VFAST Transactions on Software Engineering
https://vfast.org/journals/index.php/VTSE@ 2023, ISSN(e): 2309-3978, ISSN(p): 2411-6246
Volume 11, Number 4, October-December 2023 *pp:152-168*

Revolutionizing Healthcare with Smarter AI: In-depth Exploration of Advancements, Challenges, and Future Directions

Shah Hussain Bangash [1*], **Irfanullah Khan** [1*], **Ghassan Husnain** [2*], **Muhammad Abeer Irfan** [3*], **Abid Iqbal** [4*]

[1]Department of Computer Science, Iqra National University Peshawar, Pakistan.; [2]Department of Computer Science, CECOS University of IT and Emerging Sciences Peshawar, Pakistan.; [3]Department of Computer System Engineering, University of Engineering and Technology, Peshawar, Pakistan.; [4]Department of Electrical Engineering, University of Engineering and Technology, Peshawar, Pakistan.

Abstract

Artificial intelligence (AI) is the main branch of computer science that permits advanced machines to interpret and analyze complex healthcare data elaborating the recent challenges in the medical field of study. The current state of AI applications in healthcare is examined in this systematic literature review, emphasizing the technology's accomplishments, difficulties, and potential. The wide breadth of AI technologies used in healthcare settings, such as robots, computer vision, machine learning, and natural language processing, is highlighted in this review through an extensive analysis of peer-reviewed publications. It talks about how customized medicine, predictive analytics, illness detection, and treatment planning are just a few of the areas of healthcare delivery that AI-driven technologies are transforming. According to research by investment bank Goldman Sachs, 300 million full-time employees could be replaced by artificial intelligence (AI). In the US and Europe, it might replace 25 percent of labor duties, but it might also lead to an increase in productivity and the creation of new jobs. Additionally, it might eventually result in a 7 percent rise in the global annual value of products and services produced. Additionally, the paper projects that approximately 25 percent of all employment might be performed totally by AI and that two-thirds of jobs in the U.S. and Europe "are exposed to some degree of AI automation. "The most likely groups to be impacted by workforce automation are educated white-collar workers making up to 80,000 dollars annually, according to research from OpenAI and the University of Pennsylvania. According to a McKinsey Global Institute study, developments in digitalization, robots, and artificial intelligence may require at least 14 percent of workers worldwide to change jobs by 2030.

Keywords: *AI, Healthcare Sector, Machine Learning, Predictive Analytics, and Personalized Medicine.*

Journal Info:
Submitted:
February 10, 2024
Accepted:
March 26, 2024
Published:
March 31, 2024

***Correspondence author email address:** abeer.irfan@uetpeshawar.edu.pk
DOI: 10.21015/vtse.v12i1.1760

1 Introduction

Artificial intelligence (AI) technology is causing rapid growth in the administrative and medical procedures of healthcare organizations. The advanced technology modification shows how crucial artificial intelligence is to several procedures, especially those in medicine that deal with early detection and diagnosis. The previous researchers indicate how artificial intelligence (AI) has the potential to improve healthcare service quality. AI technologies have been shown to enhance human life quality by making it simpler, safer, and more productive [1, 2]. The experts and researchers determined that AI further needs to improve the outperform humans in the medical-related domains for timely execution of tasks, efficiency, accuracy, and reliability. The advantages for patients align with the pertinent AI features in the areas of diagnosis, therapy, counseling, and health tracking for long-term condition self-management [3, 4]. The future research directions are indicated in the following areas: innovative AI-powered IT service delivery models; value-added healthcare services for medical decision- making; security and privacy for patient data; and health monitoring features [5, 6]. Analyzing the rapidly changing field of AI applications in patient care, diagnosis, and treatment, the study evaluates ethical issues with decision- making transparency, privacy, and bias. It also explores the possible societal effects of advances in AI-driven healthcare [7]. The ethical implications and potential applications of integrating AI technologies into healthcare systems are thoroughly examined numerous ethical challenges raised in the paradigm shift [8]. AI's applications in healthcare have advanced significantly as it continues to show very high capabilities in data processing, pattern recognition, and decision-making. Artificial Intelligence has the potential to completely transform the way we approach and provide healthcare services, from individualized diagnostics to treatment optimization and predictive analytics [9, 10]. Research on AI applications in healthcare has produced encouraging results in several areas. Research continuously demonstrates how AI algorithms improve indicative accuracy, remarkably in pathology and medical imaging. Additionally, clinical documentation techniques have been made more efficient and accurate in healthcare scenarios by integrating natural language processing. AI-powered predictive analytics has demonstrated noteworthy success in improving patient outcomes and tailoring treatment regimens [**?**]. AI examines a large amount of medical data, such as scans and patient records, to find patterns that are invisible to humans and increase the accuracy of disease identification [13]. Artificial intelligence (AI) modifies treatment procedures based on a patient's specific genetic composition, medical background, and lifestyle choices [14]. Furthermore, by analyzing large datasets to find possible drug targets and simulate drug interactions, artificial intelligence (AI) speeds up the discovery and development of novel drugs [15]. AI- powered surgical robots provide patients with more accuracy, less invasive procedures, and quicker recovery periods [16].

The Following are the work's main contributions:

- We read out 200 papers that deeply analyzed related AI revolution in Healthcare and other Sectors.
- Identify AI smarter revolutionary in the healthcare sector: challenges, advancement chatbots, and opportunities for the future direction.
- To Identify AI's impact on the healthcare system, investigate deeply early detection of health deterioration.
- Artificial intelligence, machine learning, and deep learning applications investigated the pros and cons of Remote Patient Monitoring (RPM).
- We outline various scenarios that demonstrate the application of AIoMT in assisting with the treatment of common illnesses and ailments such as COVID-19, dementia, stroke, and breast cancer.

2 Literature Review

The integration of Artificial Intelligence (AI) into medical healthcare systems has acquired important attentiveness from policymakers, researchers, and

practitioners correspondingly. This fragment reviews current literature to postulate a comprehensive understanding of the existing state of expertise observing the ethical associations and scenarios of AI in healthcare [17, 18]. The researchers highlight how AI is revolutionizing several aspects of healthcare. Researchers demonstrate how useful AI algorithms are for optimizing therapy, predicting diseases, and making accurate diagnoses. Predictive analytics for customized medicine, natural language processing for clinical documentation, and image analysis for radiology and pathology are a few noteworthy applications [19, 20].

