A Systematic Review on the Use of AI-Powered Cloud Computing for Healthcare Resilience

Kudakwashe Maguraushe(✉), Patrick Ndayizigamiye, and Tebogo Bokaba

Department of Applied Information Systems, University of Johannesburg, Bunting Road Campus, Auckland Park, Johannesburg 2092, South Africa
{kmaguraushe,ndayizigamiyep,tbokaba}@uj.ac.za

Abstract. This study investigated the role of Artificial Intelligence-powered cloud computing systems in fostering healthcare resilience, using a systematic review of its range of applications and their groundbreaking implications. In-depth applications in diagnostics, care delivery, mental health care, and healthcare supply chains demonstrate how these digital technologies greatly strengthen healthcare services. The results highlight AI's decisive influence on healthcare supply chains, emphasizing its critical role in maximizing performance, efficiency, and resource use. The study sheds light on the significance of digitalization in enhancing the operational effectiveness and resilience of healthcare supply chains. The study provides recommendations based on the insights, with an emphasis on enhancing research collaborations, addressing contextual factors impacting the adoption of digital technologies, and guaranteeing interoperability and standardization in health Internet of Things devices. The implementation of cloud computing systems powered by AI in the healthcare industry is intended to be optimized by these suggestions. The study provides a foundational point of reference, providing an in-depth examination and recommended strategies for leveraging AI-powered cloud computing to improve healthcare resilience, pointing stakeholders in the direction of a robust and sustainable healthcare future.

Keywords: cloud-based · artificial intelligence · healthcare resilience · systematic review

1 Introduction

The term "healthcare" describes the comprehensive approach to maintaining and improving human health, which includes both physical and mental well-being [1]. This continuous process involves preventing illness, diagnosing conditions, and providing treatment [2]. On the other hand, "smart healthcare" is used to refer to the use of sensor-equipped devices that utilize cloud computing technologies. These devices enhance healthcare services by collecting real-time medical data and seamlessly transfer it to cloud networks for efficient processing and analysis [3]. As suggested by [4], cloud computing enables network utilization of pooled computational resources on-demand, which is particularly beneficial in the healthcare sector. By maintaining healthcare records on cloud

M. Masinde et al. (Eds.): AFRICATEK 2023, LNICST 520, pp. 126–141, 2024.
https://doi.org/10.1007/978-3-031-63999-9_8

platforms, significant improvements can be achieved in security features and efficiency, ultimately lowering the overhead costs associated with cloud computing, as noted in [5]. The transition to cloud-based systems minimizes potential dangers from outsiders and reduces the risk of cyberattacks, making it the most widely used method for storing and maintaining healthcare data in the modern day. However, the widespread adoption of cloud storage sometimes raises concerns about patient privacy and security [5]. Furthermore, this technological advancement extends to the realm of machine learning which is a subset of artificial intelligence (AI) that analyzes data and enables machines to learn using sophisticated mathematical functions [6]. The integration of AI with cloud-based healthcare data not only enhances data analysis capabilities but also proves to be financially beneficial for organizations, as they spend less by storing data in the cloud while ensuring that the records are secure.

The term resilience generally refers to the capacity to recover from an adverse situation and adapt to previous challenges, whether it be for an individual or a group [7]. Healthcare resilience is a complex concept that includes the capacity of healthcare organizations to endure, react to, and recover from disasters [8]. It is a dynamic characteristic of the healthcare system, influenced by its environment and the strategies it uses to maintain resilience [9]. Resilience is also vital in evaluating the preparedness of healthcare infrastructure for disasters, with an emphasis on returning to normal operation after a disaster [10].

The integration of AI in healthcare management is increasingly recognized as a pivotal enhancement, offering substantial improvements in the diagnosis and prognosis of serious medical disorders [2]. AI, a major disruptive emerging technology, holds the potential to revolutionize healthcare [4], making it more resilient in the face of challenges. This resilience is crucial as it ensures the healthcare system's ability to adapt, recover, and effectively respond to crises, such as pandemics or natural disasters. By utilizing AI's capabilities, which involve a blend of methodologies, algorithms, and approaches, machines are empowered to mimic human intelligence [11]. This development aims at creating autonomous, intelligent systems, contributing significantly to healthcare resilience. An example of this is AI-powered healthcare resilience solutions which complement telehealthcare. Telehealthcare, through its remote patient monitoring services, has begun to close the distance between healthcare providers and their patients [12]. These AI-driven solutions are further advanced by incorporating technologies like the Internet of Things (IoT), which enhances the healthcare system's ability to respond dynamically to varying patient needs and environmental factors. Such integration of AI not only advances medical practices but also fortifies the healthcare system against future challenges, underlining the importance of resilience in this sector.

