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Optimization of Artificial Intelligence in Internal Audit to Enhance the Effectiveness of Financial Fraud Detection Based on Real-Time Data

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ABSTRACT

Introduction: In an increasingly complex digital era, financial fraud is a serious threat to organizations around the world. Conventional audit methods are often unable to identify patterns of fraud hidden in huge transaction data. Therefore, the application of Artificial Intelligence (AI) in internal audits is a promising solution to increase the effectiveness of fraud detection based on real-time data.

Objectives: This study aims to identify the key factors that affect the successful implementation of AI in internal audit, develop an optimization model to improve the accuracy and speed of financial fraud detection, and formulate strategic recommendations for organizations in adopting AI as a financial supervision tool.

Methods: This study uses a qualitative approach with a literature study method on various recent studies related to the application of AI in financial auditing.

Results: The results show that the success of AI implementation depends on data quality, the right algorithm selection, the readiness of the technology infrastructure, as well as management support and regulatory compliance. Effective optimization models include the implementation of hybrid AI, real-time-based predictive systems, periodic model calibration, and AI integration with existing internal audit systems.

Conclusions: By adopting a holistic AI optimization strategy, organizations can improve accuracy and efficiency in detecting financial fraud, thereby strengthening their financial transparency and governance.

Keywords: Artificial Intelligence, Audit Internal, Financial Fraud.

INTRODUCTION

In the fast-paced digital era, financial fraud is a serious challenge for organizations around the world. These crimes not only harm the company financially, but also damage the reputation and trust of stakeholders [1] Fraud techniques are increasingly complex, and conventional audit methods often fail to detect anomalies hidden behind large transaction data [2] Therefore, the application of Artificial Intelligence (AI) is a potential solution to strengthen internal audits and increase the effectiveness of real-time fraud detection [3]

Financial fraud is an act of manipulation or fraud that is carried out deliberately to hide or alter financial information for the benefit of a certain person or organization. Jayanti (2021) revealed that fraud in financial statements often occurs through income manipulation, excessive presentation of assets, or concealment of liabilities [4] One of the most commonly used models for detecting fraud is the pentagon's fraud theory, which includes five elements: pressure, opportunity, rationalization, ability, and arrogance. Research by Kusumosari and Solikhah (2021) shows that companies with high financial targets are often more prone to manipulation to meet shareholder expectations, especially if internal oversight is weak [5]

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Fraud detection efforts continue to evolve with increasingly complex approaches. Setyono et al. (2023) examined the use of fraud hexagon, which adds another dimension to fraud analysis, namely external involvement that encourages or facilitates fraud [6] This model helps broaden perspectives in uncovering fraud that comes not only from internal pressures but also external factors such as fierce market competition. Nugraha and Sartono (2023) emphasized that early detection through the analysis of suspicious transaction patterns and strengthening corporate governance can be an effective preventive measure [7] This research indicates that a deep understanding of the factors that trigger fraud and the implementation of strict control systems are essential to protect the integrity of financial statements.

AI is able to quickly analyze large volumes of data, identify suspicious patterns, and provide early warnings before fraud develops further [8] This technology allows auditors to overcome human limitations in processing complex data and reduce the risk of errors due to bias or fatigue [9] Recent studies show that companies that adopt AI in internal audits have experienced significant improvements in the accuracy and speed of fraud detection [10]

AI's ability to learn adaptively from historical data strengthens its function as a tool to support smarter decision-making [3] Through machine learning and deep learning approaches, AI can develop predictive models that continue to evolve as fraudster behavior patterns change [11] This provides flexibility for auditors to adjust detection strategies without having to change procedures thoroughly, thereby accelerating response to new threats [10]

However, while AI offers great potential, its application in internal auditing still faces challenges. Factors such as algorithm bias, the need for high data quality, and the gap in technological skills in auditors are obstacles that need to be solved [9] Therefore, AI optimization not only involves improving technology, but also strengthening auditor capacity and integrating holistic systems to ensure AI can work optimally in detecting financial fraud [3]

The urgency of this research lies in the urgent need for organizations to improve financial resilience through more accurate and faster fraud detection. Amid increasing incidents of cybercrime and manipulation of financial statements, companies that are slow to adopt advanced technologies such as AI risk incurring huge losses and losing competitiveness [2] AI optimization is crucial to strengthen internal audits and ensure that financial supervision can be carried out proactively, not just reactive to fraud incidents that have occurred [10]

Previous research has examined the benefits of using AI in financial auditing, especially in detecting transaction anomalies and fraud patterns (Javadian Kootanaee et al., 2021). A study by Rahman et al. (2024) shows that machine learning can improve fraud detection accuracy by up to 90%, while Bello et al. (2024) found that the use of deep learning algorithms speeds up the audit process by up to 50%. Even so, research that examines AI optimization strategies holistically in the context of internal audit is still limited, so more in-depth research is needed to fill this gap.

