024).

Hence, this transformation is particularly relevant in the realm of auditing, a field where the roles of professional judgment and skepticism are paramount (Goto, 2021; Deliu, 2024). In an AI-augmented landscape, the dynamics of professional skepticism are poised for evolution, prompting auditors to recalibrate their approach to the way of collecting audit evidence and the coordinates of their judgment. Auditors rely heavily on their expertise, professional standards, ethical norms, and intuitive judgment to review a company's financial statements, documents, data, and accounting entries (Deliu, 2013). Yet, as the digital metamorphosis of the audit profession unfolds, the principles of professional judgment and skepticism remain more relevant than ever (Puthukulam *et al.*, 2021; Deliu, 2024).

This manuscript ventures into the nexus of AI and HI within the audit domain, critically examining the implications of this convergence for the auditor's professional judgment and skepticism. Through a literature review, the paper endeavors to provide a starting point on an analysis regarding the complexities of AI's influence on auditors' cognitive faculties and their professional conduct. The research objectives are twofold: (1) *to investigate the extent to which AI affects professional judgment and skepticism within the audit profession*, and (2) *to present potential shifts in auditors' methodologies for evidence evaluation and judgment in the presence of AI*. The study aspires to shed light on these aspects, offering new perspectives, as well as a nuanced understanding of the interplay between AI and HI, and contributing to the ongoing discourse on the subject.

As the audit profession navigates this new technological frontier, it is imperative to ensure that the core tenets of professional judgment and skepticism are not only preserved but also enhanced. This research aims to illuminate the path forward, advocating for a harmonious balance between the analytical prowess of AI and the discerning judgment of auditors. In doing so, it seeks to fortify the audit profession against the challenges of the digital age, while harnessing the opportunities that AI presents (Aitkazinov, 2023). In light of these perspectives, by informing both audit practice and academia about these challenges, the paper aims to contribute to the development of best practices that maintain the integrity of the audit profession in an age of AI.

Given these considerations, the primary objective of this paper is to explore the interaction between AI and HI in the context of auditing, with a particular focus on professional judgment and skepticism. We aim to identify the innate characteristics of HI, respectively AI, ultimately understanding how AI can complement human auditors and to what extent it can enhance (or potentially replace) HI in these critical aspects of auditing. Given this background, the *research questions* guiding this study are:

- *RQ1: How do the cognitive abilities of AI compare to the professional judgment and skepticism exhibited by human auditors?*
- *RQ2: What are the specific strengths and limitations of AI in performing tasks traditionally handled by human auditors?*
- *RQ3: To what extent can AI replicate or augment the professional judgment and skepticism required in auditing?*
- *RQ4: What ethical considerations arise from the interaction of AI and HI in the auditing process?*

To address these questions in the current study, as well as to guide further research, we will conduct a comprehensive comparison of the intelligence characteristics of auditors and AI systems. This comparison will be structured around key pillars such as: Cognitive Abilities, Functional Capabilities, Personal and Behavioral Characteristics, Sensory and Physical Attributes, and Emotional and Social Intelligence. By examining the strengths and limitations of both AI and human auditors, this paper seeks to provide insights into the potential for AI to enhance the auditing process while highlighting the areas where human judgment remains indispensable. The ultimate goal is to contribute to a better understanding of how AI can be effectively integrated into the audit profession, ensuring that it supports rather than

undermines the critical role of human auditors in maintaining the integrity and reliability of financial reporting.

The structure of the paper is as follows. The first section is the introduction that sets the stage, followed by the second section that presents the theoretical background delving into the current literature on the role of AI in auditing, comparing it with HI, and highlights the theoretical underpinnings of professional judgment and skepticism. The third section presents the methodology of the paper, elucidating the process of the literature review, while the fourth section presents the findings of the research, detailed in a comprehensive table comparing the intelligence characteristics of auditors and AI systems. Finally, the fifth section presents a discussion that interprets these findings within the broader context of the audit profession, and the sixth section, the conclusion, distills the study's insights and forward-looking recommendations for practice and research.

2. Theoretical background

The foundation of auditing is built on the pillars of professional judgment and skepticism (Deliu, 2013; Goto, 2021; Deliu, 2024). *Professional judgment* in auditing encompasses the application of relevant knowledge and experience within the framework of auditing and accounting standards, alongside ethical principles, to make informed and correct decisions from a set of existing alternatives (Deliu, 2013; Bogdan *et al*., 2020; Deliu, 2020; Puthukulam *et al.*, 2021). *Professional skepticism*, on the other hand, is the auditor's compass, guiding them through the complexities and intricacies of the audit process. This critical, vigilant and questioning mindset is essential for being alert to audit evidence that contradicts other evidence (Spector & Ma, 2019), questioning the reliability of documents and responses, and recognizing conditions that may indicate potential fraud (AFC, 2020; Deliu, 2020; PCAOB, 2023).

The rise of AI introduces new dimensions to these foundational concepts. AI, with its capacity to process vast amounts of data quickly and accurately, offers significant potential benefits to the auditing field (Omoteso, 2012). It enhances efficiency in data processing, risk assessment, and pattern recognition, which are critical components of the auditing process. However, AI also has limitations in areas such as ethical understanding, intuition, and contextual awareness, posing significant challenges, particularly regarding professional judgment and professional skepticism.

Human intelligence (HI) brings intuition, ethical reasoning, and the ability to understand complex, nuanced situations (Sternberg, 1983; Embretson, 2004; Kurzweil, 2006; Luckin, 2018; Spector & Ma, 2019). When integrated with AI, these human attributes can complement the strengths of AI (Carter & Nielsen, 2017; De Cremer & Kasparov, 2021), resulting in a more robust auditing process. This HI – AI interaction can enhance auditors' abilities to detect anomalies and make informed decisions by combining AI's data processing power with human intuition and ethical judgment.