The adoption and use of AI-powered cloud computing in the domain of healthcare resilience is a growing area of research. In their studies, [13] and [14] proposed frameworks that leverage the capabilities of AI for healthcare applications, with a particular emphasis on reliability, compatibility, and security. The framework proposed by [13] encompasses a cloud-based architecture for mobile and interconnected healthcare, whereas the one proposed by [14] employs AI-enabled smart contracts and a public blockchain network for decentralized healthcare. A study conducted by [15] examined the use of edge and fog computing to address the limitations of cloud-based systems in

healthcare, particularly in terms of response time, accessibility, security, and confidentiality. In the study conducted by [16], a framework for cyber resilience is proposed for the next-generation IoT healthcare, which incorporates machine learning and blockchain for the purposes of security and access control [16]. Together, these studies highlight the possibility of AI-empowered cloud computing in bolstering the resilience of healthcare systems.

The primary purpose of this study was to conduct a systematic review of the current state of AI-powered cloud computing applications in healthcare, with a specific focus on their role in enhancing healthcare resilience. The study aimed to evaluate how these technologies contribute to the robustness and adaptability of healthcare systems, particularly in the face of various challenges such as pandemics, natural disasters, and the rapidly evolving nature of healthcare demands. The study was guided by the following research questions: (1) What is the role of AI-powered cloud computing in enabling resilience in healthcare systems? (2) What insights can be drawn for the future use of AI-powered cloud computing systems to enhance healthcare systems resilience?

2 Methodology

2.1 Method

This study employed a systematic review methodology, adhering to the guidelines outlined in the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) statement [17]. A systematic review aims to aggregate data that meets specific criteria to address distinct research questions [17]. PRISMA is instrumental in identifying, selecting, appraising, and synthesizing studies [18]. It guides readers through an article's selection process. This study followed the PRISMA step- by-step guide as outlined by [17–19] as follows:

a. Information Sources: Lists all the databases and other resources consulted in the search for pertinent research studies.
b. Search Strategy: Outlines the search methods, including filters and limitations, applied across the databases (including the search string).
c. Eligibility Criteria: Defines the inclusion and exclusion criteria that guide the selection process.
d. Data Collection Process: Describes the methods used for extracting data from the selected research articles.
e. Data Items: Details the information extracted from the selected research articles including funding sources and PICOS (participants, interventions, comparisons, outcomes, and study design), and discusses the inferences and generalizations made from the selected articles.

2.2 Information Sources and Search Strategy

The following search string was run in the Title, Abstract and Keywords sections of the Scopus database (the query was run on 21 September 2023):

Title, Abstract and Keywords = ("Artificial Intelligence" OR "Machine Learning") AND ("Cloud Computing" OR "Cloud Services" OR "Cloud-based Solutions") AND ("Healthcare Resilience" OR "Resilient Healthcare")).

2.3 Eligibility Criteria

The inclusion and exclusion criteria are summarized in Table 1.

Table 1. Inclusion and exclusion criteria for article search

Inclusion	Exclusion
Journal articles and papers from conference proceedings	Books, book chapters, review articles and dissertations
Focused on the following subject areas: social sciences, engineering, business, management, accounting, computer science, medicine, mathematics, health professions and environmental sciences	Any other subject areas
Language used is English	Articles in other languages
Articles published between 2018 to 2023	Articles published before 2018
Articles which are finalized or in the final stages	Unpublished research with "in press" status, that is currently being worked on
Articles focusing on artificial intelligence/machine learning, cloud computing/cloud services/cloud-based solutions, healthcare resilience/resilient healthcare	Articles that do not interrogate the relationship between artificial intelligence or machine learning with cloud computing or cloud services or cloud-based solutions and healthcare resilience or resilient healthcare

2.4 Data Collection

The data collection process entails describing the procedure for extracting data from reports (such as using independently completed forms or piloted forms) or any other procedures used by the investigator/s for gathering and validating data. In this study, the authors extracted key information (title, author/s, year of publication, objective/purpose of the study, method(s)/tools used, key findings and recommendation(s)) from the eligible articles and papers using a data extraction form. Table 2 depicts key data items considered in the extraction of data which were used in the form.