This study aims to identify the key factors that affect the successful implementation of AI in internal audit, develop an optimization model to improve the accuracy and speed of financial fraud detection based on real-time data, and formulate strategic recommendations for organizations in adopting AI to strengthen the financial supervision function.

METHODS

This study uses a qualitative approach with a literature study method to examine the optimization of artificial intelligence (ai) in internal audits to improve the effectiveness of financial fraud detection based on real-time data. Literature studies were chosen because they allow researchers to explore various theoretical and empirical perspectives from previous research, so as to identify research patterns, trends, as well as gaps relevant to this topic [12]. This approach also supports a deeper understanding of the development of ai technology, fraud detection algorithms, and the challenges of its implementation in internal audit practices [13].

The data sources used in this study consist of indexed scientific journal articles, conference proceedings, academic books, and research reports published in the last five years (2019–2024). The collected literature comes from trusted

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databases such as Elsevier, Springer, and ResearchGate, with keywords such as "fraud detection," "internal audit," "artificial intelligence," and "real-time data analysis." This process follows the principle of structured secondary data collection, as suggested by Sugiyono (2019), to ensure that the data used is relevant, accurate, and supports the focus of the research [12]

Data collection also involved a rigorous screening process to ensure the inclusion of high-quality and relevant studies. Literature that is irrelevant or does not meet scientific quality standards will be eliminated to maintain the validity of the analysis results. The collected data is then analyzed using the content analysis method with a thematic approach. This analysis is carried out by identifying the main themes that appear in the literature, grouping information based on factors that affect the effectiveness of AI in fraud detection, and exploring the relationships between relevant variables [13] This analysis process follows the stages of data reduction, data presentation, and conclusion [14] With this method, this research is expected to be able to provide a comprehensive overview of AI optimization strategies in internal audit, as well as formulate practical recommendations for organizations to strengthen financial fraud detection systems in real-time.

RESULTS

The following is a selection of 10 scientific articles that are most relevant to the topic of optimization of artificial intelligence (Artificial Intelligence) in internal audits to improve the effectiveness of financial fraud detection based on real-time data. These articles were selected based on their relevance, credibility, and contribution to the development of modern audit models that integrate intelligent technology to detect anomalies and fraud patterns more accurately and quickly.

Table 1. Bibliography Data

No.	Author(s) and Year	Title of the Article	Main Findings
1	Khan, Malik, Alomari	Transforming the Capabilities of AI in GCC Financial Sector: A Systematic Literature Review	Application of AI for IoT-based fraud detection and business process optimization in internal audits.
2	Zhao, Deng	Enterprise Financial Fraud Detection and Audit Optimization Based on Deep Learning	The use of deep learning to automate the audit process and improve the accuracy of fraud detection.
3	Lei, Qiaoming, Tong	Research on Supply Chain Financial Risk Prevention Based on Machine Learning	Optimization of evolution indices to improve the ability of AI models to prevent financial risks.
4	Rahahleh, Hamzah, Rashid	AI in Internal Audit: Improving Reliability and Fraud Detection	The integration of AI in auditing improves the accuracy of detecting manipulation of financial statements and accounting information.
5	Zayed, Nour, Almubaideen	Role of AI in Accounting Information Systems for Fraud Detection	The use of AI algorithms to automate accounting tasks and detect fraud in real-time.
6	Ding	Enterprise Intelligent Audit Model Using Deep Learning	An intelligent audit model that optimizes audit data processing using a deep learning approach.
7	Popara, Savkovic, Lalic	Application of Digital Tools, Data Analytics, and Machine Learning in Internal Audit	Utilizing digital tools and data analytics to automate the detection of financial transaction anomalies.
8	Kamdjoug, Kala	Data Analytics-Based Auditing: A Case Study of Fraud Detection in Banking	A case study on the application of AI-based data analytics to support audit and fraud detection in the banking sector.