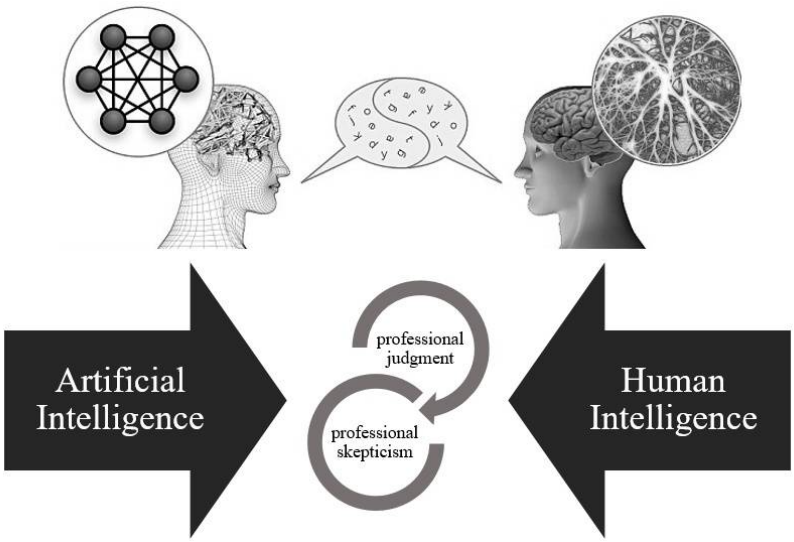
Thus, to fully grasp the dynamics of the opportunities and challenges presented by integrating AI into auditing, it is crucial to explore the theoretical foundations underpinning the roles of professional judgment and skepticism. Understanding how these human attributes interact with AI capabilities is essential. For instance, while AI can rapidly analyze large datasets to identify patterns and anomalies, human auditors must interpret these findings within the broader context of the company's operations and ethical considerations. This collaboration can lead to more accurate and comprehensive audit outcomes.

The theoretical framework of this paper explores the intricate AI – HI interplay, particularly focusing on how this interaction influences and enhances professional judgment and professional skepticism within the auditing profession (***Figure no. 1***).

In this context, the IU – IA interaction in auditing requires auditors to adapt their methodologies and enhance their professional skepticism. They must remain critical of AI-generated data, ensuring they do not blindly trust the technology but instead use it as a tool to augment their judgment (Carter & Nielsen, 2017; Spaulding, 2020; De Cremer & Kasparov, 2021). This balanced approach can mitigate the risks of over-reliance on AI and maintain the integrity of the auditing process.

In conclusion, integrating AI and HI in the audit profession presents both opportunities and challenges. It necessitates a nuanced understanding of how AI's capabilities can complement human judgment and skepticism. By exploring these theoretical foundations, we can better prepare for the future of auditing, ensuring that the profession adapts to technological advancements while upholding its core principles.

Figure no. 1. Theoretical framework



Source: own projection

2.1. Challenges of using AI in complex audit tasks

AI and other emerging technologies are revolutionizing auditing by enhancing efficiency, accuracy, and scope of analysis. AI encompasses a suite of technologies, including Machine Learning (ML), Robotic Process Automation (RPA), Big Data Analytics (BDA), and Blockchain Technology (BT) which collectively have the potential to redefine the audit landscape (Omoteso, 2012; Farcane & Deliu, 2020; Munoko *et al.*, 2020; Chowdhury, 2021; Gultom *et al.*, 2021; Tiron-Tudor & Deliu, 2021, 2022; Fedyk *et al.*, 2022). These technologies are not mere tools for automation; they represent a fundamental change in how data is analyzed and interpreted within the audit process (Fedyk *et al.*, 2022). They enable auditors to process vast amounts of data swiftly and accurately, identifying patterns and anomalies that might be missed by human auditors.

Thus, the role of AI in auditing is expanding, driven by its potential to enhance efficiency, accuracy, and consistency. AI technologies can automate routine, repetitive, and time-consuming tasks, such as data entry, transaction testing, reconciliation, and preliminary analysis. This automation allows human auditors to focus on more complex aspects of the audit, that require extensive judgments and sophisticated reasoning.

ML, a core component of AI, allows systems to learn from data patterns and improve over time without direct programming (Kurzweil, 2006; Luckin, 2018). In auditing, ML algorithms excel at effectively and comprehensively scrutinizing and analyzing extensive financial datasets to pinpoint irregular patterns and to uncover anomalies that might be overlooked in manual reviews (Luckin, 2018), respectively trends and risks that might elude human scrutiny (Chowdhury, 2021), thereby enhancing the detection of errors and fraud (AFC, 2020). This capability proves invaluable in auditing, given the escalating volume and intricacy of data being handled, supporting risk assessments, project scoping, and the proactive identification of potential issues and Key Audit Matters (ISACA, 2021). For instance, ML techniques can also detect fraudulent transactions and identify high-risk issues, such as unknown system activity from user endpoints (Chowdhury, 2021). These capabilities are reshaping the audit process, making it more efficient and effective (Fedyk *et al.*, 2022).

RPA, as well, revolutionizes assurance services by automating repetitive and rule-based tasks traditionally performed by humans. In the audit context, RPA software mimics human actions to streamline processes (i.e., data entry, reconciliation, and report generation) with

unprecedented accuracy and efficiency. For instance, they can process large amounts of data (i.e., reading bank statements and legal contracts), and reconcile accounts much faster than a human auditor can, and with fewer errors (EY, 2023). By reducing manual effort in routine tasks, RPA allows auditors to allocate more time and resources to complex and judgment-intensive aspects of audits, such as risk assessment and strategic analysis. Moreover, RPA enhances audit quality by minimizing errors and inconsistencies inherent in manual data processing, thereby improving overall reliability and confidence in audit findings. As auditors accept and embrace digital transformation, RPA emerges as a critical enabler for achieving operational efficiencies and enhancing the value proposition of audit services in a rapidly evolving business landscape.

Similarly, BDA enable auditors to perform comprehensive analyses of financial statements, leveraging vast datasets (Li, 2022) to gain deeper insights into financial health and risks (Tiron & Deliu, 2021). For example, AI can analyze entire datasets rather than relying on sampling methods traditionally used by human auditors. Consequently, by harnessing advanced analytical techniques and tools, auditors can uncover hidden patterns, correlations, and anomalies within financial data that traditional methods might overlook. BDA capabilities enable auditors to perform more thorough risk assessments and substantive testing, potentially leading to more accurate and reliable audit outcomes. Furthermore, BDA enables auditors not only to detect potential fraud or errors (AFC, 2020) but also to provide more accurate forecasts and assessments of financial performance (Tiron-Tudor & Deliu, 2021). This capability is increasingly crucial as businesses handle ever-growing volumes of data, ensuring auditors can deliver robust and insightful audits that meet the evolving needs of stakeholders. This is particularly pertinent in areas such as sustainability reporting (Deliu, 2024), where companies subject to the Corporate Sustainability Reporting Directive (CSRD) will soon be required to adhere to European Sustainability Reporting Standards (ESRS).