Table 2. Data items

No.	Data item	Description
1	Title	Title of the paper
2	Year	Publication year of the paper
3	Author/s	Author/s of the paper

(*continued*)

Table 2. (*continued*)

No.	Data item	Description
4	Abstract	Summary of the paper
5	Keywords	Words used to specify the content of the paper
6	Type of publication	Is it a journal article/conference paper etc.?
7	Channel of publication	Medium in which the paper was published
8	Country	Country in which the paper was published

3 Results

Based on the search criteria specified in Table 1, a total of 13 articles were identified from the Scopus online database as relevant to the research questions guiding this investigation. Since Scopus was the only database used, there were no duplicate articles. After an initial screening based on titles, five articles were excluded, leaving eight for further examination. Subsequently, upon reviewing the abstracts, one more article was removed, leaving seven for in-depth analysis. Following a thorough review of the full texts, two further articles were deemed unsuitable. Consequently, five articles were ultimately selected for detailed analysis. Figure 1 summarizes this selection procedure.

The subsequent sub sections present more details about the selected five papers including the year and country of publication, type of research, and keywords used in the selected publications,

3.1 Year of Publication

Figure 2 shows the categorization of the articles based on their year of publication (from 2018 to 2023). Of the five selected articles, one (20%) was published in 2021, one (20%) was published in 2022, and three (60%) were published in 2023. No articles were published in 2018, 2019 or 2020. This shows that there is an increase in the number of publications on research that focuses on AI-powered cloud computing applications in healthcare.

3.2 Country of Publication

The selected articles in Fig. 3 are categorized by the countries of the institutions where the first authors are affiliated. An author's affiliation, typically a university or research institution, is listed next to their name, providing insight into the country they belong to. According to this analysis, two of the chosen articles (40%) had a first author from an Australian institution; India also had two articles (40%) with a first author from its institutions; and Brazil had one instance (20%) where the first author was affiliated with an institution in that country. This indicates that, based on our research criteria, only three countries have published articles focusing on AI-powered cloud computing applications in healthcare.

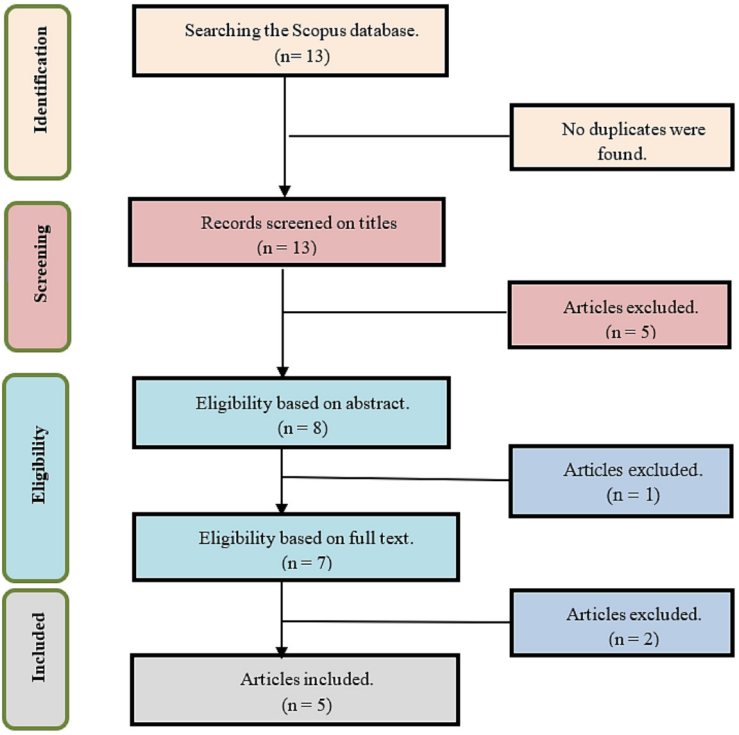

Fig. 1. Selection procedure followed in this study.