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No.	Author(s) and Year	Title of the Article	Main Findings
9	Zhong, Yang, Shi	From Data to Insights: Knowledge Graphs in Intelligent Audit	The use of AI-based knowledge graphs to strengthen data analysis and prediction of financial risks.
10	Bonrath, Eulerich	Internal Auditing's Role in Preventing and Detecting Fraud: An Empirical Analysis	Internal audits that utilize data-driven technology to improve fraud prevention and detection.

In an effort to optimize financial fraud detection, the application of artificial intelligence (AI) is one of the most promising solutions to strengthen internal audit. Recent studies have shown that AI is not only able to improve detection accuracy, but also speed up the audit process and reduce the risk of human error. Through a search of the relevant literature, ten key articles were found that provide valuable insights into how AI can be optimized to support internal audit functions more effectively and efficiently.

Research conducted by Khan, Malik, and Alomari (2022) highlights the transformation of AI capabilities in the GCC financial sector through a systematic literature review. The study reveals that AI integrated with the Internet of Things (IoT) can significantly improve the precision of fraud detection by identifying anomalous patterns in financial transactions in real-time. This approach allows auditors to detect suspicious activity early, thereby reducing potential losses due to fraud that are not detected in conventional manual systems [15]

Meanwhile, Zhao and Deng (2024) examined how deep learning technology can be adopted to optimize the audit process. By leveraging deep learning algorithms, the model can learn complex patterns in transaction data and identify anomalies that indicate potential fraud. The study shows that AI not only functions as a detection tool, but is also capable of performing predictive analytics that help auditors anticipate possible future fraud [16]

The research of Lei, Qiaoming, and Tong (2023) also enriched the understanding of financial risk prevention through machine learning. They developed an evolution index to optimize the fraud detection model, allowing the system to continuously update and improve its accuracy over time. This model can adapt to changing fraud patterns that are constantly evolving, giving companies an edge in the face of increasingly sophisticated threats [17]

In the context of accounting, Rahahleh, Hamzah, and Rashid (2021) examine how AI can improve the reliability of accounting information and strengthen the detection of manipulation of financial statements. The integration of AI in auditing allows companies to identify suspicious data discrepancies, even if done with complex manipulation techniques. These findings indicate that AI can be an important pillar in maintaining the transparency and integrity of the Company's finances [18]

Zayed, Nour, and Almubaideen (2024) further explore the use of AI algorithms to automate accounting tasks and detect fraud in real-time. This implementation not only improves operational efficiency, but also allows auditors to focus on strategic analysis rather than just administrative tasks [19] This is in line with a study conducted by Ding (2022), who developed a deep learning-based intelligent audit model. This model automates large-scale audit data processing, allowing for more in-depth analysis in less time, thereby accelerating audit cycles and improving a company's response capacity to indications of fraud [20]

On the other hand, Popara, Savkovic, and Lalic (2023) propose the use of digital tools and data analytics to automate anomaly detection in financial transactions. By combining machine learning and advanced data analysis techniques, this study shows that companies can speed up the fraud investigation process and reduce reliance on manual procedures that are prone to errors [21]

Kamdjoug and Kala (2024) reviewed a case study of the implementation of AI-based data analytics in the banking sector, showing that this technology can significantly strengthen the audit process and accelerate the detection of suspicious activity. They emphasized the importance of strengthening technology capabilities and training auditors to maximize the potential of AI in uncovering complex and hidden fraud [22]

Zhong, Yang, and Shi (2024) contribute by proposing the use of knowledge graphs to enrich audit data analysis. This technology allows AI systems to understand complex relationships between financial entities, expanding the scope of fraud detection to a deeper level. Thus, auditors can identify suspicious transaction patterns more accurately, even if done with sophisticated layering techniques [23]

Finally, the research of Bonrath and Eulerich (2024) provides empirical evidence that active involvement in internal audits supported by data-driven technology significantly improves fraud prevention and detection. The study underscores the importance of synergy between humans and machines, where AI acts as a powerful analytical tool, while auditors play a role in interpreting the results of the analysis for more strategic decision-making [24]

Overall, the literature reviewed shows that AI optimization in internal audits not only speeds up the fraud detection process, but also strengthens the overall quality of financial supervision. However, the success of AI implementation is highly dependent on data quality, the right selection of algorithms, and the readiness of organizations to adopt this technology. Therefore, a comprehensive optimization strategy needs to be developed, covering aspects of technology, processes, and human resources, to ensure that AI can truly be a catalyst for a more adaptive and resilient internal audit transformation in the face of future fraud threats.