In the same vein, Blockchain Technology (BT) offers auditors a revolutionary tool for ensuring the integrity and traceability of financial transactions. By leveraging decentralized and tamper-proof digital ledgers, BT provides an immutable audit trail that records every transaction in a transparent and secure manner (Farcane & Deliu, 2020). This technology enhances audit efficiency by reducing the time and resources required to verify transactions and trace financial flows. Moreover, BT enhances trust and confidence among stakeholders by providing real-time access to verified transaction records, mitigating the risk of fraud and improving overall transparency in financial reporting. As auditors adapt to increasingly digital business environments, BT emerges as a critical asset for conducting audits with heightened accuracy, reliability, and trustworthiness.

In this background, leading companies like the Big Four – Deloitte, PwC, EY, and KPMG – are at the forefront of integrating these technologies into their audit practices. Deloitte's Omnia DNAV platform, for example, leverages AI and BDA to perform advanced audit analytics (Deloitte, 2020). PwC's Halo suite uses AI and ML for real-time monitoring and analysis of transactions (PwC, 2019). EY's Helix is a suite of analytics tools that improve the risk assessment process (EY, 2017). KPMG's Clara platform integrates AI to enhance audit quality and efficiency (KPMG, 2021). These examples illustrate how AI and emerging technologies are not just augmenting traditional auditing processes but are fundamentally transforming the audit profession, leading to more robust and reliable "financial oversight" (Tiron-Tudor & Deliu, 2022).

Predictive Analytics (PA), a technique that leverages data to create mathematical models for forecasting, is revolutionizing the accounting and auditing profession. This approach can be highly beneficial both internally and externally within an organization (Huerta & Jensen, 2022; Tiron-Tudor & Deliu, 2022). Given the critical role of external auditing, the use of PA for assurance purposes is becoming increasingly prevalent. This involves the adoption of sophisticated platforms, tailored applications, and specialized personnel training. For instance, EY's Helix suite of analytics tools exemplifies how PA is being seamlessly integrated into the assurance workflow.

Hence, since precision in auditing is essential, the Big Four companies utilize specialized audit software to achieve this standard. Deloitte's TeamMate, PwC's Aura, EY's Canvas, and KPMG's Clara are prime examples of tools designed to enhance risk assessment, audit planning, data analysis, documentation, and the creation of detailed audit reports, that also include Key Audit Matters (Huerta & Jensen, 2022; Tiron-Tudor & Deliu, 2022). The integration of technology and assurance transforms audits from mere compliance tasks into strategic initiatives.

Henceforth, AI holds the potential to significantly enhance audit quality and efficiency by augmenting, automating, and scaling up human expertise. By taking over routine tasks, AI enables auditors to dedicate more time to areas demanding professional skepticism and judgment (Carter & Nielsen, 2017; De Cremer & Kasparov, 2021). This shift allows auditors to focus on strategic activities that benefit from human insight (i.e., interpreting complex transactions and offering advisory services) (Tiron-Tudor & Deliu, 2022).

However, while AI offers numerous advantages, it also presents challenges in *complex audit tasks* that require deep professional skepticism and judgment. One of the primary concerns is the "black box" nature of some AI systems, where the decision-making process is not transparent or easily understood (Pomerol, 1997; Tiron-Tudor *et al.*, 2024). This opacity can be problematic in auditing, where *transparency* and the ability to explain findings are paramount. Auditors must ensure that AI's limitations do not undermine the quality of the audit and that they continue to apply their professional judgment effectively (Fedyk *et al.*, 2022).

Complex audit tasks (i.e., evaluating management estimates or detecting subtle signs of fraud) may still necessitate human intervention (AFC, 2020). AI systems may not fully capture the nuances and contextual factors that auditors consider when making judgments. Therefore, auditors must be vigilant in overseeing AI's contributions to the audit process (Munoko *et al.*, 2020; Fedyk *et al.*, 2022). In this context, they must ensure that they understand how AI tools arrive at their conclusions and that these tools are used in a way that complements, rather than replaces, professional judgment (Carter & Nielsen, 2017; Malone, 2019; De Cremer & Kasparov, 2021).

Another challenge is the potential for AI to perpetuate or even amplify *biases* present in the underlying data. Auditors must maintain professional skepticism and be vigilant in identifying and mitigating these biases to ensure that AI tools do not lead to discriminatory, unfair or unethical outcomes. This requires a deep understanding of the data, the algorithms, and the context in which they are applied.

Additionally, the development and maintenance of AI systems require *specialized technical expertise*, especially in the context of the concerns regarding data privacy and security, potential biases within AI algorithms, and the ethical implications of relying on automated decision-making (Pomerol, 1997; Aitkazinov, 2023; Tiron-Tudor *et al.*, 2024).

Despite all these challenges, the opportunities presented by AI in auditing are vast. AI can enhance the auditor's ability to detect fraud and provide more insightful analysis (Aitkazinov, 2023). Therefore, as the technology continues to evolve, it is likely that AI will play an increasingly central role in the audit process (Fedyk *et al.*, 2022), shaping the future of the profession gradually (Kurzweil, 2006).

Consequently, AI represents a transformative force in auditing, offering significant benefits in terms of efficiency, accuracy, and depth of analysis. As the profession navigates this technological evolution, auditors must balance the use of AI with the maintenance of professional judgment, professional skepticism and ethical standards. The successful integration of AI into auditing will require a collaborative effort between technology experts and audit professionals to ensure that the benefits of AI are fully realized while its challenges are effectively managed.

2.2. Balancing HI and AI in audit

AI has emerged as a powerful tool across auditing. AI systems are designed to perform tasks that typically require HI (i.e., learning from data, recognizing patterns, and making decisions). AI can be broadly categorized into two types: *narrow AI*, which is specialized for specific tasks (i.e., language translation, fraud detection), and *general AI*, which aims to replicate human cognitive abilities across a wide range of activities, although this remains largely theoretical at present.

HI, in contrast, is characterized by its broad range of cognitive abilities. These include learning from experience, understanding complex ideas, solving problems, and adapting to new situations (Sternberg, 1983; Embretson, 2004; Kurzweil, 2006; Luckin, 2018; Spector & Ma, 2019). HI is not merely a function of processing speed or memory capacity but also involves emotional and social intelligence, ethical judgment, and intuitive judgment (Martınez-Miranda & Aldea, 2005; Korteling *et al.*, 2021). These attributes enable humans to understand context, apply ethical considerations, and navigate complex social interactions (Satyawan & Iswati, 2023).