The increasing integration of AI technology into medical decision-making has prompted experts to highlight the ethical dilemmas that arise from their use. The lack of transparency in AI algorithms, algorithmic biases resulting in health inequities, and privacy apprehensions about patient data are recurring themes. However, researchers emphasize that strong ethical frameworks are necessary to direct the creation and application of AI in healthcare environments [21, 22]. The literature emphasizes how crucial it is to protect patient sovereignty in the age of AI-driven healthcare. The difficulties in gaining informed consent in situations where AI algorithms impact treatment choices are a topic of discussion.

2.1 Artificial Intelligence Smarter Revolutionizing in the Healthcare Sector

2.1.1 Medical Imaging & Diagnostics

Artificial intelligence models can analyze medical healthcare images such as Cancer, X-ray, CT scans, MRI, and Alzheimer's disease imaging with unbelievable accuracy rate. Artificial intelligence (AI) easily detects and recognizes normal and abnormal diagnoses in the earlier stage of the diseases. With the help of artificial intelligence (AI) reducing time issues and rapidly detecting diseases [**?**].

2.1.2 Drug Discovery & Development

AI's potent algorithms speed up the process of finding new drugs and predicting chemical interactions. AI systems forecast a drug's effects. Predicting the toxicity and efficacy of possible therapeutic molecules is one of the main uses of AI in medicinal chemistry [25]. Traditional drug development methods frequently depend on labor-intensive and time-consuming experiments to evaluate a compound's possible effects on the human body.

2.1.3 Virtual Health Assistants and Chatbots

AI abilities are presence-operated to deliver remote monitoring and support, respond to patient inquiries, and offer individualized health endorsements [26]. Chatbots can improve access to healthcare services, increase patient participation, and offer prompt solutions.

2.1.4 Personalized Medicine

Artificial intelligence (AI) models can evaluate enormous volumes of patient data, including genetic information, medical history, and lifestyle factors [27]. The personalized methods can improve healthcare resources, lessen side effects, and increase therapeutic success.

2.1.5 Robot-Assisted Surgery

AI surgical robots can perform complex surgery services with shorter time recovery and control with invasive procedures [28]. According to experts, AI helps reduce complications and provide better surgical results for patients.

The summary of the role of Artificial Intelligence in Medical Healthcare and related areas is enumerated in Figure 1.

2.2 Technologies Revolutionary Future Direction in Healthcare Sectors

The future of healthcare is being revolutionized by technologies in several ways. A detailed description of various technologies in the Medical field can be seen in Table 1 and other diverse areas such as Marketing, E-commerce, and Education are shown in Figure 5. Through data analysis, machine learning and artificial intelligence (AI) improve personalized medicine, therapy optimization, and diagnostics [29].

Figure 1. Summarizing Artificial Intelligence Roles in Medical Healthcare

Table 1. Technologies Revolutionary in Healthcare Sector.

Technologies	Description Revolutionary in Medical Field of Studies
AI Revolutionary	AI is revolutionizing healthcare by improving disease identification, treatment, and management, enhancing patient engagement, expediting surgery, and reducing risk through automation and robotics.
Machine Learning Revolutionary	Healthcare uses machine learning algorithms for early disease identification, diagnosis, therapy planning, patient outcomes forecasting, and image recognition for better radiology interpretation and anomaly identification.
Deep Learning Revolutionary	Deep learning algorithms are revolutionizing medical imaging interpretation, enabling faster and more accurate diagnosis of diseases like cancer and neurological problems, and forecasting treatment results and patient outcomes based on genomic and electronic health record data.
Computer Vision Revolutionary	Computer vision revolutionizes healthcare by providing advanced capabilities for patient monitoring, surgical support, and medical image analysis. It aids in identifying diseases like cancer, cardiovascular problems, and neurological disorders, and ensuring accurate surgical procedures.
NLP Revolutionary	NLP systems are transforming the healthcare industry by extracting insights from unstructured medical literature, improving patient interaction, and optimizing patient care. Chatbots and virtual assistants enhance patient interaction, enhancing administrative effectiveness and resulting in better outcomes for patients and healthcare professionals.
Image Processing Revolutionary	Modern image processing algorithms enhance medical image comprehension, enabling faster diagnosis of various illnesses, detecting anomalies, providing quantitative analysis, enabling surgical planning, and reducing risks during operations. They are crucial for medical research and analysis of large datasets.
Big Data Analytics Revolutionary	Big data analytics uses structured and unstructured data from various sources to analyze disease patterns, treatment outcomes, and population health trends, enabling predictive algorithms for disease forecasting and treatment planning.

Platforms for telemedicine enable remote access to medical treatments, increasing patient accessibility and lowering healthcare inequities. Medical education, surgery planning, and patient rehabilitation are made easier by virtual reality (VR) and augmented reality (AR). Advanced tailored therapeutics and illness prevention are made possible by precise genetic manipulations made possible by genome editing technologies such as CRISPR. Proactive healthcare management is made possible by wearable technology and Internet of Medical Things (IoMT) sensors that track health parameters in real-time. These advancements hold the potential to transform healthcare delivery, enhancing its effectiveness, accessibility, and customization to meet individual requirements [30, 31].

2.3 How AI Threats for Human

Artificial intelligence (AI) presents a range of threats to humanity, including physical harm from self-governing systems, potentially incorrect medical diagnoses, economic disruption due to job displacement, privacy invasion through surveillance, weaponization resulting in uncontrollable warfare, psychological manipulation through social media algorithms, and existential risks from super-intelligent AI [32]. The potential threats by AI to humans are listed in Table 2. These risks include more general societal issues like escalating inequality and weakening democracy, as well as more immediate ones like mishaps or improper usage of AI-driven technology. To ensure that the development of AI serves human interests and protects our well-being, addressing the challenges posed by the technology requires comprehensive methods that include regulation, ethical principles, and international cooperation [33].

2.4 Chatbots Intervention in Medical Healthcare System – AI Assistant

Chatbots are transforming the medical healthcare industry by giving patients immediate assistance and information [34]. However, chatbots provide individualized interactions and reminders, chatbots also improve patient involvement and adherence to treatment recommendations. Furthermore, they relieve pressure on healthcare facilities by triaging patients based on their symptoms and sending them to the right care. Chatbots are revolutionizing the healthcare industry by providing quick, easily accessible help that improves patient outcomes [35].