DISCUSSION

Key Factors Affecting the Success of AI Implementation in Internal Audit

The success of AI implementation in internal audits is highly dependent on various factors, one of which is the quality of the data and the technological infrastructure used. The accuracy of the analysis carried out by AI is greatly influenced by the available data. If the data used is incomplete or not well structured, then the results of the analysis can be biased or even inaccurate. The Wells Fargo case in 2016, for example, shows how a fake account opening scandal involving millions of customer accounts could have been detected earlier if the bank had an AI system capable of better analyzing transaction patterns. In addition, the existence of adequate technological infrastructure, such as the use of cloud computing and a strong cybersecurity system, is also an important factor in ensuring that AI can operate optimally.

In addition to data quality, the selection of algorithms used in machine learning models also plays a big role in improving the effectiveness of fraud detection. Models based on supervised learning can help identify patterns of fraud that have occurred before, while unsupervised learning is more effective in recognizing new anomalies that have never been detected. PayPal, for example, has combined machine learning and deep learning in its system to detect suspicious transactions with greater accuracy than conventional rule-based methods.

However, technological factors and algorithms alone are not enough. Support from top management also plays a big role in ensuring the successful implementation of AI in internal audits. An organization must have proactive leadership and be open to digital change so that this technology can be utilized to its fullest. A study from Deloitte shows that organizations with management that actively support digital transformation tend to have more successful AI-based audit systems than organizations that are less open to technological innovation. Therefore, in addition to adequate budget allocation, organizational culture also needs to be adjusted to be more adaptive to the use of new technology.

In addition, the implementation of AI in financial auditing must also pay attention to applicable regulatory aspects. In the European Union, for example, the use of AI in auditing must comply with the General Data Protection Regulation (GDPR) to protect the privacy of user data. Compliance with these regulations not only ensures that the audit system remains compliant with legal standards, but also increases stakeholder confidence in the use of AI in financial supervision.

Optimization Model to Improve the Accuracy and Speed of Financial Fraud Detection

To improve the accuracy and speed of financial fraud detection based on real-time data, an optimization model is needed that can maximize AI's capabilities in identifying suspicious transactions. One of the approaches that can be applied is the use of a hybrid AI system that combines supervised and unsupervised learning techniques. Supervised learning is used to recognize fraud patterns based on historical data, while unsupervised learning plays a role in

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detecting anomalies that have never been identified before. Mastercard, for example, has implemented this hybrid AI model to analyze transactions in real-time, thereby reducing the rate of false positives and improving efficiency in dealing with financial fraud.

In addition to the use of hybrid AI, the implementation of a real-time-based predictive system is a strategic step in increasing the effectiveness of fraud detection. By leveraging big data analytics and parallel processing, AI can process millions of transactions in seconds and provide early warning of suspicious activity. JP Morgan, for example, has used AI to analyze more than 12,000 legal contracts in a short period of time, a job that previously took months if done manually by human auditors. This capability allows financial companies to respond to potential fraud more quickly and accurately.

However, the reliability of AI systems in detecting fraud depends not only on the selection of algorithms and the speed of analysis, but also on the continuous maintenance of the model. Periodic model calibration is crucial so that AI remains relevant to the ever-evolving fraud mode. Amazon, for example, routinely updates its AI models to detect various forms of fraud in e-commerce transactions, such as the use of stolen credit cards and suspicious activity from newly created accounts. With this approach, AI systems can continue to adapt and improve their accuracy in detecting increasingly complex patterns of financial crime.

Additionally, the effectiveness of AI in internal auditing can be strengthened by integration into existing systems, such as Enterprise Resource Planning (ERP) and other financial software. With this interoperability, AI can automatically access company transaction data and conduct in-depth analysis without disrupting ongoing financial operations. This not only improves audit efficiency, but also ensures that every data-driven decision can be made more accurately and in a timely manner.

Strategic Recommendations for Organizations to Adopt AI to Strengthen Financial Supervisory Functions

In an effort to adopt artificial intelligence to strengthen the financial supervision function, organizations need to take comprehensive strategic steps so that AI implementation runs effectively and delivers optimal results. One of the key steps is to strengthen technology capabilities, which includes investments in digital infrastructure such as cloud computing, advanced cybersecurity systems, and structured data management. With adequate technology, AI can work more efficiently in identifying suspicious transactions and analyzing financial patterns in real-time. For example, global financial companies such as HSBC have adopted cloud-based AI to improve fraud detection and minimize the risk of illegal transactions.