The interaction between AI – HI in the context of auditing raises several important questions. While AI can process large volumes of data with high accuracy and speed, its ability to replicate the nuanced understanding and ethical judgment inherent to HI is limited (Smith, 2019; Spaulding,

2020; Korteling *et al.*, 2021). This distinction becomes particularly important in auditing, where professional judgment and skepticism are crucial (Puthukulam *et al.*, 2021). AI technologies can assist auditors in processing and analyzing large volumes of data, enabling them to focus on higher-level judgment and judgment tasks. For example, ML algorithms can be trained to recognize indicators of fraudulent activity (AFC, 2020; Chowdhury, 2021), which auditors can then investigate further using their professional judgment. This symbiotic relationship between AI and HI can lead to more accurate and reliable audit outcomes.

Additionally, the AI – HI interaction hinges on finding a balance where AI augments human capabilities without undermining ethical principles (Carter & Nielsen, 2017; De Cremer & Kasparov, 2021). This balance requires ongoing education and training for professionals to understand AI's limitations and potential biases (Luckin, 2018). It also involves developing AI systems that are aligned with ethical standards and societal values.

In this sense, one approach is the concept of *"*Human-in-the-Loop*"* systems, where AI assists but does not replace human decision-making (Pomerol, 1997; Malone, 2019). This approach ensures that human judgment remains central, allowing for ethical considerations to be integrated into the decision-making process (Malone, 2019; Munoko *et al.*, 2020). For instance, in using drones for stock counts, human oversight can intervene in critical situations, ensuring that ethical decisions are made in scenarios where AI might fail.

In a new scenario known as *"Auditor-Governing-the-Loop"*, auditors are deeply engaged in overseeing AI models. Here, they monitor and supervise these models closely, ready to intervene if the AI encounters unexpected or undesirable incidents, such as model failures (Tiron-Tudor & Deliu, 2022). According to this framework, the collaboration between humans and computer systems should transcend mere integration, aiming to collectively enhance the auditing profession's capabilities and shape its future (Kurzweil, 2006; Tiron-Tudor & Deliu, 2022).

Consequently, the AI – HI interaction in auditing is a dynamic and evolving relationship that presents both opportunities and challenges. AI's capacity to augment human expertise with advanced data processing and analytical capabilities has the potential to significantly enhance the audit profession. However, this integration also necessitates a re-evaluation of the auditor's role and the development of new competencies.

2.3. The promise and peril of AI in professional judgment and professional skepticism

The *identity of audit professionals* is traditionally marked by several *key attributes* that define their role and responsibilities: professional judgment, professional skepticism, independence, and acting for the public interest (Deliu, 2013; Deliu, 2020; Goto, 2021). Professional judgment is paramount, encompassing the application of relevant knowledge and experience within the framework of auditing standards to make informed decisions. Equally important is professional skepticism, which involves a critical and questioning mindset (Spector & Ma, 2019), alert to potential misstatements and the reliability of audit evidence. Independence is another crucial marker, ensuring that auditors remain unbiased and impartial, free from any conflicts of interest. Acting for the public interest is fundamental, as auditors are entrusted with upholding the integrity of financial reporting and protecting stakeholders. Additionally, audit professionals are characterized by their adherence to ethical standards, commitment to continuous learning, and the ability to adapt to evolving regulatory and technological landscapes. Together, these attributes form the *core identity of audit professionals*, underpinning their critical role in maintaining trust and transparency in financial markets (Goto, 2021).

According to the specialty literature, AI has a particularly significant impact on the attributes of professional judgment and professional skepticism (Deliu, 2013; Deliu, 2020). Therefore, in this increasingly AI-driven audit landscape, it is vital to explore the evolving role of auditors and how AI influences their professional judgment and skepticism (Puthukulam *et al.*, 2021). Further research must delve into both the potential benefits and limitations of integrating AI into these critical areas of auditing, providing a comprehensive understanding of the changes and challenges facing the profession.

Professional judgment in auditing involves the application of auditors' knowledge and experience in order to critically evaluate information, identify key issues, interpret evidence, and make informed decisions from a set of possible alternatives (Deliu, 2013; Spector & Ma, 2019). This multifaceted cognitive process is inherently complex and context-dependent, demanding a high level of

expertise and reasoning (Bogdan *et al.*, 2020). It involves the application of knowledge, experience, and critical thinking (Spector & Ma, 2019; Satyawan & Iswati, 2023) to navigate through complex audit tasks. In this context, practitioners must not only assess financial data but also understand the business context, industry trends, and regulatory environment (Bogdan *et al.*, 2020).

Professional skepticism is a fundamental aspect of auditing, as well, characterized by a questioning mindset and heightened alertness to conditions that may indicate potential misstatements due to error or fraud (Olsen & Gold, 2018; AFC, 2020). Auditors critically assess audit evidence, seek corroboration, and remain vigilant for inconsistencies or anomalies. This mindset helps auditors identify and investigate potential risks, ensuring the reliability and accuracy of financial statements. It is the auditor's duty to remain skeptical, not only to detect errors and fraud but also to ensure the integrity of the audit process (Fedyk *et al.*, 2022). The importance of skepticism is even greater in the face of new challenges brought about by the adoption of emerging technologies in auditing (AFC, 2020).

The introduction of AI into auditing brings new dimensions to these two attributes that define the role and responsibilities of auditors.

First, as regards *professional judgment*, AI has the potential to revolutionize it by offering unprecedented levels of efficiency, accuracy, and data-driven insights. AI's data-driven approach can enhance certain aspects of professional judgment by quickly processing and analyzing large datasets to identify anomalies. The integration of AI into professional judgment has the potential to significantly enhance the auditor's judgment capabilities by providing deeper insights into financial data and identifying patterns that may indicate risks or anomalies. However, it also presents significant ethical dilemmas. One primary concern is the reliance on AI tools built by humans that introduces the bias of human judgment and stereotyping (ISACA, 2021). This can lead to the risk of over-reliance, where auditors may become complacent and overly dependent on AI-generated insights without applying their professional judgment (Bogdan *et al.*, 2020). Professionals might be tempted to defer to AI-driven decisions, potentially neglecting their critical thinking and judgment (Spector & Ma, 2019). This can lead to a loss of accountability, as decisions become increasingly opaque and difficult to challenge (Tiron-Tudor *et al.*, 2024). Additionally, inadequate testing of AI outcomes can produce questionable results or audit outcomes, and human logic errors might hinder the development of AI algorithms used for auditing. Therefore, auditors must maintain a thorough understanding of the AI tools they use, including their limitations and the underlying assumptions of the algorithms, to ensure the integrity and reliability of the audit process (Fedyk *et al.*, 2022). This understanding is crucial to ensure that AI supports, rather than undermines, the auditor's professional judgment.