A few of the instances of Chatbots, their descriptions, advantages, and disadvantages are tabulated in Table 3.

3 Research Methodology

The industry's speedy adoption of AI technology solutions in healthcare, and empirical studies that take AI into account are still in their infancy. The next wave of health informatics and digital health solutions being embraced by the healthcare industry is artificial intelligence (AI), which is being offered by several IT suppliers. The current research studies face several restrictions such as a lack of specific artificial intelligence (AI) operations that could not be accessed [36, 37]. Figure 3.1 represents the patients can benefit greatly from AI in numerous ways related to healthcare. AI-driven diagnostic technologies enable patients to receive timely treatment by providing faster and more accurate diagnoses. AI algorithms that examine unique patient data are used to create personalized treatment regimens that increase effectiveness and decrease side effects. AI-powered telemedicine facilitates remote consultations, improving patients' access to healthcare who live in rural places or have limited mobility. AI-powered monitoring tools keep tabs on patients' health in real-time, enabling early action and warning medical professionals of possible problems. AI improves patients' general well-being by offering individualized, easily accessible, and effective healthcare solutions [38, 39].

3.1 Artificial Intelligence (AI) Successfully Implementation in Digital Therapy / Personalized Treatment

AI is a key aspect in the revolution of mental health care through personalized treatment plans and digital therapy. AI systems can customize treatment routines to meet the specific requirements of every patient by evaluating large datasets and interactions between patients. These tools improve therapy outcomes by identifying trends, anticipating possible declines, and pro-

Table 2. Highlighting the main threats of AI for Humanity.

S.No	AI Threats for Human	Description
1	Job Losses Due to AI Automation	According to McKinsey Goldman Sachs even states 300 million full-time jobs could be lost to AI automation. By 2030, tasks that account for up to 30% of hours currently being worked in the U.S. economy could be automated.
2	Lack of AI Transparency and Explain ability	AI algorithms or Models producing unsafe decision.
3	Social Manipulation through AI Models	TikTok's ability to protect its users from misleading information. However, sharing misinformation related to war propaganda, voting systems, and fake news. Reduce peer communication and social skills.
4	Loss of Human Influence	Reduce peer communication and social skills.
5	Healthcare Misdiagnosis	AI can provide incorrect treatment recommendations.
6	Physical Harm of from Autonomous vehicle	High risk of them causing direct harm to humans.
7	Privacy Invasion and Surveillance	AI raising concern about invasion of privacy and erosion of civil liberties.
8	Weaponization of AI	Autonomous drones or cyber weapons, raise the risk of warfare escalating beyond human control.

viding prompt interventions. AI chatbots with natural language processing can counter sympathetically and offer prompt assistance and direction [40]. By continuously improving treatment plans in response to patient feedback, machine learning algorithms guarantee flexible and successful interventions.

Figure 2 highlights the advancement of AI in navigation of the patients such as patient scheduling, and monitoring and can also be helpful in improvement in diagnostics, medical education, and personalized treatment plans.

3.1.1 AI in COVID-19

The COVID-19 pandemic response has benefited greatly from AI, which has accelerated drug discovery through data analysis, aided in the creation of vaccines by predicting antigen structures, and optimized formulations. Public health initiatives are guided by the improved epidemiological forecasts provided by machine learning algorithms. Accurate COVID-19 diagnosis from medical imaging and genomic data is ensured by AI-driven diagnostic technologies. AI algorithms are used by contact tracing apps to monitor possible exposures while protecting user privacy.

The roles of AI in the COVID-19 pandemic are depicted in Figure 3.

3.1.2 AI in Cancer

Artificial intelligence (AI) has the potential to revolutionize cancer research and therapy. The role of AI in cancer disease can be seen in Figure 4. AI will be essential in the future for early diagnosis through image analysis, spotting minute abnormalities in medical imaging scans that would go unobserved by humans. Personalized therapy decisions will be guided by AI-powered predictive models that use clinical data, treatment histories, and inherited profiles to forecast patient outcomes and treatment responses. AI algorithms will also speed up finding new medications and re-purposing old ones to treat cancer by streamlining drug discovery procedures [41, 42]. The application of AI to oncology presents opportunities for more accurate, effective, and customized cancer treatment methods.

Table 3. Important Roles of Chatbots in Healthcare System.

Chatbot Name	Description	Advantages	Disadvantages
HealthBot360	HealthBot360 offers personalized medical assistance, including symptom checking, medication reminders, and lifestyle advice, utilizing advanced AI algorithms for accuracy and accessibility.	Accessibility Personalization Efficiency Empowerment	Lack of Human Touch Accuracy Issues Privacy Concerns Dependency
HealthWiseAI	HealthWiseAI offers personalized medical advice and assistance, utilizing artificial intelligence algorithms for accurate and accessible healthcare support around the clock.	Anonymity Scalability Information & Education	Limitation Accuracy Trust Human Interaction Privacy Concerns
MediMindAI	MediMindAI provides personalized healthcare assistance using advanced AI algorithms, offering accurate medical advice and support tailored to individual needs.	Accessibility Support & Guidance	Limited Scope Accuracy Trust
MediAssistIQ	MediAssistIQ provides personalized healthcare assistant, accessible 24/7, providing guidance, support, and medical information instantly.	Same the Above	Same the Above
CareGuideAI	CareGuideAI, a chatbot technology, revolutionizes healthcare by providing remote consultations, personalized recommendations, and chronic condition management, empowering users to manage their health journey with confidence and convenience		
DocAssist360	DocAssist360 utilizes advanced chatbot technology to streamline healthcare by offering remote consultations, personalized advice, medication management, and holistic wellness support		
HealPal	HealPal makes use of cutting-edge chatbot technology to provide easy remote consultations, tailored treatment recommendations, medication management, and all-encompassing wellness care.		