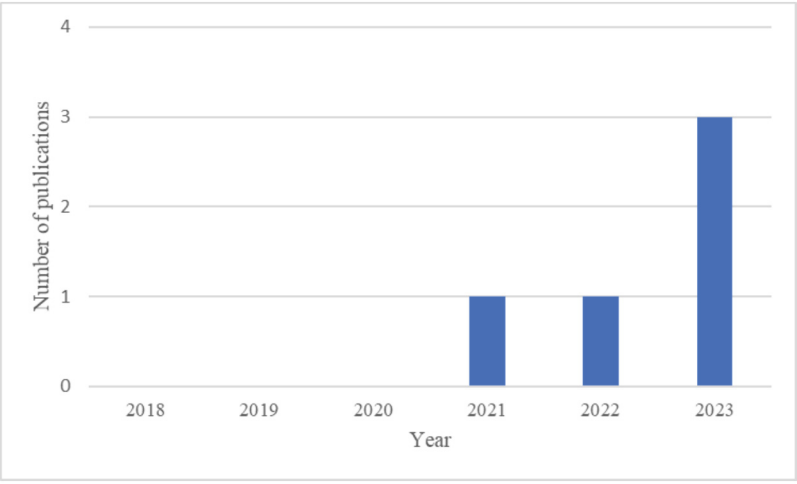

Fig. 2. Year of publication

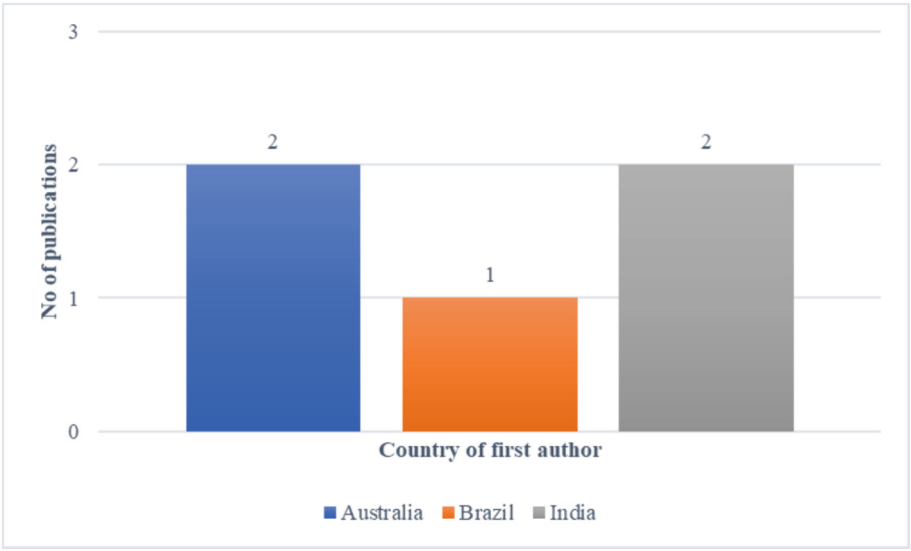

Fig. 3. Country of publication

3.3 Type of Research

Figure 4 depicts the types of research conducted within the articles under consideration. One article (20%) conducted a bibliometric analysis and a second article (20%), comprised a systematic review (20%). Three articles (60%) used quantitative research. This shows that, using the selection criterion, most articles published on AI-powered cloud computing applications in healthcare were quantitative in nature.

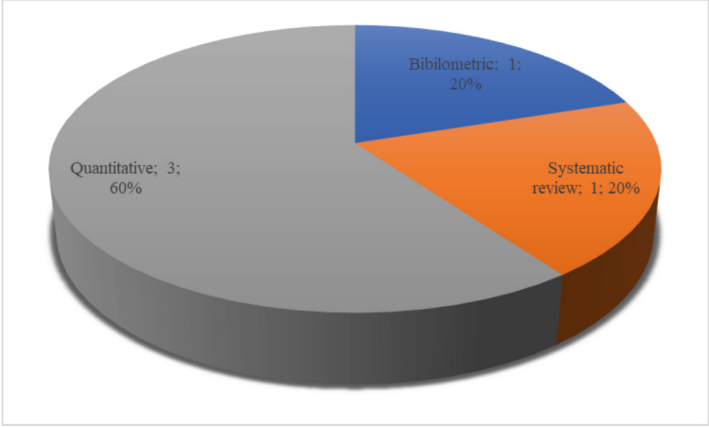

Fig. 4. Type of research

3.4 Keywords Used

Table 3 shows the top 10 keywords used in the selected articles (as presented in their abstracts) and the frequency of their usage. The keyword "Healthcare" was most used in four publications, referring to healthcare business or healthcare supply chain [20], healthcare supply chain and healthcare 4.0 [21], healthcare [22], or healthcare 4.0 [23]. The term "Resilience" appeared in three publications, denoted as resilience [21, 22], or resilient healthcare or resilience abilities [23]. Two publications mentioned "Artificial intelligence" [19, 24], while an equal number referred to "Big data analytics" [19, 24]. Including this information about the keywords employed and their frequency within the five selected articles facilitates the identification of publications related to AI-powered cloud computing applications in healthcare.

Table 3. Keywords used.

No.	Keyword	Frequency	No.	Keyword	Frequency
1	Healthcare	4	6	Supply chain management	2
2	Resilience	3	7	Internet of Things	1
3	Artificial intelligence	2	8	Digital health technology	1
4	Big data analytics	2	9	Natural disaster	1
5	Industry	2	10	3D printing	1

Table 4 depicts the summary of the selected articles. The authors, the purpose or objective of the article, the methodology used, the key findings or results, and the recommendations of each article are provided.