Second, as regards *professional skepticism*, prudence plays a crucial role in mitigating the risks associated with AI integration. There is a risk that auditors may become over-reliant on AI tools which may have inherent biases or limitations, potentially leading to a diminution of professional skepticism (Olsen & Gold, 2018). Auditors must remain vigilant and ensure that they critically evaluate the outputs of AI systems and consider alternative explanations for the findings. They must also be aware of the potential biases within AI algorithms and the ethical implications of automated decision-making (Pomerol, 1997; Mökander, 2023). Thus, audit professionals must maintain a critical stance towards AI outputs, questioning the data, algorithms, and ethical implications of AI-driven decisions (Olsen & Gold, 2018; Fedyk *et al.*, 2022). This skepticism ensures that AI serves as an aid to human judgment rather than a replacement (Carter & Nielsen, 2017; Malone, 2019; De Cremer & Kasparov, 2021). For example, in an audit engagement, AI tools can analyze legal documents and predict outcomes based on historical data (Huerta & Jensen, 2022). However, auditors must scrutinize these predictions, considering the unique circumstances of each case and the potential biases in the AI's training data (Fedyk *et al.*, 2022). Additionally, AI's ability to exercise professional skepticism is limited, per se, by its reliance on predefined algorithms and lack of contextual understanding (Olsen & Gold, 2018). While AI can flag unusual transactions or discrepancies, the interpretative and judgmental aspects of skepticism still require human oversight. By fostering a culture of skepticism, professionals can better balance the insights provided by AI with their ethical obligations and professional expertise.

As observed above, AI's impact on professional judgment and skepticism extends to the ethical concerns surrounding data privacy, algorithmic bias, and auditor's accountability (Tiron-Tudor *et al.*, 2024). Auditors must ensure that the data used by AI systems is handled in accordance with privacy laws and regulations (Mökander, 2023). Additionally, concerns arise about algorithmic bias, where AI systems may

unfairly discriminate against certain groups or individuals in their outcomes (Bogdan *et al.*, 2020). Moreover, as companies increasingly adopt AI, they face unique challenges such as maintaining data integrity, ensuring security, preserving privacy, and meeting regulatory requirements (EY, 2023; Mökander, 2023; Tiron-Tudor *et al.*, 2024). In this context, the objectivity, transparency, accuracy, and explainability of AI models are becoming increasingly relevant, especially as legislative initiatives like the forthcoming EU AI Act evolve (EP, 2023).

To navigate these challenges, auditors must deepen their understanding of AI technologies and their applications. They should advocate for transparency and accountability in AI systems, ensuring that the decision-making processes of these systems are explainable and justifiable (Pomerol, 1997; Mökander, 2023). Thus, auditors must ensure that their practices align with professional standards and societal expectations.

Consequently, while AI has the potential to significantly enhance professional skepticism and judgment in auditing by providing powerful tools for data analysis and risk assessment, it is imperative that auditors maintain a critical mindset and ethical approach when integrating AI into their work (Olsen & Gold, 2018). They must approach the integration of AI with caution, ensuring that they maintain the critical thinking and judgment skills that are the hallmark of the profession (Spector & Ma, 2019). As AI continues to evolve, it will become increasingly important for auditors to develop skills in interpreting and validating the results provided by AI systems (Spector & Ma, 2019). This may involve a combination of traditional auditing knowledge and new competencies in data science and AI (Satyawan & Iswati, 2023). Ongoing education and training will be essential to equip auditors with the necessary skills to effectively integrate AI into their professional judgment processes (Luckin, 2018; Spector & Ma, 2019). This may also involve developing new guidelines and frameworks for the use of AI in auditing (Mökander, 2023) to help auditors develop their professional judgment and maintain their skeptical mindset in an increasingly automated environment.

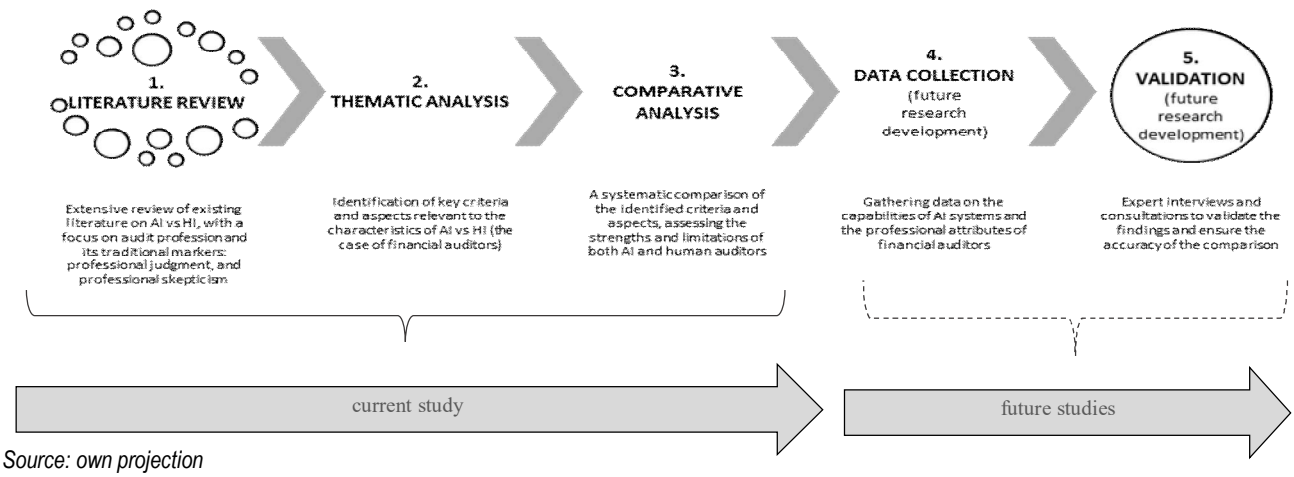
3. Methodology

The research design follows a qualitative methodology, utilizing a *systematic literature review* as the primary method for data collection and analysis. This approach is chosen for its suitability in comprehensively understanding complex phenomena and developing a theoretical framework based on existing literature (Levy & Ellis, 2006).

The research methodology for this study involved a detailed comparative analysis of the intelligence characteristics of auditors and AI systems.

The study was conducted in several structured phases (***Figure no. 2***) to ensure a comprehensive understanding of how AI can complement or replace HI in the context of auditing, with a specific focus on the auditor's professional judgment and skepticism.