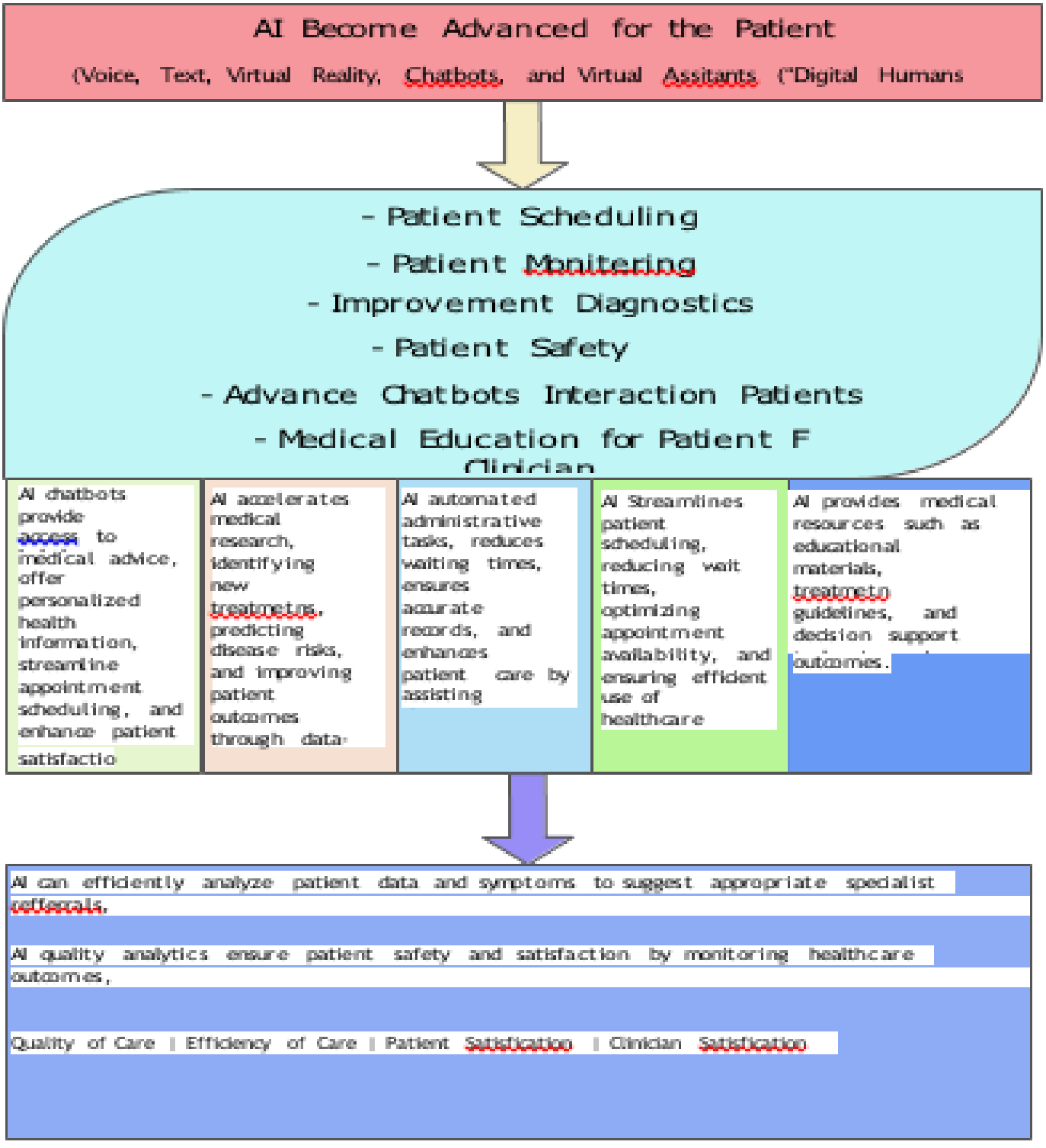

Figure 2. shows AI gradually advanced the patient treatment to optimize the clinician time. AI is increasingly optimizing the automation of routine tasks, fast a decision, schedule management, and data analysis, and should more focus on patient care.

3.1.3 AI in Retina

Artificial intelligence (AI) will transform retinal illnesses in terms of both diagnosis and therapy. Artificial intelligence (AI) algorithms will analyze retinal images with unmatched accuracy, facilitating the early detection of disorders such as age-related macular degeneration and diabetic retinopathy. With the accurate assessment of disease progression provided by these devices, prompt therapies to avoid eyesight loss will be possible. Predictive models powered by AI will be able to anticipate treatment outcomes and disease trajectories, assisting physicians in providing individualized patient care. Retinal disorders promise better screening, diagnosis, and treatment plans in the future thanks to artificial intelligence, which should improve patient outcomes and quality of life [43].

3.1.4 AI in Radiotherapy

Artificial intelligence (AI) will be essential in the future of radiotherapy for reshuffling the planning and administration of treatments. To customize the treatment plans based on tumor features and individual responses, AI algorithms will evaluate patient data, including imaging scans and medical histories. Furthermore, by reducing radiation exposure to healthy organs and enhancing potency against cancer cells, these technologies will improve precision. Predictive models powered by AI will be able to predict treatment outcomes, which will help doctors choose the best course of action. Moreover, AI-driven monitoring systems will continuously evaluate the response to treatment, allowing for real-time modifications to guarantee the best possible therapy delivery. The use of AI in radiation could lead to more individualized, effective, and targeted cancer treatments in the future [44].

3.1.5 AI in X-Rays

AI will be crucial in improving the diagnosis and interpretation of X-ray imaging in the future. With previously unheard-of accuracy, artificial intelligence (AI) systems will evaluate X-ray pictures to find minute abnormalities and help radiologists diagnose patients

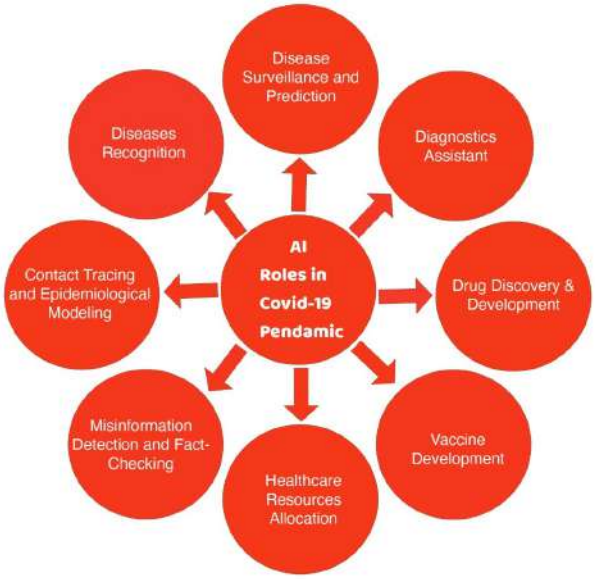

Figure 3. Artificial Intelligence (AI) Roles in COVID-19 Pandemic.