4 Discussion

The discussion of the findings delineated above is based on the two research questions that guided the study:

What is the role of AI-powered cloud technologies in enabling resilience in healthcare systems?

The integration of AI and cloud computing in the healthcare industry is a transformative advancement that allows for advanced data management and real-time decision-making. This integration has the potential to improve healthcare services, especially in medical decision-making, data security, and health monitoring. It has been noted that AI is revolutionizing healthcare by utilizing large, interconnected datasets to accelerate breakthroughs and provide decision support [23]. The use of cloud computing in healthcare integration, specifically within e-health solutions, has been examined with a focus on enhancing data accessibility and reducing wait times [21].

The use of AI-powered cloud computing in healthcare has been demonstrated in various real-world situations, showing its practical application. During the COVID-19 pandemic, studies [24] indicate that these technologies allowed for remote diagnosis and

Table 4. Summary of the selected articles

Author(s)	Objective/ Purpose of the Study	Method(s)/ Tools Used	Key Findings/ Results	Recommendation(s)
Marques da Rosa et al. (2021) [23]	Explored the effects of digital healthcare systems on resilient systems' monitoring, anticipatory, response, and learning capacities	A quantitative study comprising a survey of 109 resilient healthcare providers and healthcare professionals from both developing and developed nations	Identified four digital healthcare technologies that have a significant impact on the four resilience abilities: digital platforms for collaborative exchange of information and patient data, digital non-invasive care, interlinked emergency medical support, and virtual consultations and development of care strategies in real-time	Prioritising various technologies and applications can direct financial and human resources towards a resilient healthcare deployment
Sood et al. (2022) [24]	In the context of COVID-19, the objective was to give a scientometric analysis of the literature pertaining to impact of Industry 4.0 technologies healthcare services	A bibliometric study of key reference and indexed databases (Web of Science, Scopus, and Google Scholar). CiteSpace was used as a mapping tool to detect and represent the metrics of publications. The period under publication was 2019–2021 focusing on all journals within the Computer Science and Engineering subject area. 4763 records were retrieved	Deep learning, machine learning, diagnostic imagine, artificial intelligence, predictive analysis, big data, deep neural network, image segmentation and computerised tomography were some of the highly frequently used keywords that emerged as a result of a search on the impact of artificial intelligence and industry 4.0 in healthcare, especially in the context of the COVID-19 pandemic	Scholars, decision-makers, and academic institutes should continually expand their research collaborations and emphasize the use of cutting-edge technologies in the healthcare industry, including 5G, deep learning, machine learning, 4D printing, and the Internet of Things

(*continued*)

Table 4. (*continued*)

Author(s)	Objective/ Purpose of the Study	Method(s)/ Tools Used	Key Findings/ Results	Recommendation(s)
Lokmic-Tomkins et al. (2023) [22]	Examined the ways in which digital health technology can be depended upon to provide high-quality healthcare interventions amid natural disasters and support the corresponding preparatory and recovery endeavours	Employed a qualitative literature review, followed by more in-depth narrative analyses to assemble case studies. There were no time or geographic restrictions. English-language publications were selected using PubMed/MEDLINE, Web of Science, Scopus, and CINAHL databases. The search string used was ("digital health technolog*") OR ("digital health") AND ("natural disasters") AND ("healthcare)."	Digital health technologies and related interventions are increasingly seen as a solution to building climate-resilient healthcare systems. There is a global consensus effort to address the growing pressures from climate-driven environmental changes on the community's health and the healthcare systems. In addition, it can be concluded that the management of preparedness, response, and recovery in the context of natural disasters is increasingly being done using digital health technology	A large global movement and methodological approach known as "citizen science" that involves active public engagement in the creation of scientific knowledge is fundamental Digital healthcare systems that are climate-resilient should be able to foresee, respond to, deal with, and recover from climate-related disasters The need to create national or worldwide frameworks for healthcare systems to respond to climatic disasters
Bag et al. (2023) [21]	Investigated the origins of a big data analytics and artificial intelligence (BDA-AI) technology-based collaborative platform for enhancing absorptive capacity in omnichannel healthcare procedures. Also explores the impact of the collaborative BDA-AI platform's supercharged absorptive ability on omnichannel healthcare processes and organizational performance	Data was gathered using a structured questionnaire from supply-chain healthcare executives based in South Africa. The respondents were surveyed online using Google survey forms. Data was gathered from 279 respondents for a year (January 2020–January 2021) during phases 1 and 2 of the study	Results show that managerial aspects will help healthcare organizations establish a collaborative platform driven by BDA-AI technology to assimilate, transfer, and utilize crucial knowledge from enormous datasets. It will enable healthcare supply chains to function innovatively for the benefit of healthcare organizations	Future studies to examine the moderating impact of competitiveness and knowledge traits are needed. Also needed is research on how absorptive capacity develops over time in the context of artificial intelligence

