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The Role of Artificial Intelligence in Transforming the Healthcare Industry: A Systematic Literature Review

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Abstract:

Purpose: *This study explores the transformative role of artificial intelligence in the Healthcare Industry through a systematic literature review. Subsequently, this assessment elucidates how Artificial Intelligence in hospitals is a paradigm-shifting domain that aids in diagnosis, treatment, and monitoring real-time data analysis of patients. Smarter healthcare techniques like IOT, machine learning, and deep learning are fostered in a streamlining environment, refining processes and elevating a better experience in patients and healthcare professionals, which leads to patient-centered healthcare services.*

Design/ Methodology/Approach: *This research implemented data were extracted from the SCOPUS Database, analyzing 71 peer-reviewed research articles encompassing publications between 2010-2024. The Systematic review methodology incorporated bibliometric analysis techniques using VOSviewer to perform Co-authorship, Co-occurrence, Co-citation, and Bibliometric Coupling Network. Therefore, the PRISMA Model was followed to ensure methodological rigor and transparency for the study.*

Findings: *A Systematic Analysis illustrated a significant rise in research publications on AI applications in the healthcare industry after the COVID-19 pandemic in the U.S., India, and China. The findings underscore that AI is therefore revolutionizing healthcare in augmenting diagnostic precision, enabling individualized therapy, accelerating operational workflows, reducing administrative and overhead expenses, and forecasting analytics for improved patient outcomes.*

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Introduction

The rapid advancement of Artificial Intelligence (AI) has revolutionized various sectors, specifically the Healthcare sector. In Hospital Management, AI is growing into a robust solution for high-quality patient care and reshaping the way we diagnose, treat, and monitor patients. This technology is significantly enhancing medical outcomes by providing more accurate diagnoses and personalized treatment strategies (Ounasser et.al 2024). Medical institutions and practitioners worldwide, particularly in developing nations, are adopting digital solutions like AI, machine learning, smart sensors and robots, advanced data analysis, and Internet of Things (IOT). The Healthcare system's central emphasis on duties that consolidate, rebuild, and enhance healthcare services, which adds value towards socio-economic growth. (Nguyen, Voznak 2024).

AI is providing crucial aid to hospital staff, encompassing both clinical and non–clinical uses, including management planning, policy making, decision support functions, and optimizing workflow efficiency. The incorporation of IOT devices is crucial for smart healthcare operations, allowing for real-time data monitoring and analysis. IOT devices in healthcare span from vital sign monitors, implantable devices, smart beds, wearable electronic devices, all collecting real -time data on patient health (Khatib et.al.2024).AI Adopting these technologies helps hospitals in providing cost-effective treatment solutions to patients. Healthcare professionals are persistently under pressure to provide excellent care despite limited resources. This can only be accomplished through the application of real-time system. (almojel et al., Almasri et al. 2024)

Deep learning and blockchain technology ensure a safe and secure platform for managing healthcare records, patient safety, and work as a clinical support tool to suggest patients based on diagnostic findings, and therefore ensure precision in treatments. (Reddy et.al (2023), Raul et al. 2023). Blockchain's cryptographic features encrypt patient data, which is tamper-proof and saves from unauthorized access, therefore ensuring authenticity of medical records and enabling the tracking of drugs from the pharmaceutical industry to patients, which assists in reducing the threat of adulterated medicines (Jadav et al. 2023).

AI plays a crucial role for patient-centered care in the field of genomics it helps to analyze massive, complex genetic datasets that are beyond human comprehensive and helps to identify mutations and variations patterns which facilitate disease diagnosis, prediction, and gene therapy by analyzing an individual genetic makeup and genomes of pathogens like viruses and bacteria to monitor evolution, forecast future variations, and create immunizations and therapy treatments. AI has decreased the expenses of genomic analysis and expedited innovation, bridging the gap in utilizing biological big data. (Liang et al. 2023).

