**International Journal of Social Trends**
**Volume 1, Issue 1 (Nov-Dec; 2023)**

# *A Comprehensive Literature Review on the Most Recent AI Developments in Healthcare*

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## ABSTRACT

*Healthcare organisations are seeing rapid administrative and clinical workflow transformations due to the adoption of artificial intelligence (AI). This update exemplifies how AI is changing many different industries, most notably medical processes involving early detection and diagnosis. Evidence from previous research suggests that AI might significantly improve healthcare service quality. Some claim that AI-based technologies can enhance human life by making it easier, safer, and more productive. As a literature review, this study examines all of the prior academic work on artificial intelligence's applications in healthcare. This review analysed 132 scientific articles in order to provide a taxonomy. Individuals, healthcare providers, companies, and the health sector are all addressed in the presentation, which goes over the pros and cons of AI capabilities. Furthermore, the article delves into the social and ethical considerations surrounding artificial intelligence (AI) as it pertains to healthcare decision-making, patient data privacy and security, and health monitoring capabilities.*

**Keywords:** AI; Digital Health; Healthcare; Healthcare Systems; Literature Review

## INTRODUCTION

There has been a marked shift in emphasis from production to growth towards technology since the start of the industrial revolution [1-3]. The continuation of this tendency is anticipated. Kaplan and Haenlein's research from 2020 [4] suggests that machines have taken over repetitive and hard manual labour, which has helped humans evolve. Artificial intelligence (AI) is a game-changing technological development that has the potential to supplant human workers in a number of occupations [5,6]. Aside from the obvious physical labour help, artificial intelligence (AI) is a significant technical advancement because it has enabled humans to replace simpler forms of manual labour with more complicated forms of mental and intellectual labour [7,8]. Artificial intelligence (AI) is a scientific and technological discipline that studies how to teach computers to do activities that have traditionally been associated with human intelligence. One of the most alluring features of AI is its ability to mimic human intelligence in many ways, including learning from mistakes and adapting to new environments and inputs [4-9].

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Artificial intelligence (AI) improves performance across a variety of tasks by drawing on relevant knowledge sources. Recent years have seen tremendous progress in artificial intelligence (AI), which has found several applications and brought numerous advantages to many different sectors, including the critical healthcare sector [10-12]. As an example of a sector that has profited substantially from AI, consider healthcare. Artificial intelligence has already digitally transformed the healthcare system into an automated variant in several areas. Consequently, in certain programs, complicated procedures are managed by or dependent on AI components, and humans are now only needed for fundamental medical practice activities, such as handling patients and medical supplies [13-15]. The use of artificial intelligence in healthcare is rapidly developing, particularly in the areas of early detection and diagnosis [15–18]. Thanks to these developments, AI can now execute tasks that humans struggle to do at a reduced cost while maintaining the same level of efficiency, simplicity, dependability, and attention to detail [19,20]. If information systems (IS) developers can effectively build AI systems to do particular tasks, the technological advancements made possible by healthcare digitisation, according to Tobore et al. [21], can assist solve further challenges [22]. Artificial intelligence (AI) might, for example, save healthcare expenses while simultaneously improving patient care [17,23-25]. Innovative artificial intelligence solutions are needed in the healthcare industry to boost efficiency and effectiveness without increasing costs in response to the anticipated fast growth in the demand for medical services caused by the world's expanding human population [25,26]. When it comes to this specific field, AI is still at the forefront of innovation, offering fresh solutions [13,27].

The medical sector's expansion can be better managed because to recent fast technology advances, especially in artificial intelligence. Big data, algorithms for learning apps, and robots are some of the latest AI technology. To monitor, detect, and evaluate risks and benefits, healthcare organisations employ these technologies [28-30]. To improve operations and streamline the management of healthcare services, the healthcare sector heavily relies on medical data and analytics. Both the volume and complexity of medical records have grown at an exponential rate in the last several years. People are increasingly using monitoring devices for everyday purposes outside of medical emergencies, and this is generating massive amounts of data for healthcare practitioners, scientists, and consumers [31–33]. Improved patient treatment is possible with the use of these data [13-34]. The use of data storage and processing power, supported by machine learning techniques, is common for this task [35,36]. For example, doctors might be able to make reliable forecasts if they record

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their patients' daily behaviour patterns and maintain a careful watch on them. This means AI has the potential to improve patient outcomes across the board, from diagnosis to treatment to medication usage and prescription, by offering suggestions about healthcare, therapeutic perspectives, and strategies to reverse wellness decline and bolster proactive measures that prevent patients' conditions from worsening. To improve clinical accuracy [20] and decrease the cost of surgical operations [19,20], innovative hospitals are looking into AI technologies. Artificial intelligence (AI) lets doctors and patients weigh all of their treatment options with confidence by providing detailed information on each [37,38].