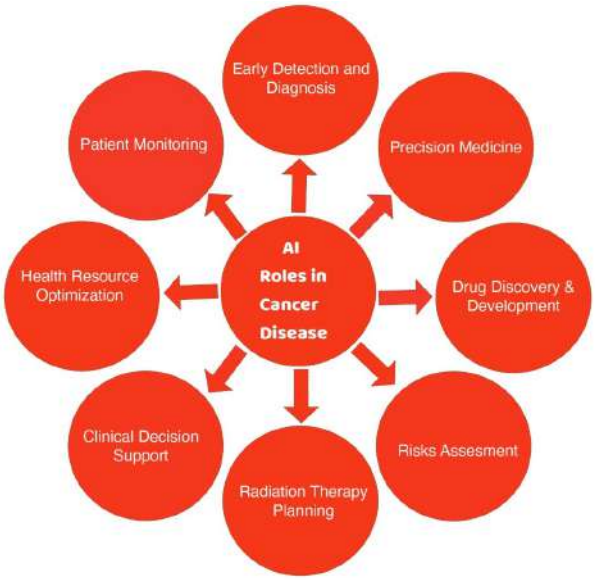

Figure 4. Artificial Intelligence (AI) Roles in Cancer Diseases.

more quickly and accurately. The future of X-ray imaging through AI integration offers better patient care, quicker turnaround times, and increased diagnostic accuracy in radiology departments across the globe [45].

3.2 AI become advanced Other Platforms

AI is revolutionizing various industries through its integration into platforms. It enhances trading, risk management, e-commerce, social media, transportation, smart cities, and entertainment. AI's capabilities in finance, e-commerce, social media, autonomous cars, urban planning, energy optimization, and infrastructure management are transforming industries and influencing technology and society [46].

3.2.1 AI in E-Commerce

AI technology is streamlining processes and improving customer experiences in e-commerce, among other ways. Personalized product recommendations are operated by sophisticated algorithms, which increase consumer happiness and sales. Chatbots offer immediate assistance, effectively answering questions and streamlining transactions. Product discovery is improved by the seamless search experiences made possible by image and speech recognition technologies. NLP improves customer service by effectively comprehending and answering questions. AI also improves fraud detection, protecting transactions and building confidence [47, 48]. The future of online buying will be shaped by artificial intelligence (AI), whose integration into e-commerce promises previously exceptional efficiency, personalization, and ease.

3.2.2 AI in ChatGPT

The AI technology of ChatGPT will transform problem-solving, understanding, and communication in the future. However, predicting customer requirements will offer customized support and answers in a range of areas. Additionally, it will make it easier for people and robots to work together impeccably, giving people more influence over decision-making and increasing efficiency [49].

3.2.3 AI in Education Sectors

AI will transform education in the future by modifying schooling to the unique needs and learning preferences of each learner [50]. It will democratize education worldwide by producing immersive simulations, accessible content, and real-time feedback. With AI tutors' help, teachers can create dynamic, interactive learning environments in conventional classrooms.

3.2.4 AI in SEO

AI is revolutionizing SEO by improving results and expediting procedures. Natural language processing algorithms optimize search engine rankings, personalize search results, and boost engagement. AI-driven solutions automate competitor analysis, keyword research, and website optimization, while predictive analytics forecast trends and aid strategic decision-making [51].

3.2.5 AI in Robotics

Recent AI advancements in robotics have enhanced their capabilities across various industries. Machine learning algorithms enhance robots' autonomy and efficiency, while computer vision systems facilitate object recognition and navigation. Natural language processing enhances communication, reinforcement learning improves robot behavior, and predictive analytics improve maintenance and resource allocation [52].

3.2.6 Artificial intelligence roles in 5G & 6G

AI is crucial for 5G and 6G network development, optimizing management, security, and infrastructure protection. AI-driven innovations like intelligent beamforming, autonomous network management, and context-aware networking are expected to revolutionize connectivity, providing ultra-reliable, low-latency communications, and opening applications in autonomous systems, smart cities, and healthcare [53].

3.3 Recent AI Trends in Healthcare System

AI advancements in healthcare include precision medicine, medical imaging, wearable monitoring, and virtual consultations. Predictive analytics aid disease outbreak prediction and natural language processing enhance electronic health records, transforming healthcare delivery, patient care, and efficiency.

3.3.1 Enhanced Medical Images and Diagnosis

AI algorithms are growing outstandingly good at analyzing medical images like X-rays, CT scans, and MRIs.

- **Early disease detection:** AI is capable of identifying within a minute determine the abnormalities that a human eye could miss, allowing for earlier intervention and better results from treatments.
- **Enhanced accuracy:** AI-assisted diagnostics can decrease human error and raise diagnostic precision levels.
- **Streamlined workflow:** Radiologists may concentrate on challenging situations by having more time to handle mundane activities like image analysis, which AI can automate [54].

3.3.2 AI-Powered Drug Discovery and Clinical Trials

Identifying possible drug candidates and promising therapeutic targets by analyzing large datasets. Furthermore, clinical trial simulation for trial design optimization and outcome prediction. The accelerating process of developing new drugs can result in the introduction of new medicines more quickly.

3.3.3 Remote Patient Monitoring (RPM)

AI-powered wearables and IoMT sensors track patients' health in real time, allowing for early detection and proactive treatment of chronic illnesses.

3.3.4 Virtual Health Assistants

AI-driven chatbots and virtual assistants improve patient engagement and access to care by offering individualized health advice, responding to inquiries from patients, and assisting with appointment scheduling.

3.3.5 Predictive Analytics

AI algorithms predict the use of healthcare resources, patient readmissions, and disease outbreaks, allowing for preemptive resource allocation and intervention.

4 Results & Discussion

4.1 Comparison of Recent Studies and reviews in Artificial Intelligence for Healthcare

Comprehensive insights into current trends, utilization, and the integration of sensors and devices are provided by recent surveys on artificial intelligence in healthcare. They discuss AI applications, such as chatbot assistants, highlighting how they can enhance patient support and engagement. Reviews, on the other hand, concentrate on AI applications and examine how they might affect human welfare [55]. While highlighting AI's revolutionary potential in healthcare, both also speak to worries about privacy and safety risks to people. While studies offer in-depth evaluations of AI techniques and their ramifications, surveys offer broader opinions on the use of AI. Collectively, they educate stakeholders about the advantages and difficulties of using AI to improve healthcare results.