A Health Management Information System (HMIS) plays a pivotal role in healthcare for simplifying workflows, improving data- driven decision making, augmenting patient care, and managing resources like staff, equipment, and hospital beds through digital platforms and AI blockchain technology helps in managing privacy of medical data of Healthcare Industries (Almalawi et al. 2023, Yang et.al 2023, Hai et al. 2022). The Healthcare industry is witnessing a paradigm shift from traditional paper-based records to electronic health records (EHRs), which ensures quality of service care to patients, increases the working efficiency of hospitals as well as reduces medication errors. (Zhou et al. 2022)

Human Resource Information System (HRIS) is a software platform tool that manages and automates various human resources tasks and processes, such as analyzing personnel and recruitment management, which helps in improving data accuracy and supporting decision-making (Yu et al. 2022). AI Algorithms can analyze comprehensive datasets to identify risk factors associated with various diseases, facilitating timely detection and intervention. AI-driven automation tasks have improved administrative efficiency and optimizing workflow (Schwartz et al. 2021).

Internet of Things (IOT) in healthcare connects devices, people, and systems to enhance patient care, hospital operations, and data management. Digital connectivity can help patients to access quality healthcare services anytime, anywhere, at an affordable cost (Lee et al. 2021). IOT enables remote patient management, facilitating physicians to monitor patient conditions in real time and provide personalized care to individuals according to the clinical needs of the patients. Networked medical equipment in hospitals creates smarter environments, optimizing efficiency and providing a better experience for patients and the healthcare team. IOT in healthcare enables interoperability, artificial intelligence, and machine-to-machine connectivity which helps transmit information and disseminate data that helps healthcare delivery be effective. Fog computing devices in healthcare offer real-time data processing, reducing latency and improving bandwidth for detecting stroke, heart attack, and managing chronic diseases. (Mani et al. 2020)

Machine learning, a pivotal element of AI, has profoundly reshaped healthcare by enhancing medical diagnosis and treatment. Through extensive data sets, algorithms can identify disease patterns and predict clinical outcomes with accurate results, and improve operational efficiency (Piccialli et al. 2020). Big data handling refers to the extensive process of collecting, organizing, storing, and managing large, complex data, which optimizes an organizations efficiency by improving business decisions and operations (Pashazadeh et al. 2018). Time series forecasting

in hospitals uses past trends data of disease occurrence to forecast future changes and optimize operations, and it often helps in predicting mortality and morbidity data, which serves as major health indicators of society. (Purwanto et al. 2011)

Objectives of the Study

- To evaluate how AI in healthcare strengthens patient outcomes through precise diagnosis, personalized treatment plans, and enhances the quality of care.
- To explore AI incorporation with other technologies like IOT, blockchain, machine learning, and its relevance on patient care.
- To investigate AI's potential for workflow automation and boosting healthcare performance.
- To evaluate the favorable outcomes of AI in streamlining resources and refining decision processes in healthcare.

Research Methodology

Research Design

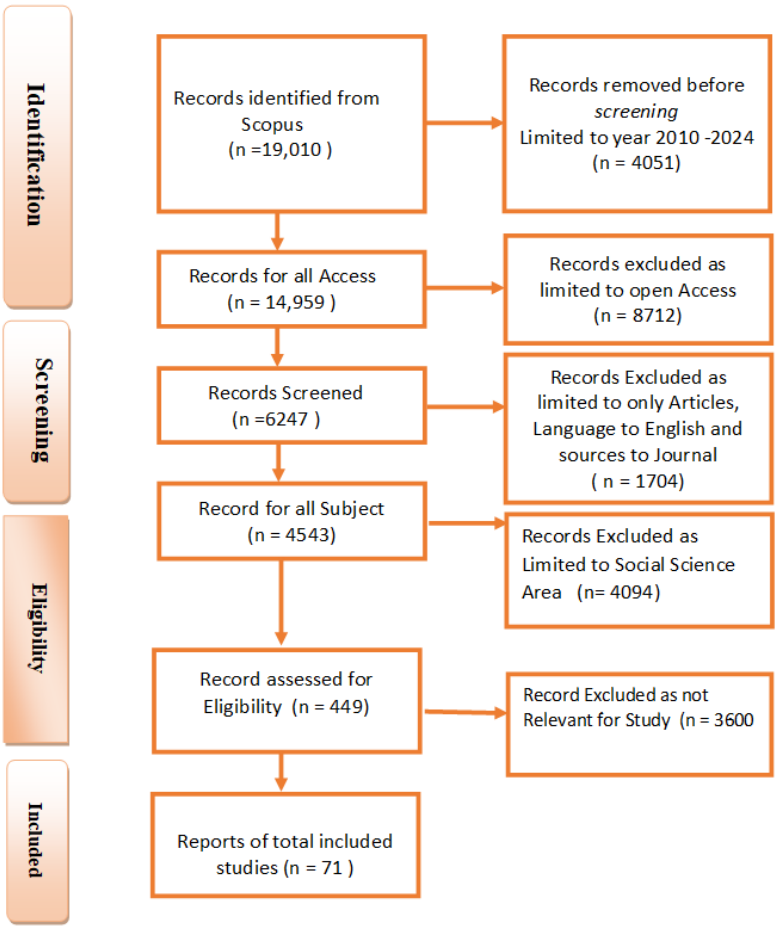
This research incorporates a systematic review methodology and meta-analyses (PRISMA) model to scrutinize the analysis of established literature review data based on the application of Artificial Intelligence in Healthcare. The researcher intends to determine the current scenario, challenges, and consequences of AI in the health industry. A Systematic review is an integrative analysis of the facts on a coherently presented idea utilizing critical evaluation to identify, elucidate, and analyze on research topic.