(*continued*)

Table 4. (*continued*)

Author(s)	Objective/ Purpose of the Study	Method(s)/ Tools Used	Key Findings/ Results	Recommendation(s)
Tortorella et al. (2023) [20]	Aimed to determine how Industry 4.0 adoption and resilience development are affected by the contextual factors of healthcare supply chains. Additionally, examined how resilient people do better on Industry 4.0 across a variety of contextual variables	Examined 179 organizations from health supply chains in Brazil and India. Multiple data approaches were used to analyze the responses	When the contextual variables are considered separately, large health supply chain agents are more likely to acquire resilience skills and use Industry 4.0 technology. However, the combined analysis of Industry 4.0 and resilience revealed numerous strong relationships among small organizations	Findings justify health supply chain managers boosting resilience through digitization. Organizations in the health supply chain can choose their environment to customize programmes for digitization and resilience

monitoring of patients, ensuring that healthcare services continued without interruption. They also played a crucial role in storing, collaborating on, and accessing data, especially during the pandemic. The potential of AI in healthcare extends to diagnosis, treatment recommendations, patient engagement, and administrative tasks [21]. Cloud computing has been particularly important in facilitating collaboration, communication, and essential online services during the pandemic [24]. These studies collectively emphasize how AI-powered cloud computing significantly improves the efficiency and effectiveness of healthcare operations.

This study found that the future of AI in the healthcare sector is characterized by rapid advancements, and it has already made significant progress in the sector. The incorporation of IoT devices for continuous monitoring of patients and the development of advanced machine learning algorithms to enhance the accuracy of diagnostics are poised to bring about a transformative impact on the delivery of healthcare services [24]. These revolutionary developments not only boost patient outcomes but also optimize healthcare operations, leading to enhanced efficiency and cost-effectiveness [20]. The significance of AI in reshaping the future of healthcare is emphasized, with particular attention given to the importance of privacy, data sharing, and genetic information.

What insights can be drawn for the future use of AI-powered cloud computing systems to enhance healthcare systems resilience?

This study noted that incorporating AI-enabled cloud computing in the healthcare sector necessitates careful examination of policy implications. It is crucial to establish uniformity in data formats and ensure interoperability among diverse healthcare systems to facilitate a seamless exchange of information. Implementing regulatory frameworks becomes crucial to govern the ethical use of AI, guaranteeing responsible and advantageous application of these technologies. Policy creators should likewise think about the broader communal consequences, such as the potential for job displacement and the necessity for new skill sets among healthcare professionals.

The educational and training requirements are vital due to the dynamic nature of healthcare technology [23]. Consequently, there arises a demand for educational curricula that encompass the fundamental principles of AI and cloud computing, data analytics, as well as cybersecurity. To sufficiently prepare the healthcare workforce for this new era of digital healthcare, it is imperative to develop training programs that equip healthcare professionals with the necessary skills to effectively utilize these technologies.

The contribution of digital healthcare technologies like AI-powered cloud-based systems to the resilience of healthcare services is enormous [22]. In terms of practice, determining the impact that digital healthcare technologies have on improving the resilience of healthcare services may assist managers in establishing the rules for a digital transformation. The findings of [22] may encourage more aggressive investments in the adoption of digital technologies, prioritizing those with greater resilience-related potential. The usage of digital healthcare technology to provide resilient services may increase across the hospital if their advantages are well understood. That could assist in persuading significant internal and external stakeholders of the value of systematically implementing healthcare. As articulated by [24] in their bibliometric analysis research on the influence of AI in healthcare, social distancing, cloud computing, machine learning, telehealth, medical computing, medical imagine, IoT, mhealth telemedicine, and

3D printing are some of the key hotspots that have been identified since 2020. They are considered instrumental for sustainable future healthcare solutions.

An analysis was also done on the use of AI, combined with big data, on the healthcare supply chain for empowering absorptive capacity and its impact on healthcare processes and performance [21]. The study noted that, since organizational knowledge is tied to context, circumstance, and business practices that occur throughout everyday contacts, healthcare supply chain managers need to concentrate on the preconditions for developing effective absorptive capacity. Every stage of the information acquisition process is intricate, yet knowledge from outside sources is valuable, but it must be transformed and applied in new contexts. As discovered in the study by [21], the use of AI and big data analytics opens the possibility of more rapid medicine production and dissemination. Virtual aids for nursing were also perceived to be useful as they can be used with individualized treatment.