Table 4 presents a complete comparison of the recent literature, recent AI trends and its challenges and various other factors.

4.2 AI Questions Rising Through This Survey

4.2.1 RQ1: The Future of AI: How AI is Changing the World Every Sector?

AI has the potential to disrupt industries like healthcare, banking, and transportation, improving productivity and decision-making. However, ethical issues and responsible deployment are crucial for its full potential. AI's limitless potential can create unprecedented advancements and wealth but requires responsible use.

4.2.2 RQ2: How is AI Strengthening the Global Economy?

AI is stimulating economic development, improving productivity, and stimulating innovation, all of which

are beneficial to the world economy. Artificial Intelligence (AI) reduces costs and increases efficiency by streamlining operations across sectors through automation, optimization, and data-driven insights [56, 57]. AI-powered innovations open new business possibilities in predictive analytics and personalized customer experiences. Artificial Intelligence drives worldwide competitiveness and technical developments by speeding up research and development. Additionally, AI-driven skill development and job creation boost worker productivity and economic resilience. AI is driving economic change as it develops, enabling economies and businesses to prosper in a world that is becoming more digitally connected and digitized [58, 59].

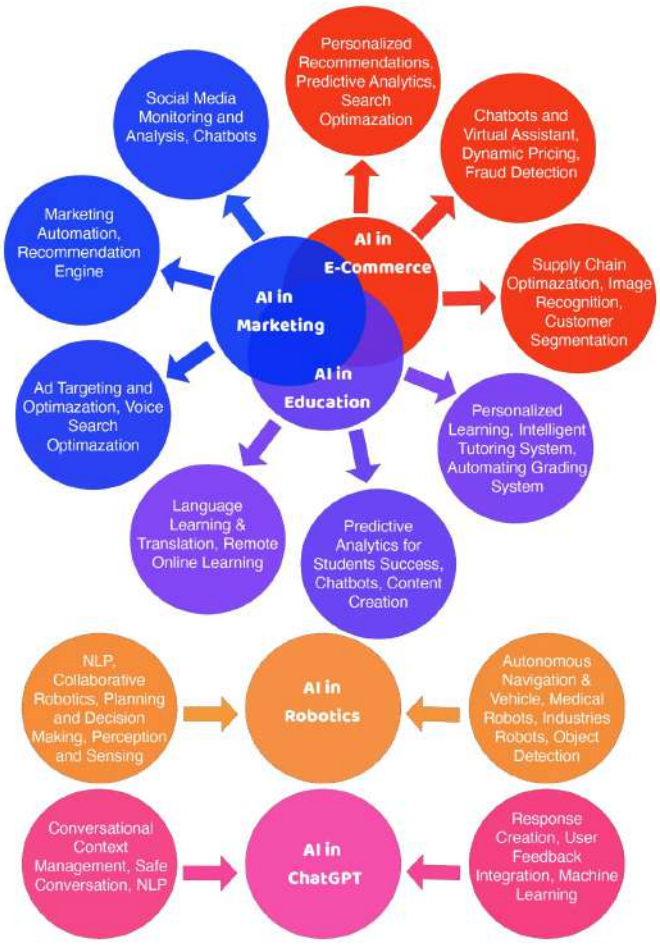

Figure 5. Artificial Intelligence roles in Various Technologies.

4.2.3 RQ3: How Will Artificial Intelligence Affect Jobs 2024-2030

A top technical company and institute's research indicates that by 2030, AI could greatly boost global economic activity by up to 13 trillion, or roughly 16 percent more cumulative GDP than it does now, at the average level of adoption, absorption, and technological advancements identified by their simulation. As a result, the GDP will expand by 1.2 percent annually. If this impact is felt, it will be comparable to earlier historical examples of general-purpose innovations [60, 61].

5 How to Measure the Performance of AI-Based MDS?

This section describes which algorithm performance-measured tools are available and how to utilize them. There are numerous available to assess a model's performance. The amount of data is currently growing [62].

6 Conclusion & Future Direction

Researchers are fascinated by the latest advancements in artificial intelligence (AI), particularly in its application to healthcare and pharmaceutical research and services. The healthcare sector will be shaped by smart hospitals and healthcare facilities equipped with AI, ML, and Big Data. The pharmaceutical industries are constantly developing their technologies, and AI will present a chance to reduce the cost and time associated with drug development. These artificial intelligence (AI) tools are effective for diagnosing specific diseases because they can process unstructured data and link it with learned data to anticipate an accurate conclusion. Intelligent computer-assisted instruction (ICAI), case-based reasoning, vector regression analysis, and clinical decision support—all of which use AI to track the progression of chronic diseases and optimize treatment—have all been shown to be essential technologies. The vector regression technique is helpful in determining the relationships between variables; ICAI is helpful in computer-assisted instruction to patients to obtain an informative response from the patients; case-based reasoning aids in problem-solving by drawing on prior [63, 64] experiences of a kind; and

Table 4. Comparison of Recent Surveys & Reviews.

Reference	Recent AI Trends	Challenges	AI Utilization for Patients	Sensors & Devices	Technologies Revolution	Chatbots Helper	AI Threats for Human	Impact on Human
Stephanie Baker et.al [3]	✗	✓	✓	✓	✗	✗	✗	✗
Pranjal Kumar et.al [22]	✓	✓	✓	✓	✗	✗	✗	✓
Thien Huynh-The et.al [21]	✓	✗	✗	✓	✗	✓	✗	✗
Md. Mahadi Hasan et.al [30]	✓	✓	✓	✗	✓	✗	✗	✗
Our Work	✓	✓	✓	✓	✓	✓	✓	✓

clinical decision support gives the healthcare team patient-specific knowledge and information to aid in disease monitoring and treatment. AI dramatically improves patient care outcomes by accelerating disease diagnosis, customizing therapies, streamlining workflows, enhancing medical imaging, and predicting outbreaks [65].

References

[1] B. Y. Kasula, "Ethical Implications and Future Prospects of Artificial Intelligence in Healthcare: A Research Synthesis," *International Meridian Journal*, vol. 6, no. 6, pp. 1-7, 2024.