Figure no. 2. Research methodology



Source: own projection

The *first* phase involved an extensive *review of existing literature* comparing HI and AI in auditing. The literature review focused on understanding the concepts of professional judgment and skepticism, their application in the audit profession, and the current capabilities of AI in performing tasks traditionally handled by human auditors. This phase included reviewing academic papers, industry reports, and case studies to gather insights into how AI is being used in auditing and the challenges and opportunities it presents. Regarding data collection methods, the literature review process began with a structured search for relevant literature across multiple databases, including Web of Science and Scopus. Keywords such as "artificial intelligence", "human intelligence", "audit profession", "professional skepticism", and "professional judgment" were used in various combinations to ensure a wide coverage of the topic. Inclusion criteria were established to select studies that specifically address the interaction between AI and HI within the audit profession and its impact on the auditor's professional judgment and skepticism.

In the *second* phase, the collected literature underwent a *thematic analysis* to identify recurring themes and debates. This involved coding the literature into categories (pillars) and sub-categories (criteria) based on the research objectives and synthesizing the information to draw meaningful insights relevant to the study. Through this analysis, we identified key pillars and criteria pertinent to the characteristics of HI and AI in auditing, with a focus on professional judgment and skepticism. Essential attributes and capabilities that auditors must possess (i.e., analytical skills, ethical judgment, intuition, and contextual understanding) were highlighted. Simultaneously, the capabilities of AI systems in relation to these attributes, were examined, with a focus on their data processing, pattern recognition, and decision-making abilities. The dimensions were categorized into pillars, with each general category (pillar) further developed into corresponding sub-categories (criteria) derived from the literature review. This categorization provided a structured framework for understanding the different aspects of both HI and AI, facilitating a more systematic analysis of their strengths and weaknesses.

In the *third* phase, a systematic comparative analysis of the identified criteria and aspects was conducted, with an assessment of all aspects referring to the HI, respectively AI. This facilitated identifying strengths and limitations of both AI and human auditors, as well as an evaluation of the qualitative attributes of professional judgment and skepticism (i.e., ethical judgment and intuition), inherently human, versus the performance of AI systems in terms of speed, accuracy, and consistency in data processing and pattern recognition tasks.

The *fourth* phase, reserved for future research developments, will focus on gathering data on the capabilities of AI systems and the professional attributes of auditors. Data collection may involve surveys and questionnaires (that may be distributed to auditors to gather insights into their professional judgment and skepticism practices), and/or interviews (conducted with experts in AI and auditing to understand the practical applications and limitations of AI in the field). By this, a gap analysis may be performed, in order to identify the gaps where AI falls short compared to human auditors and where it can potentially enhance the auditing process.

The *fifth* phase, also reserved for future studies, involves validating the findings through expert interviews and consultations. This phase will aim to ensure the accuracy of the comparison and to gather feedback from practitioners and academics in the field of auditing and AI. The validation process may include: expert panels (i.e., engaging panels of auditors and AI experts to review and discuss the findings), pilot testing (implementing AI tools in real-world auditing scenarios to test their effectiveness and gather practical insights, as well as examples of good practices), and/or continuous feedback (collecting ongoing feedback from industry stakeholders to refine and update the research findings).

This approach ensures that the study is grounded in both theoretical insights and practical considerations, offering a balanced view of the potential for AI to enhance the audit profession while highlighting the irreplaceable elements of human judgment and skepticism.

4. Results

Our study provides a comprehensive comparison of HI and AI across various dimensions. It encompasses a detailed analysis of HI and AI across multiple pillars and criteria. **Table no. 1** presents a structured overview of these intelligence aspects, facilitating a systematic examination. The table breaks down the aspects of intelligence (i.e., *pillars*), categorizing them under broader dimensions (i.e., *criteria*) and specifying their relevance to AI and HI.

Thus, it categorizes intelligence, per se, into five major pillars: Cognitive Abilities, Functional Capabilities, Personal and Behavioral Characteristics, Sensory and Physical Attributes, and Emotional and Social Intelligence. Each pillar is further broken down into specific criteria and dimensions relevant to professional judgment and skepticism, allowing for a nuanced comparison of AI and human auditors' strengths and limitations. For each criterion, the attributes and assessments for both HI and AI, are detailed, with a focus on their respective capabilities and constraints.

Table no. 1. Comparison of intelligence characteristics required by auditors and capabilities of AI in auditing

Pillar	Criteria	AI	HI
1. COGNITIVE ABILITIES	*1.1. Data Processing & Analysis*	Can process and analyze large datasets rapidly and with high accuracy. Uses algorithms to detect patterns and anomalies.	Excels in understanding context and making nuanced judgments. Interprets findings based on experience and industry knowledge.
	1.2. Efficiency & Automation	Automates routine tasks, increasing efficiency and allowing focus on strategic areas.	Cannot match AI's speed but excels in tasks requiring deep understanding and subtleties.
	1.3. Risk Identification & Assessment	Applies analytics to detect risks and anomalies, enhancing the auditor's ability to identify and assess risks.	Uses judgment and experience to assess risks, considering both quantitative and qualitative factors.
	1.4. Learning & Adaptation	Learns from data over time but is limited to patterns within its training data.	Continuously learns and adapts from a broad range of experiences and knowledge.
	1.5. Decision-Making	Makes decisions based on pre-defined algorithms and data patterns. Struggles with ambiguous or incomplete data.	Capable of making complex decisions that involve ethical considerations, ambiguity, and incomplete information.
	1.6. Understanding of Context	May not fully understand the context or the 'why' behind data.	Has a deep understanding of context, which is critical for evaluating audit evidence and the significance of audit findings.
	1.7. Strategic Thinking	Follows programmed strategies but cannot create new strategies.	Capable of strategic thinking and long-term planning based on a holistic understanding of the business environment.
2. FUNCTIONAL CAPABILITIES	*2.1. Adaptability to Change*	Requires reprogramming or retraining to adapt to new scenarios.	Naturally adapts to new situations and can handle unexpected changes with ease.
	2.2. Audit Quality & Assurance	Can improve certain aspects of audit quality but cannot assure the overall quality of an audit.	Responsible for the overall quality and assurance of the audit, ensuring compliance with standards and regulations.
3. PERSONAL & BEHAVIOURAL CHARACTERISTICS	*3.1. Creativity & Innovation*	Limited to its programming and cannot conceive original ideas or creative solutions.	Can think creatively, generate new ideas, and innovate beyond existing paradigms.
	3.4. Professional Reasoning	Lacks the ability to exercise professional judgment.	Possesses professional judgment that is honed through experience and is crucial for audit quality.
	3.4. Continuous Learning	Can update its algorithms based on new data but does not 'learn' in the human sense.	Engages in continuous professional development to stay updated with the latest industry practices and standards.