Selection Criteria

An extensive research was carried out in the digital database SCOPUS by preliminary assessment based on inclusion and exclusion criteria, as peer-reviewed articles promulgated between 2010 to 2024, studies included articles which were written in English based on the core index term "Artificial Intelligence", "Deep Learning", "Machine Learning", "Hospital Management" in Healthcare.

Data Sources and Collection

Data analysis is based on Systematic analysis of AI in healthcare retrieved from the SCOPUS database, queried according to parameters, because Scopus is meticulously organized with precise quality control, assuring authoritative content is indexed and expediting global collaboration by linking researchers worldwide. The study identified 19,010 records based on AI, Deep Learning, and Machine Learning in Healthcare, and per records researcher opted for 71 articles. The study excluded was limited to the social science area due and its lack of relevance, as it does not align with the research area. As part of this analysis, the data collection was put into practice by applying Boolean search Syntax [("Artificial Intelligence" OR "Machine Learning" OR "Neural Network" OR "Hospital Management" OR "Clinical Administration" OR "Healthcare Operations"] derived from the SCOPUS database to refine searches by synthesizing terms to refine or diversify results in the database. The search results were then systematically screened and analyzed following the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) Model protocols to verify systematic selection, authenticity, and credibility.



Prisma Model

- **Co-authorship Analysis**

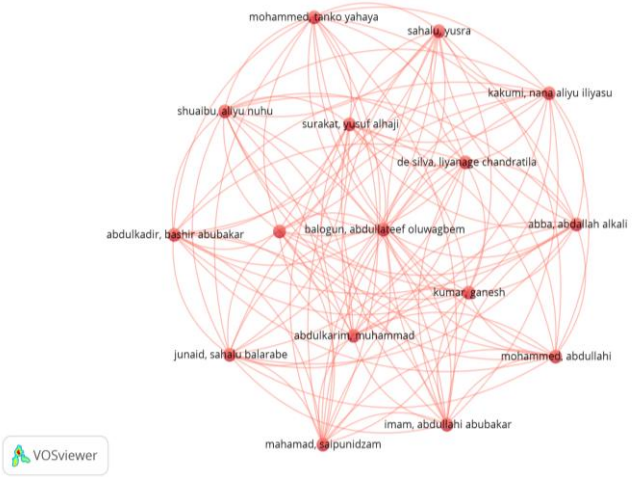


Figure 1: Co-Citation Network

Co-authorship Analysis is a technique used to probe the relationship between authors of scholarly articles and also to ascertain the association between various areas of study. **Figure 1**: was created using vosviewer software comprises of 383 numbers of authors, this study focal point was on determining alliance network of authors **Table 2**: shows top ten Co-Authorship analysis based on number of shared publications, citations and total link strength "Abba, abdallah alkali", "Abdulkadir, basher abubakar **",** **"**Abdulkarim, Muhammad", **"**Balogun, abdullateef oulwagbemiga", "De silva, liyanage chandratilak", "Garba, aliyu", "Imam, abdullahi abubakar", "Junaid, sahalu balarabe", "Kakumi, nana aliyu iliyasu", Kumar, ganesh"