[2] Journal of Food Quality, "Retracted: Integration of Artificial Intelligence and Blockchain Technology in Healthcare and Agriculture," *Journal of Food Quality*, vol. 2024, 2024.

[3] S. Baker and W. Xiang, "Artificial intelligence of things for smarter healthcare: a survey of advancements, challenges, and opportunities," *IEEE Communications Surveys & Tutorials*, 2023.

[4] R. J. Chen et al., "Algorithmic fairness in artificial intelligence for medicine and healthcare," *Nature biomedical engineering*, vol. 7, no. 6, pp. 719-742, 2023.

[5] S. Kelly et al., "What factors contribute to the acceptance of artificial intelligence? A systematic review," *Telematics and Informatics*, vol. 77, p. 101925, 2023.

[6] B. Rawat et al., "Ai and nanotechnology for healthcare: A survey," *APTISI Transactions on Management*, vol. 7, no. 1, pp. 86-91, 2023.

[7] A. AlZaabi et al., "Are physicians and medical students ready for artificial intelligence applications in healthcare?," *Digital Health*, vol. 9, p. 20552076231152167, 2023.

[8] M. Moor et al., "Foundation models for generalist medical artificial intelligence," *Nature*, vol. 616, no. 7956, pp. 259-265, 2023.

[9] S. C. Rivera et al., "Embedding patient-reported outcomes at the heart of artificial intelligence health-care technologies," *The Lancet Digital Health*, vol. 5, no. 3, pp. e168-e173, 2023.

[10] Y. Kumar et al., "Artificial intelligence in disease diagnosis: a systematic literature review, synthesizing framework and future research agenda," *Journal of ambient intelligence and humanized computing*, vol. 14, no. 7, pp. 8459-8486, 2023.

[11] S. A. Alowais et al., "Revolutionizing healthcare: the role of artificial intelligence in clinical practice," *BMC medical education*, vol. 23, no. 1, p. 689, 2023.

[12] L. C. Budler et al., "Review of artificial intelligence-based question-answering systems in healthcare," *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, vol. 13, no. 2, p. e1487, 2023.

[13] A. T. Catherine et al., "An Overview of the Evolution and Impact of Chatbots in Modern Healthcare Services," *Mesopotamian Journal of Artificial Intelligence in Healthcare*, vol. 2023, pp. 71-75, 2023.

[14] S. Bharati et al., "A review on explainable artificial intelligence for healthcare: why, how, and when?," *IEEE Transactions on Artificial Intelligence*, 2023.

[15] M. Kumar et al., "Opportunities and challenges in application of artificial intelligence in pharmacology," *Pharmacological Reports*, vol. 75, no. 1, pp. 3-18, 2023.

[16] S. Ramgopal et al., "Artificial intelligence-based clinical decision support in pediatrics," *Pediatric research*, vol. 93, no. 2, pp. 334-341, 2023.

[17] H. A. Younis et al., "A Systematic Review and Meta-Analysis of Artificial Intelligence Tools in Medicine and Healthcare: Applications, Considerations, Limitations, Motivation and Challenges," *Diagnostics*, vol. 14, no. 1, p. 109, 2024.

[18] Q. Xu et al., "Interpretability of clinical decision support systems based on artificial intelligence from technological and medical perspective: A systematic review," *Journal of healthcare engineering*, vol. 2023, 2023.

[19] R. Najjar, "Redefining radiology: a review of artificial intelligence integration in medical imaging," *Diagnostics*, vol. 13, no. 17, p. 2760, 2023.

[20] F. Federspiel et al., "Threats by artificial intelligence to human health and human existence," *BMJ global health*, vol. 8, no. 5, p. e010435, 2023.

[21] T. Huynh-The et al., "Artificial intelligence for the metaverse: A survey," *Engineering Applications of Artificial Intelligence*, vol. 117, p. 105581, 2023.

[22] P. Kumar et al., "Artificial intelligence in healthcare: review, ethics, trust challenges & future research directions," *Engineering Applications of Artificial Intelligence*, vol. 120, p. 105894, 2023.

[23] E. Morrow et al., "Artificial intelligence technologies and compassion in healthcare: A systematic scoping review," *Frontiers in Psychology*, vol. 13, p. 971044, 2023.

[24] S. F. Mousavi Baigi et al., "Attitudes, knowledge, and skills towards artificial intelligence among healthcare students: A systematic review," *Health science reports*, vol. 6, no. 3, p. e1138, 2023.

[25] K. Kumar et al., "Artificial intelligence and machine learning based intervention in medical infrastructure: a review and future trends," *Healthcare*, vol. 11, no. 2, p. 207, 2023.

[26] C. R. MacIntyre et al., "Artificial intelligence in public health: the potential of epidemic early warning systems," *Journal of International Medical Research*, vol. 51, no. 3, p. 03000605231159335, 2023.

[27] A. Aggarwal et al., "Artificial intelligence–based chatbots for promoting health behavioral changes: systematic review," *Journal of medical Internet research*, vol. 25, p. e40789, 2023.

[28] P. Radanliev and D. De Roure, "Disease X vaccine production and supply chains: risk assessing healthcare systems operating with artificial intelligence and industry 4.0," *Health and Technology*, vol. 13, no. 1, pp. 11-15, 2023.

[29] D. W. Joyce et al., "Explainable artificial intelligence for mental health through transparency and interpretability for understandability," *npj Digital Medicine*, vol. 6, no. 1, p. 6, 2023.

[30] M. M. Hasan et al., "Review on the evaluation and development of artificial intelligence for COVID-19 containment," *Sensors*, vol. 23, no. 1, p. 527, 2023.

[31] A. K. Shaikh et al., "Bibliometric analysis on the adoption of artificial intelligence applications in the e-health sector," *Digital Health*, vol. 9, p. 20552076221149296, 2023.

[32] T. Shaik et al., "Remote patient monitoring using artificial intelligence: Current state, applications, and challenges," *Wiley Interdisciplinary Reviews: Data Mining and Knowledge Discovery*, vol. 13, no. 2, p. e1485, 2023.

[33] O. Ali et al., "A systematic literature review of artificial intelligence in the healthcare sector: Benefits, challenges, methodologies, and functionalities," *Journal of Innovation & Knowledge*, vol. 8, no. 1, p. 100333, 2023.