4.1 Theoretical Contribution

This research provides a substantial theoretical contribution by synthesizing the existing knowledge on the integration of AI and cloud computing in the healthcare sector. It adds to the knowledge of the role of AI-powered cloud computing in healthcare resilience and what important considerations should be taken note of for its future application in enabling healthcare resilience. This contribution is crucial in comprehending the role of emerging technologies in augmenting healthcare delivery and management.

4.2 Theoretical Implications

This research emphasizes the necessity to reevaluate conventional healthcare theories considering technological progress. The study proposes that future theoretical models in healthcare management should incorporate the intricacies of AI and cloud computing to remain pertinent. Furthermore, it challenges prevailing theories of healthcare resilience by introducing a technology-driven perspective, which could incite additional academic discussion and research in this field.

4.3 Practical Implications

The study's findings have several practical implications. Firstly, healthcare providers might explore utilizing cloud computing powered by AI to optimize data management and predictive analytics, potentially improving the quality of patient care. In addition, policymakers can employ the insights identified to establish regulations and frameworks that promote the ethical and efficient utilization of AI in healthcare. Moreover, valuable details for technology developers and practitioners are provided, equipping them with insight into the specific demands and restrictions in healthcare, thereby empowering the development of more targeted and efficient solutions.

4.4 Limitations of the Study

It is acknowledged that the results of this study are derived from previous research and may not encompass all the latest advancements in AI and cloud computing because these technologies are evolving rapidly. Secondly, the applicability of these findings may be restricted since healthcare systems across the globe have different capabilities and resources for incorporating such technologies.

4.5 Recommendations

This study recommends that subsequent research should concentrate on conducting empirical investigations to authenticate the theoretical discoveries expounded in this study. It is also recommended that healthcare systems should allocate resources towards training initiatives that enable healthcare professionals to acquire the essential proficiencies required to assimilate AI and cloud computing technologies. Lastly, policymakers should prioritize the development of comprehensive policies that foster unity between sophisticated healthcare systems and those that lack sufficient resources.

5 Conclusion

This systematic review examined the role of AI-powered cloud computing in the context of healthcare resilience. It sheds light on important considerations that need to be noted moving forward towards the use of AI-powered cloud computing in the context of healthcare resilience. The results indicate that AI-powered cloud computing greatly enhances data management, predictive analytics, and decision-making in healthcare. However, there are challenges such as concerns about data privacy. The study emphasizes the importance of interdisciplinary collaboration and policy development to ensure the ethical use of technology in healthcare. It also provides practical implications for various stakeholders in the field. Overall, the analysis drawn from this study establishes a foundation for understanding the role of AI-powered cloud computing in enhancing healthcare resilience and offers insights for future research and implementation in this rapidly evolving area.

References

1. Fischer, M.: Fit for the future? a new approach in the debate about what makes healthcare systems really sustainable. Sustain. **7**(1), 294–312 (2015). https://doi.org/10.3390/su7010294
2. Mohapatra, S., Swarnkar, T.: Artificial intelligence for smart healthcare management: brief study. In: Mishra, D., Buyya, R., Mohapatra, P., Patnaik, S. (eds.) Intelligent and Cloud Computing. Smart Innovation, Systems and Technologies, vol. 153. Springer, Singapore (2021). https://doi.org/10.1007/978-981-15-6202-0_37
3. Taj, I., Jhanjhi, N.Z.: Towards industrial revolution 5.0 and explainable artificial intelligence: challenges and opportunities. Int. J. Comput. Digit. Syst. **12**(1), 285–310 (2022). https://doi.org/10.12785/ijcds/120124