Pillar	Criteria	AI	HI
4. SENSORY & PHYSICAL ATTRIBUTES	*4.1. Physical Coordination*	High level of dexterity and coordination.	Varies; often limited in complex tasks.
	4.2. Sensory Perception	Integrates multiple sensory inputs seamlessly.	Depends on sensors; may lack integration.
	4.3. Data Storage & Retrieval	Limited by biological constraints.	Can store and retrieve vast amounts of data accurately and rapidly.
5. EMOTIONAL & SOCIAL INTELLIGENCE	*5.1. Ethical & Regulatory Compliance*	Must operate within ethical and regulatory frameworks. Transparency and explainability are crucial.	Bound by professional ethics and standards. Accountable for judgments and decisions.
	5.2. Collaboration & Communication	Lacks the ability to collaborate or communicate like humans. Serves as a support tool.	Essential for interpreting AI findings, communicating results, and providing advisory services.
	5.3. Emotional Intelligence	Incapable of understanding or expressing emotions.	Can perceive and interpret emotional cues, which is important for team dynamics and client interactions.
	5.4. Client Relationships	Does not manage client relationships.	Builds and maintains client relationships, which are essential for successful audit engagements.

Source: own projection

The fundamental nature of AI and HI is characterized by their origins and inherent capabilities. AI's nature is computational, designed to process data and execute tasks with a level of speed and precision that is unattainable for humans (Korteling *et al.*, 2021). Its algorithmic foundation allows it to perform complex calculations and data analyses rapidly, making it an invaluable asset in handling the quantitative aspects of auditing. HI, however, is organic and intuitive, capable of understanding the subtleties and nuances that AI cannot compute (Sternberg, 1983; Embretson, 2004; Kurzweil, 2006; Luckin, 2018; Spector & Ma, 2019). Human auditors bring a wealth of experience and contextual knowledge to the table (Satyawan & Iswati, 2023), enabling them to interpret data within the broader framework of industry practices, economic conditions, and organizational culture.

Cognitive abilities encompass the intellectual processes used to perceive, reason, and judge. AI excels in tasks that require computational judgment (Embretson, 2004), such as identifying discrepancies in financial statements or predicting trends based on historical data (Huerta & Jensen, 2022). Its cognitive abilities are rooted in its programming and the quality of data it has been trained on. Thus, AI systems, while powerful, operate within the constraints of their programming (Korteling *et al.*, 2021), lacking the ability to understand the broader business context, to interpret nuanced information, and to apply ethical considerations (Embretson, 2004). AI decisions are based on algorithms and statistical models, which can sometimes lead to incorrect conclusions if not properly supervised (Malone, 2019). Human auditors, conversely, use cognitive abilities that include critical thinking, problem-solving, and the application of professional judgment (Kurzweil, 2006; Spector & Ma, 2019; Bogdan *et al.*, 2020; Gultom *et al.*, 2021). They can understand complex concepts, evaluate the implications of audit findings, and make informed decisions based on a combination of empirical evidence and professional expertise.

Functional capabilities refer to the practical application of skills to perform specific tasks. AI's functional capabilities are defined by its ability to automate processes, analyze data, and provide insights based on predefined parameters (Korteling *et al.*, 2021). It is particularly effective in performing repetitive tasks with high accuracy, such as data entry and validation (Embretson, 2004). Human auditors offer functional capabilities that AI cannot replicate, such as physical presence during inventory counts, understanding the physical aspects of an organization's operations, and applying hands-on experience to assess the real-world implications of audit findings (Gultom *et al.*, 2021).

Personal and behavioral characteristics include traits such as creativity, innovation, and continuous learning.

AI's capabilities in these areas are limited to the scope of its programming and the data it has been exposed to (Embretson, 2004; Li, 2022). It does not possess the ability to think outside the box or engage in creative problem-solving. Human auditors, in contrast, are capable of creative thinking (Korteling *et al.*, 2021), developing innovative solutions to complex problems (Bogdan *et al.*, 2020), and adapting their approach based on new information or changing circumstances (Kurzweil, 2006; Gultom *et al.*, 2021). They also exhibit personal characteristics such as integrity, accountability, and ethical behavior (Li, 2022; Satyawan & Iswati, 2023), which are essential for maintaining the trust and credibility of the audit profession.

Sensory and physical attributes play a role in auditing, particularly in tasks that require direct interaction with the physical environment. AI does not possess sensory experiences or physical attributes (Embretson, 2004), operating strictly within the digital realm. Human auditors, however, may use their senses to observe, touch, and assess physical assets (Korteling *et al.*, 2021; Satyawan & Iswati, 2023). They can conduct on-site inspections, engage in face-to-face meetings, and perform tasks that require a physical presence, such as verifying the existence of tangible assets.

Emotional and social intelligence are critical in the audit profession, where understanding client needs, managing relationships, and navigating ethical dilemmas are daily tasks. AI lacks emotional intelligence (Korteling *et al.*, 2021) and cannot engage in the social aspects of an audit engagement, such as negotiating with clients or understanding the emotional underpinnings of organizational behavior (Satyawan & Iswati, 2023). Human auditors, on the other hand, are adept at reading emotional cues, demonstrating empathy, and building relationships with clients (Martınez-Miranda & Aldea, 2005; Kurzweil, 2006; Bogdan *et al.*, 2020). Their ability to understand and manage emotions plays a significant role in conducting and effective audit process and delivering insights with tact and sensitivity (Martınez-Miranda & Aldea, 2005).

In a nutshell, this detailed comparison highlights the complementary strengths and limitations of auditors and AI. Auditors excel in professional judgment, professional skepticism, and nuanced decision-making, all of which are critical for effective auditing (Pomerol, 1997; Olsen & Gold, 2018; Li, 2022). They bring creativity, intuition, ethical understanding, and emotional intelligence to their work (Martınez-Miranda & Aldea, 2005; De Cremer & Kasparov, 2021) – dimensions that AI cannot fully replicate. AI, however, offers unparalleled speed, efficiency, scalability, and data handling capabilities, making it a valuable tool to augment human auditors' work (Carter & Nielsen, 2017). The integration of AI in auditing can enhance accuracy and efficiency (Korteling *et al.*, 2021), but the irreplaceable human elements of judgment and skepticism underscore the continuing importance of skilled auditors in the auditing process (Spector & Ma, 2019; Gultom *et al.*, 2021).