Table 1

Author	Documents	Citations	Total Link Strength
Abba, Abdallah alkali	1	141	15
Abdulkadir, Basher Abubakar	1	141	15
Abdulkarim, Muhammad	1	141	15
Balogun, Abdullateef oulwagbemiga	1	141	15
De Silva, liyanage chandratilak	1	141	15
Garba, aliyu	1	141	15
Imam, abdullahi abubakar	1	141	15
Junaid, sahalu balarabe	1	141	15
Kakumi, nana aliyu iliyasu	1	141	15
Kumar, ganesh	1	141	15
Mahamad, saipunidzam	1	141	15

- **Co-occurrence all Keywords**

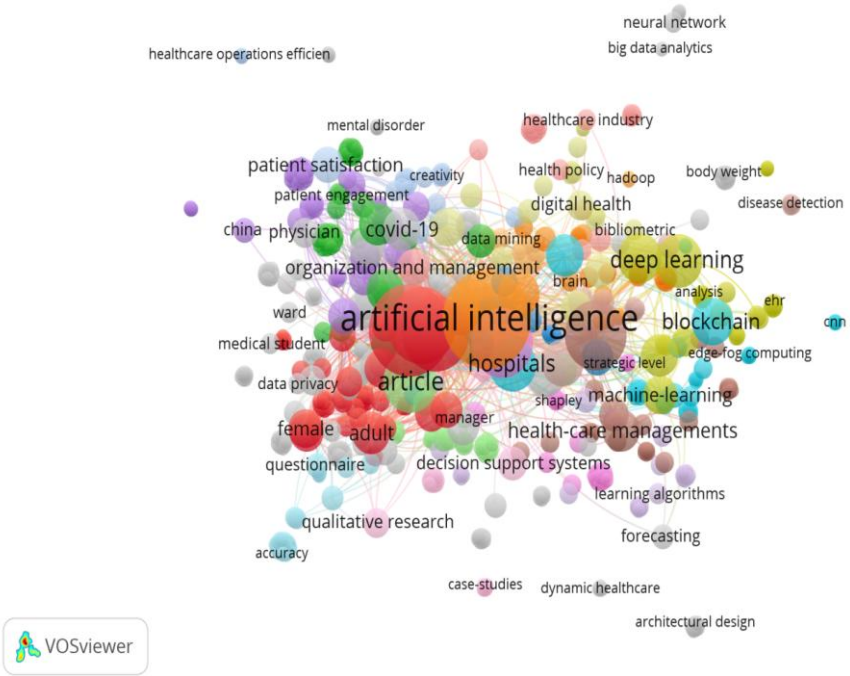


Figure 2: Co-Occurrence Plot

Co-occurrence of all keywords helps in scrutinizing two or more keywords in identifying a focal point with datasets throughout diverse documents. **Figure 2:** comprises 905, the most widespread usages of words in this research based on VOSviewer analysis. **Table 2**: describes top 10 highly occurred keywords like "Artificial Intelligence"(44), "Humans"(38), "Hospital Management"(27), "Health Care"(22), "Machine Learning"(17), "Article"(13), "Health Care Delivery"(13), "Hospitals"(13), "Deep Learning"(13). Vosviewer facilitated the scrutiny, assisting us to identify keywords and drift.

Table 2

Keyword	Occurrences	Total Link Strength
Artificial Intelligence	44	931
Human	38	979
Humans	27	764
Hospital Management	26	606
Health Care	22	548
Machine Learning	17	440
Article	13	473
Health Care Delivery	13	408
Hospitals	13	365
Deep Learning	12	198