4. Yadav, S., Kaushik, A., Sharma, S.: Simplify the difficult: artificial intelligence and cloud computing in healthcare. In: Verma, J.K., Saxena, D., González-Prida, V. (eds.) IoT and Cloud Computing for Societal Good. EAI/Springer Innovations in Communication and Computing. Springer, Cham (2022). https://doi.org/10.1007/978-3-030-73885-3_7
5. Chennam, K.K., Uma Maheshwari, V., Aluvalu, R.: Maintaining IoT healthcare records using cloud storage. In: Nath Sur, S., Balas, V.E., Bhoi, A.K., Nayyar, A. (eds.) IoT and IoE Driven Smart Cities. EAI/Springer Innovations in Communication and Computing. Springer, Cham (2022). https://doi.org/10.1007/978-3-030-82715-1_10
6. Khan, M., Pasha Khan, S.: Perspectives of healthcare sector with artificial intelligence. In: Shukla, R., Agrawal, J., Sharma, S., Chaudhari, N., Shukla, K. (eds.) Social Networking and Computational Intelligence. Lecture Notes in Networks and Systems, vol. 100. Springer, Singapore (2020). https://doi.org/10.1007/978-981-15-2071-6_12
7. Ambrose, J.W., Layne, D.M., Nemeth, L.S., Nichols, M.: A systematic concept analysis of healthcare team resilience in times of pandemic disasters. Nurs. Forum **57**(4), 671–680 (2022). https://doi.org/10.1111/nuf.12723
8. Zhong, S., Clark, M., Hou, X.: Proposing and developing the definition and conceptual framework for healthcare resilience to cope with disasters. Emergencias (2015). http://eprints.qut.edu.au/68257/
9. Rohova, M., Koeva, S.: Health system resilience: review of the concept and a framework for its understanding. J. IMAB **27**(4), 4060–4067 (2021). https://www.journal-imab-bg.org/issues-2021/issue4/vol27issue4p4060-4067.html
10. Wulff, K., Donato, D., Lurie, N.: What is health resilience and how can we build it? Annu. Rev. Public Health **36**, 361–374 (2015). https://doi.org/10.1146/annurev-publhealth-031914-122829
11. Epstein, R.M., Krasner, M.S.: Physician resilience: what it means, why it matters, and how to promote it. Acad. Med. **88**(3), 301–303 (2013). https://doi.org/10.1097/ACM.0b013e318280cff0
12. Kumar, M., et al.: Healthcare Internet of Things (H-IoT): current trends, future prospects, applications, challenges, and security issues. Electron **12**(9) (2023). https://doi.org/10.3390/electronics12092050
13. Sodhro, A.H., Zahid, N.: AI-enabled framework for fog computing driven e-healthcare applications. Sensors **21**(23) (2021). https://doi.org/10.3390/s21238039
14. Puri, V., Kataria, A., Sharma, V.: Artificial intelligence-powered decentralized framework for internet of things in healthcare 4.0. Trans. Emerg. Telecommun. Technol., December 2020, 1–18 (2021). https://doi.org/10.1002/ett.4245
15. Greco, L., Percannella, G., Ritrovato, P., Tortorella, F., Vento, M.: Trends in IoT based solutions for health care: moving AI to the edge. Patt. Recognit. Lett. **135**, 346–353 (2020)
16. Vasiliki, K., Sarigiannidis, P., Argyriou, V., Lagkas, T., Vitsas, V.: A cyber resilience framework for NG-IoT healthcare using machine learning and Blockchain. IEEE Int. Conf. Commun., 1–6 (2021). https://doi.org/10.1109/ICC42927.2021.9500496
17. Moher, D., Liberati, A., Tetzlaff, J., Altman, D.G.: Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. J. Clin. Epid. **62**, 1006–1012 (2009)
18. Page, M.J., et al.: The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. J. Clin. Epidemiol. **134**, 178–189 (2021)
19. Knobloch, K., Yoon, U., Vogt, P.M.: Preferred reporting items for systematic reviews and meta-analyses (PRISMA) statement and publication Bias. J. Cranio-Maxillofacial Surg. **39**(2), 91–92 [21]
20. Tortorella, G., et al.: Resilience development and digitalization of the healthcare supply chain: an exploratory study in emerging economies. Int. J. Logist. Manag. **34**(1), 130–163 (2023). https://doi.org/10.1108/IJLM-09-2021-0438

21. Bag, S., Dhamija, P., Singh, R.K., Rahman, M.S., Sreedharan, V.R.: Big data analytics and artificial intelligence technologies based collaborative platform empowering absorptive capacity in health care supply chain: an empirical study. J. Bus. Res. **154**, 113315 (2023). https://doi.org/10.1016/j.jbusres.2022.113315
22. Lokmic-Tomkins, Z., Bhandari, D., Bain, C., Borda, A., Kariotis, T.C., Reser, D.: Lessons learned from natural disasters around digital health technologies and delivering quality healthcare. Int. J. Environ. Res. Public Health **20**(5), 1–28 (2023). https://doi.org/10.3390/ijerph20054542
23. Marques da Rosa, V., Saurin, T.A., Tortorella, G.L., Fogliatto, F.S., Tonetto, L.M., Samson, D.: Digital technologies: an exploratory study of their role in the resilience of healthcare services. Appl. Ergon. **97**, 103517 (2021). https://doi.org/10.1016/j.apergo.2021.103517
24. Sood, S.K., Rawat, K.S., Kumar, D.: A visual review of artificial intelligence and industry 4.0 in healthcare. Comput. Electr. Eng. **101**, 107948 (2022). https://doi.org/10.1016/j.compeleceng.2022.107948