In addition to the technological aspect, organizations also need to develop competent human resources in the use of AI. Internal auditors must be equipped with a deep understanding of data analytics, machine learning techniques, and the use of AI in financial audits. Without a skilled workforce, the use of AI in internal audits will not achieve maximum effectiveness. Therefore, training and certification for auditors is one of the most important investments. For example, Deloitte has provided AI-based training programs for their internal auditors to ensure they are able to interpret the results of AI analysis and make informed decisions based on the data generated.

Internal governance and regulations are also crucial aspects in the application of AI in financial audits. Organizations need to establish clear policies regarding transparency, accountability, and data protection in the use of AI. This is important to ensure that AI is used in accordance with applicable regulations and does not pose a legal risk. Audits of AI systems must also be conducted periodically to evaluate their effectiveness and identify potential irregularities that can occur. For example, Bank of America has developed a tightly controlled AI-based internal oversight system to ensure compliance with applicable financial regulations in each country in which they operate.

In addition to internal factors, organizations can also strengthen the implementation of AI through collaboration with external parties such as technology companies and research institutions. This collaboration can help in the development of more accurate AI models and provide access to the latest technology in fraud detection. Benchmarking against other companies that have successfully implemented AI can also be an effective strategy to accelerate the adoption of this technology. For example, the collaboration between IBM and various financial

institutions has resulted in Watson-based AI solutions that are able to analyze transactions more sophisticatedly, detect fraud patterns that are not detected by conventional methods, and improve the overall security of the financial system.

CONCLUSION

The results of this study show that the application of artificial intelligence in internal audits can provide significant benefits in improving the effectiveness of financial fraud detection based on real-time data. The success of AI implementation in auditing depends on several key factors, including data quality, selection of appropriate algorithms, readiness of technology infrastructure, as well as full support from management and compliance with applicable regulations. By optimizing the combination of supervised and unsupervised learning in AI models, organizations can improve their fraud detection capabilities more accurately and efficiently than conventional audit methods. In addition, the use of big data analytics and real-time processing allows AI to quickly detect anomalies in financial transactions, provide early warnings, and assist auditors in making more informed decisions.

From a practical perspective, organizations are advised to invest in technology that supports the implementation of AI in financial auditing. This includes the provision of cloud computing infrastructure, a robust data security system, and the integration of AI with existing Enterprise Resource Planning (ERP) systems. In addition, companies must also focus on developing the competencies of internal auditors by providing training related to data analytics and the use of AI in audits. Clear governance policies also need to be implemented to ensure that AI is used transparently, accountably, and in accordance with applicable financial regulations.

For further research, it is suggested that future studies explore more deeply the effectiveness of various AI models in detecting fraud in various industry sectors. Empirical research measuring the impact of AI implementation on financial audit efficiency over the long term is also needed to provide deeper insights. In addition, the study of ethics and legal challenges in the application of AI in internal audit will be an important topic to ensure that these technologies can be adopted in a sustainable and responsible manner.

REFRENCES

[1] W. M. Ikhsan, E. H. Ednoer, W. S. Kridantika, and A. Firmansyah, “Fraud detection automation through data analytics and artificial intelligence,” *Ris. J. Apl. Ekon. Akunt. dan Bisnis*, vol. 4, no. 2, pp. 103–119, 2022.

[2] O. E. Ejiofor, “A comprehensive framework for strengthening USA financial cybersecurity: integrating machine learning and AI in fraud detection systems,” *Eur. J. Comput. Sci. Inf. Technol.*, vol. 11, no. 6, pp. 62–83, 2023.

[3] H. O. Bello, A. B. Ige, and M. N. Ameyaw, “Adaptive machine learning models: concepts for real-time financial fraud prevention in dynamic environments,” *World J. Adv. Eng. Technol. Sci.*, vol. 12, no. 02, pp. 21–34, 2024.

[4] U. P. Lestari and F. D. Jayanti, “Pendeteksian kecurangan laporan keuangan dengan analisis fraud pentagon,” *J. Proaksi*, vol. 8, no. 1, pp. 38–49, 2021.

[5] L. Kusumosari and B. Solikhah, “Analisis kecurangan laporan keuangan melalui fraud hexagon theory,” *Fair Value J. Ilm. Akunt. Dan Keuang.*, vol. 4, no. 3, pp. 753–767, 2021.

[6] D. Setyono, E. Hariyanto, S. Wahyuni, and B. C. Pratama, “Penggunaan fraud hexagon dalam mendeteksi kecurangan laporan keuangan,” *Own. Ris. dan J. Akunt.*, vol. 7, no. 2, pp. 1036–1048, 2023.