- **Co-citation Analysis**

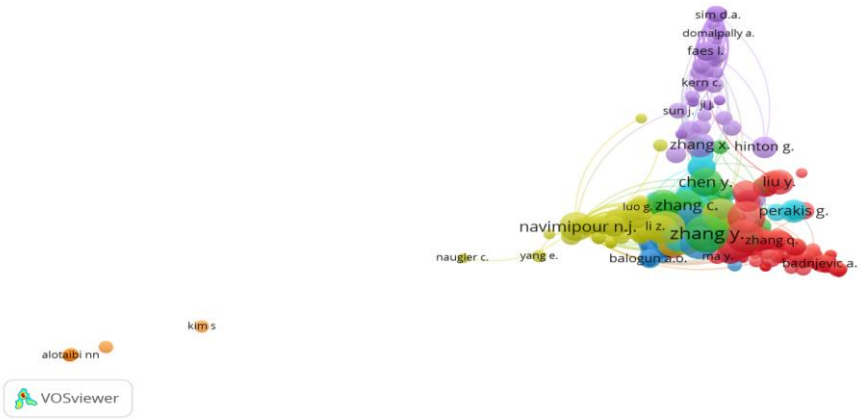


Figure 3: Co-citation Plot

Co-Citation author analysis plays a very crucial role in evaluating how frequently two authors are cited collaboratively in research; it proposes their work together to structure the realm of bibliometrics. **Figure 3**: VOSviewer output of Co-citation author having a total of 13281, most influential authors in the field of AI are "Zhang y.", "Wang l.", "Liu x.", "Wang j.", "Navimipour n.j.", **"**Li j.", "Wang f.", "Chen y.", "Acharya u.r.", "Balogun a.o." And therefore, VOSviewer has been enhanced to identify pioneering authors. **Table 3:** Top Co-citation of authors like Zangy y. Holds the highest citations 26 in the area of "Construction of Hospital Human Resource Information Management System under the background of AI", Wang l. Is second- highest cited with 21 in the area "Patient-Centric Mobile Medical Services Accessed Through Smartphone in the Top 100 Chinese Public Hospitals: Cross-Sectional Survey Study" and Liu x. is the third highest cited research in the area "Constructing a Hospital Department Development–Level Assessment Model: Machine Learning and Expert Consultation Approach in Complex Hospital Data Environments" is shown in Table 3.

Table 3

Authors	Citations	Total Link Strength
Zhang y.	26	2440
Wang l.	21	2798
Liu x.	20	2116
Wang j.	19	3630
Navimipour n.j.	16	3308
Li j.	16	2679
Wang f.	15	2134
Chen y.	15	2017
Acharya u.r.	10	2192
Balogun a.o.	7	1960

- **Co-authorship Countries**

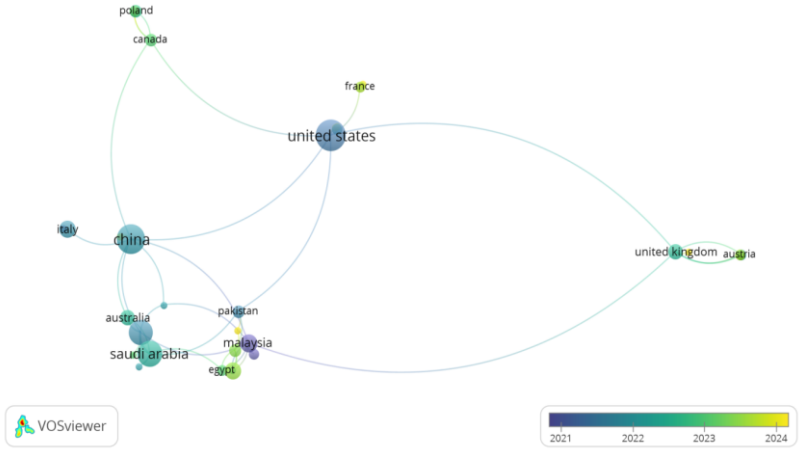


Figure 4

Co-authorship countries analysis helps to determine international collaborations via mapping out co-authored publication to disclose global networks, and identifying pioneering research nations, **Figure4:** Total of 45 countries has yielded diverse insights out of which India, Malaysia, China, Saudi Arabia and United Kingdom were top five contributor ahead to this research based on citations, total link strength and publication documents has been depicted in table 4.