This analysis provides a thorough exploration of the distinct roles that AI and HI play in auditing, highlighting the strengths and limitations of both, and underscoring the importance of integrating AI into the audit process in a manner that enhances (De Cremer & Kasparov, 2021), rather than replaces, human expertise. The future of financial auditing will likely involve a collaborative approach, leveraging the computational power of AI while retaining the irreplaceable human elements of judgment, ethics, and interpersonal skills (Spector & Ma, 2019; Tiron-Tudor & Deliu, 2022).

5. Discussion & further research developments

Our findings reveal that auditors possess strong capabilities in professional judgment and skepticism, which are critical for the integrity and reliability of audits. They excel in cognitive abilities, emotional and social intelligence (Satyawan & Iswati, 2023), and personal and behavioral characteristics (Martınez-Miranda & Aldea, 2005). These skills enable them to make informed decisions, apply ethical considerations, and maintain a questioning mindset essential for identifying potential misstatements due to error or fraud (Spector & Ma, 2019; AFC, 2020).

AI systems, on the other hand, demonstrate significant strengths in data processing and pattern recognition, outperforming human auditors in terms of speed and accuracy in handling large datasets (Kurzweil, 2006). However, AI lacks the depth of contextual understanding, ethical judgment, and intuitive judgment that human auditors bring to the auditing process (Korteling *et al.*, 2021). While AI can assist in identifying anomalies and performing routine tasks, it cannot fully replicate the nuanced professional skepticism and judgment of human auditors (Olsen & Gold, 2018; Li, 2022).

However, as AI systems aim to mimic human cognitive skills and judgment, they bring forth questions about responsibility, governance, and the potential for unintended consequences. Auditors must address these ethical concerns, ensuring that AI is used in a manner that aligns with professional standards and societal expectations (Munoko *et al.*, 2020; Fedyk *et al.*, 2022).

The findings also suggest that AI can enhance the auditing process by augmenting human capabilities (Carter & Nielsen, 2017), particularly in data-intensive tasks (De Cremer & Kasparov, 2021). However, the irreplaceable elements of professional judgment and skepticism underscore the continuing importance of skilled auditors (Olsen & Gold, 2018; Spector & Ma, 2019; Gultom *et al.*, 2021; Puthukulam *et al.*, 2021), namely the fact that it is very unlikely that in the future, financial auditors will be replaced by AI tools.

In conclusion, this comparative analysis highlights the complementary nature of AI and HI in auditing. The integration of AI should be approached with caution, ensuring that human auditors continue to play a pivotal role in applying their expertise and judgment to uphold the highest standards of accuracy and ethical conduct in financial reporting. A balanced approach that leverages the strengths of both AI and human auditors is recommended, ensuring that human judgment and ethical considerations remain central to the auditing process.

The AI – HI intersection challenges traditional notions of professional judgment and necessitates a healthy degree of skepticism to ensure ethical outcomes. Future research endeavors should explore these ethical considerations, focusing on the balance between leveraging AI's capabilities and maintaining human oversight.

The human brain is not superior to AI. Vice versa – yes. The only problem would be that the two are simply not comparable. The main difference between the two types of intelligence is the way of data processing and abstract thinking (Korteling *et al.*, 2021). At bottom and after all, even the most polished AI existing is not much different from any other software. They all work on the same principle: bits of data zipping through electrical circuits at breakneck speed. AI is capable of solving problems as long as those problems are found in data sets it has access to. The same cannot be said for the human brain – or at least the speed differs (Korteling *et al.*, 2021). If we are to judge from the perspective of data processing, HI is clearly inferior to AI. However, in other areas, the human brain is head and shoulders above the competition – abstract thinking, for example (Spector & Ma, 2019). The human mind can access knowledge from other fields as well; it is not for nothing that one speaks of the fullness of the mental faculties (Satyawan & Iswati, 2023). AI algorithms have been shown many times to fail at logic as soon as they are presented with a problem outside of their range of competence or that differs from the data they were trained with (Gultom *et al.*, 2021).

Consequently, the evolving role of AI in auditing presents numerous *opportunities for future research*. Key areas include the development of frameworks for the ethical use of AI, the exploration of AI's impact on professional skepticism, and the examination of how AI can support the auditor's judgment in complex scenarios (Olsen & Gold, 2018). Future research should also focus on the long-term implications of AI on the audit profession. This may include studying the effects of AI on audit quality, efficiency, and the labor market within the auditing sector. Additionally, research is needed to guide the development of best practices that balance the benefits of AI with the need for professional skepticism and human judgment (Olsen & Gold, 2018). Ultimately, the future of AI in auditing is ripe with research opportunities that can contribute to the advancement of the profession (Luckin, 2018; Aitkazinov, 2023). Auditors, academics, and policymakers must collaborate to explore these opportunities and proactively address the challenges presented by AI.

Although AI and HI are different in many ways, there is also great potential to use them together. Completely replacing HI is not possible, but using AI to support and improve our abilities can lead to significant innovations and improve people's lives in ways we could not imagine now. Therefore, it is important that we continue to explore the potential of AI and ensure that it is used in a responsible and ethical way to benefit humanity.

6. Conclusion

This research underscores the complementary strengths of AI and HI in auditing. AI excels in speed, efficiency, and data handling, offering significant benefits. However, the irreplaceable human elements of ethical judgment, intuition, and professional skepticism remain crucial. A balanced approach that leverages AI's capabilities while preserving the essential roles of human auditors enhances the overall effectiveness of audit engagements, ensuring accuracy, reliability, and ethical integrity.

The interaction between AI and HI in auditing introduces a complex landscape of ethical considerations. To navigate these challenges, auditors must respond to shifts in business models and risk triggered by AI and use these novel technologies to reimagine audits. This requires a balance between leveraging AI's capabilities to enhance the audit process and maintaining the auditor's critical judgment and professional skepticism.

Audit professionals must navigate this terrain with a blend of trust in AI's capabilities and a healthy dose of skepticism. Adhering to robust ethical frameworks and maintaining human oversight, as outlined in the "Auditor-governing-the-loop" scenario, allows us to harness AI's benefits while safeguarding professional judgment and proactively addressing ethical challenges to maintain the trust and integrity of the audit profession. As AI continues to evolve, the commitment to ethical integration will be paramount to ensuring technology serves the public interest in a fair and just manner.

In conclusion, the interplay between AI and HI in auditing presents a promising yet intricate dynamic. Embracing continuous learning and adaptability is essential for auditors to harness AI's power while upholding the profession's core principles. By doing so, the audit profession can achieve audits that are not only efficient and accurate but also ethically sound and trustworthy, paving the way for a future where technology and human expertise coalesce to elevate the standards of auditing.

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