[7] N. Nadia, N. Nugraha, and S. Sartono, “Analisis Pengaruh Fraud Diamond Terhadap Kecurangan Laporan Keuangan Pada Bank Umum Syariah,” *J. Akunt. Dan Gov.*, vol. 3, no. 2, pp. 125–139, 2023.

[8] A. Javadian Kootanaee, A. A. Poor Aghajan, and M. Hosseini Shirvani, “A hybrid model based on machine learning and genetic algorithm for detecting fraud in financial statements,” *J. Optim. Ind. Eng.*, vol. 14, no. 2, pp. 169–186, 2021.

[9] S. Rahman, M. R. M. Sirazy, R. Das, and R. S. Khan, “An exploration of artificial intelligence techniques for optimizing tax compliance, fraud detection, and revenue collection in modern tax administrations,” *Int. J. Bus. Intell. Big Data Anal.*, vol. 7, no. 3, pp. 56–80, 2024.

[10] O. Ilori, N. T. Nwosu, and H. N. N. Naiho, “Advanced data analytics in internal audits: A conceptual framework for comprehensive risk assessment and fraud detection,” *Financ. Account. Res. J.*, vol. 6, no. 6, pp. 931–952, 2024.

[11] B. Mohanty and S. Mishra, "Role of artificial intelligence in financial fraud detection," *Acad. Mark. Stud. J.*, vol. 27, no. S4, 2023.

[12] Sugiyono, *Metode Penelitian*. Bandung: CV Alfabeta, 2019.

[13] G. A. Bowen, "Document analysis as a qualitative research method," *Qual. Res. J.*, vol. 9, no. 2, pp. 27–40, 2009.

[14] M. B. Miles, A. M. Huberman, and J. Saldana, "Qualitative Data Analysis, A Methods Sourcebook (Fourth)," *Arizona State Univ.*, 2019.

[15] H. U. Khan *et al.*, "Transforming the capabilities of artificial intelligence in GCC financial sector: a systematic literature review," *Wirel. Commun. Mob. Comput.*, vol. 2022, no. 1, p. 8725767, 2022.

[16] P. Zhao and L. Deng, "Enterprise Financial Fraud Detection and Audit Optimization Based on Deep Learning," in *International Conference on Computational Finance and Business Analytics*, Springer, 2024, pp. 3–14.

[17] Y. Lei, H. Qiaoming, and Z. Tong, "Research on supply chain financial risk prevention based on machine learning," *Comput. Intell. Neurosci.*, vol. 2023, no. 1, p. 6531154, 2023.

[18] M. H. Rahahleh, A. H. Bin Hamzah, and N. Rashid, "The artificial intelligence in the audit on reliability of accounting information and earnings manipulation detection," in *The Big Data-Driven Digital Economy: Artificial and Computational Intelligence*, Springer, 2021, pp. 315–323.

[19] L. M. M. Zayed, M. I. Nour, K. Al Attar, H. Almubaideen, and G. A. M. Abdelaziz, "Role of artificial intelligence (AI) in accounting information systems in detecting fraud," in *Artificial Intelligence and Economic Sustainability in the Era of Industrial Revolution 5.0*, Springer, 2024, pp. 397–409.

[20] R. Ding, "Enterprise intelligent audit model by using deep learning approach," *Comput. Econ.*, vol. 59, no. 4, pp. 1335–1354, 2022.

[21] J. Popara, M. Savkovic, D. C. Lalic, and B. Lalic, "Application of digital tools, data analytics and machine learning in internal audit," in *IFIP International Conference on Advances in Production Management Systems*, Springer, 2023, pp. 357–371.

[22] J. R. K. Kamdjoug, H. D. Sando, J. R. Kala, A. O. N. Teutio, S. Tiwari, and S. F. Wamba, "Data analytics-based auditing: a case study of fraud detection in the banking context," *Ann. Oper. Res.*, vol. 340, no. 2, pp. 1161–1188, 2024.

[23] H. Zhong, D. Yang, S. Shi, L. Wei, and Y. Wang, "From data to insights: the application and challenges of knowledge graphs in intelligent audit," *J. Cloud Comput.*, vol. 13, no. 1, p. 114, 2024.

[24] A. Bonrath and M. Eulerich, "Internal auditing's role in preventing and detecting fraud: An empirical analysis," *Int. J. Audit.*, vol. 28, no. 4, pp. 615–631, 2024.