Table 4

Country	Documents	Citations	Total Link Strength
India	11	906	9
Malaysia	6	210	9
China	15	966	8
Saudi Arabia	12	562	8
United states	17	1241	8

- **Bibliographic Coupling Sources**

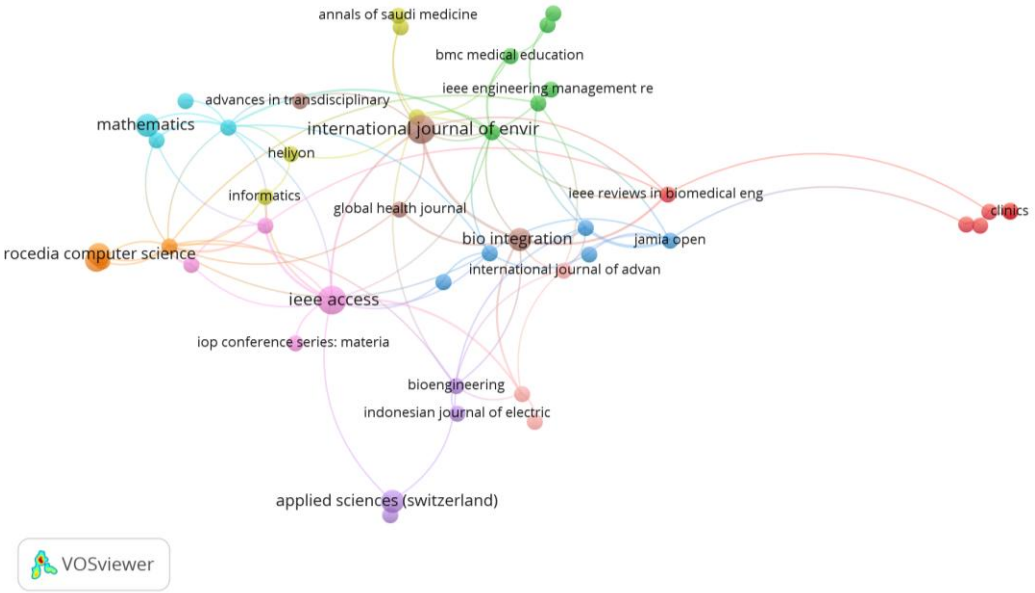


Figure 5: Bibliographic coupling according to sources highlights ideational affinity and association with journals and by enumerating number of exact sources the two credit in their bibliographies throughout this research based on AI in Healthcare by identifying journals with common references by utilizing Vos viewer, IEEE access, bio intergration, International Journal of Environmental research and Public Health and International Journal of Intelligent are top sources based on most cited and total link strength shown in table 5.

Table 5

Sources	Documents	Citations	Total Link Strength
Ieee access	3	201	17
Bio integration	2	43	15
Healthcare(Switzerland)	1	141	15
International Journal of Environmental Research and Public Health	3	764	12
International Journal of Intelligent	1	452	12

Conclusion

This research emphasizes the groundbreaking viability of Artificial Intelligence in Healthcare, strengthening diagnostic precision to consolidate administrative tasks and empowering bespoke treatment. A PRISMA-based systematic review has been conducted, which helped in analyzing an exhaustive overview of the existing state of AI in healthcare; therefore, it has the ability to transform health services by delivering optimal care to improve patient outcomes. This investigation highlights how AI, Deep Learning, and Machine Learning help in medical Imaging diagnosis, early disease detection, individualized medicine based on medical history, streamlining Administrative tasks, genomics, robotics, and expediting medical research. Moreover, AI-driven applications such as virtual support and fitness trackers are liberating patients to proactively engage in their personal wellness management and facilitating active lifestyle.

The consolidation of AI and Blockchain in Healthcare is metamorphosing the market in distinct approaches like safe Electronic Health Records (EHRs.), Supply network Management, Virtual Patient Monitoring, and Insurance claims assessment, which have the inherent ability to provide a fortified, transparent, and fostering way to handle clinical records and operations.

However, setbacks such as data security, algorithmic prejudice, ethical dilemmas, accountability, scalability, and credibility endure hurdles to pervasive acceptance due to various scientific, ethical, and social challenges. Therefore, AI is not a substitute for allied health professionals as a dynamic supporter to revolutionize the Healthcare system into a more prognostic, anticipatory, and customized system, eventually optimizing the standard of living and accelerating worldwide health outcomes.

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