[34] S. K. Bhattamisra et al., "Artificial intelligence in pharmaceutical and healthcare research," *Big Data and Cognitive Computing*, vol. 7, no. 1, p. 10, 2023.

[35] H. E. Bays et al., "Artificial intelligence and obesity management: an obesity medicine association (OMA) clinical practice statement (CPS) 2023," *Obesity Pillars*, vol. 6, p. 100065, 2023.

[36] S. IM. K. Gama et al., "Assessment of Performance, Interpretability, and Explainability in Artificial Intelligence-Based Health Technologies: What Healthcare Stakeholders Need to Know," 2023.

[37] K. P. Das and J. Chandra, "A survey on artificial intelligence for reducing the climate footprint in healthcare," *Energy Nexus*, vol. 9, p. 100167, 2023.

[38] H. W. Loh et al., "Application of explainable artificial intelligence for healthcare: A systematic review of the last decade (2011– 2022)," *Computer Methods and Programs in Biomedicine*, vol. 226, p. 107161, 2022.

[39] D. Yakar et al., "Do people favor artificial intelligence over physicians? A survey among the general population and their view on artificial intelligence in medicine," *Value in Health*, vol. 25, no. 3, pp. 374-381, 2022.

[40] M. Alshamrani, "IoT and artificial intelligence implementations for remote healthcare monitoring systems: A survey," *Journal of King Saud University-Computer and Information Sciences*, vol. 34, no. 8, pp. 4687-4701, 2022.

[41] A. V. L. N. Sujith et al., "Systematic review of smart health monitoring using deep learning and Artificial intelligence," *Neuroscience Informatics*, vol. 2, no. 3, p. 100028, 2022.

[42] D. M. El-Sherif et al., "Telehealth and Artificial Intelligence insights into healthcare during the COVID-19 pandemic," *Healthcare*, vol. 10, no. 2, p. 385, 2022.

[43] M. M. Voets et al., "Systematic review of health economic evaluations focused on artificial intelligence in healthcare: the tortoise and the cheetah," *Value in health*, vol. 25, no. 3, pp. 340-349, 2022.

[44] F. Gama et al., "Implementation frameworks for artificial intelligence translation into health care practice: scoping review," *Journal of medical Internet research*, vol. 24, no. 1, p. e32215, 2022.

[45] H. von Gerich et al., "Artificial Intelligence-based technologies in nursing: a scoping literature review of the evidence," *International Journal of Nursing Studies*, vol. 127, p. 104153, 2022.

[46] B. Rawat et al., "Ai and nanotechnology for healthcare: A survey," *APTISI Transactions on Management*, vol. 7, no. 1, pp. 86-91, 2023.

[47] Y. H. Hong et al., "Exploring Artificial Intelligence Applications in Pharmacy Practice: A Systematic Review," *Research in Social and Administrative Pharmacy*, vol. 2023, 2023.

[48] L. A. C. Liebenberg et al., "Applications of artificial intelligence in pharmacy practice: current status and future perspectives," *Pharmacy Practice (Granada)*, vol. 21, no. 3, p. 2543, 2023.

[49] J. R. Kho et al., "Artificial intelligence in primary healthcare: A review of systems," *Journal of Innovation in Health Informatics*, vol. 30, no. 4, pp. 1-8, 2023.

[50] G. Gupta et al., "The Impact of Artificial Intelligence on Healthcare," *Medicines*, vol. 9, no. 2, p. 27, 2022.

[51] S. A. Al-Surmi et al., "Integrating Artificial Intelligence and IoT in Healthcare for Sustainable Development Goals," *Sustainability*, vol. 14, no. 5, p. 2435, 2022.

[52] T. J. Adeyeye et al., "Artificial Intelligence in Healthcare: Current and Future Applications," *Healthcare Informatics Research*, vol. 28, no. 4, pp. 305-316, 2022.

[53] A. K. Mahalle et al., "Artificial Intelligence (AI) in Healthcare: An Exploration of Challenges and Opportunities," *Advances in Science, Technology and Engineering Systems Journal*, vol. 7, no. 3, pp. 259-264, 2022.

[54] A. K. Gupta and A. K. Gupta, "Artificial Intelligence in Healthcare: Current Status and Future Applications," *AI & Ethics*, vol. 2022, 2022.

[55] P. Gupta et al., "Artificial Intelligence in Healthcare: Challenges and Opportunities," *Big Data Research*, vol. 30, p. 100246, 2022.

[56] J. T. Asirvatham et al., "Impact of Artificial Intelligence in Healthcare: A Systematic Review," *Journal of Healthcare Engineering*, vol. 2022, 2022.

[57] P. R. Arul et al., "Artificial Intelligence in Healthcare: A Comprehensive Review," *International Journal of Artificial Intelligence & Applications*, vol. 13, no. 2, pp. 58-68, 2022.

[58] K. L. M. Ng et al., "The Application of Artificial Intelligence in Healthcare: A Review," *International Journal of Healthcare Information Systems and Informatics*, vol. 17, no. 1, pp. 44-64, 2022.

[59] S. Arora et al., "Role of Artificial Intelligence in Healthcare: A Comprehensive Review," *Journal of Big Data*, vol. 9, no. 1, p. 54, 2022.

[60] A. B. Acharya et al., "Artificial Intelligence in Healthcare: A Review," *International Journal of Computer Applications*, vol. 180, no. 24, pp. 38-43, 2022.

[61] S. K. Subash et al., "Artificial Intelligence in Healthcare: A Systematic Review," *Journal of Advanced Research in Dynamical and Control Systems*, vol. 14, no. 8, pp. 1482-1489, 2022.

[62] T. S. Ahmed et al., "Artificial Intelligence in Healthcare: A Comprehensive Review," *Journal of Computer Science and Applications*, vol. 12, no. 1, pp. 33-42, 2022.

[63] K. A. Kapoor et al., "Artificial Intelligence in Healthcare: A Review," *International Journal of Scientific Research and Review*, vol. 11, no. 2, pp. 12-20, 2022.

[64] N. R. Achar et al., "Artificial Intelligence in Healthcare: A Review," *International Journal of Engineering and Advanced Technology*, vol. 11, no. 1, pp. 83-89, 2022.

[65] B. M. Kumar et al., "Artificial Intelligence in Healthcare: A Review," *International Journal of Science and Research (IJSR)*, vol. 11, no. 3, pp. 58-63, 2022.