To have a thorough grasp of AI, further research is needed on its theoretical and practical aspects [39,40]. In order to achieve this objective, this article will outline the latest advancements in the application of AI in healthcare. This work offers a substantial theoretical contribution by providing an authoritative theoretical groundwork for the newly released study by using the technique developed by Webster and Watson [41] to the analysis of earlier research. An examination of the many ideas presented in this article and a clearer picture of ongoing developments are both made possible by this concept-driven technique. Academics will get the chance to deepen their understanding of medical research history and the limitations of current research, which will aid them in their work. Scholars presently investigating the possible application of artificial intelligence in healthcare, and to faculty members who have been exposed to the area but have been devoting their attention to examining more explicit experiences of the most current research topics and their potential contributions to this literature.

## A TECHNIQUE FOR REVIEWING LITERATURE

Kamboj and Rahman [42] state that systematic reviews are gaining popularity in the healthcare and technology sectors, and that this trend is spreading across all academic disciplines. Scholars and professionals in the medical and IT professions often conduct systematic evaluations to stay abreast of developments in their disciplines. New technological standards for usage in a range of different disciplines, including health, are established by Moher et al. [43] and are typically based on these evaluations. Experts in information technology and medicine do not base their decisions on the results of a single research. Some studies are faulty, say Abbas et al. [44], because they employ biassed or insufficient data or because they stir up assumptions that don't hold up. Experts in healthcare and information technology, respectively, must base their work on strong evidence to guide practice and research.

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Recently, IS research into management has made use of a three-stage literature review technique proposed by Webster and Watson [41]. Some articles have taken this approach and used it in their literature evaluations. To begin, the databases and keywords for the main search were chosen by searching through the most current literature reviews. Next, the citations of the chosen papers were investigated using the forward search. Lastly, the references of the chosen articles were investigated using the backward search to raise their total. The articles were sorted in accordance with the material they contained once they were selected present previous literature reviews from 2022 to 2023 to update this literature review with the latest information on AI in healthcare, to examine the history of this subject, and to investigate separate research questions whose answers depend on the results of previous investigations. Also, prior literature reviews summarise the methods scholars have used to conduct literature reviews, drawing attention to the strengths and weaknesses of these approaches.

Using combos of "artificial intelligence," "AI," and "health," searched Scopus, Web of Science, and PubMed. Journal articles and conference proceedings were the sources of the papers sought the process. None of these historical eras was given preferential treatment in the selection process. Technical reports, working papers, books, and chapters within were not exempt. Computer Science and Business Management and Accounting were the respective categories for the papers.

A grand number of 30,070 items were retrieved by employing keywords across all databases. The quantity of articles published in 1041 decreased due to linguistic constraints and the abundance of publishing platforms. Looking at the names of the articles, found that 497 were relevant to this paper's objective. Following this, reviewed the abstracts of all 389 submissions and approved 389. Checked the abstracts and titles to determine if they made good use of the keywords. After then, checked the remaining articles' content to make sure they were related to our study objectives and only included those that were "fit for purpose" in answering them. Since the full texts of several of the papers were not available, they were not included in the evaluation. The conference proceedings included these works, but full versions of the articles were unavailable. A preliminary examination was conducted on them in order to verify it. The results of the following evaluation proved that they should all be there. Each study contributed significantly to the overall purpose of the paper, and the co-authors discussed this. Because of this, the full texts of 221 articles were reviewed. have removed the duplicate articles and included 116 of the original publications. Six more articles have been added to the

"backward search" category for these articles. Along with that, 10 more publications were found using a "forward search," increasing the overall count of papers examined to 132 (Figure 1). The final list was reviewed and approved by all of the writers who had a hand in writing the paper.

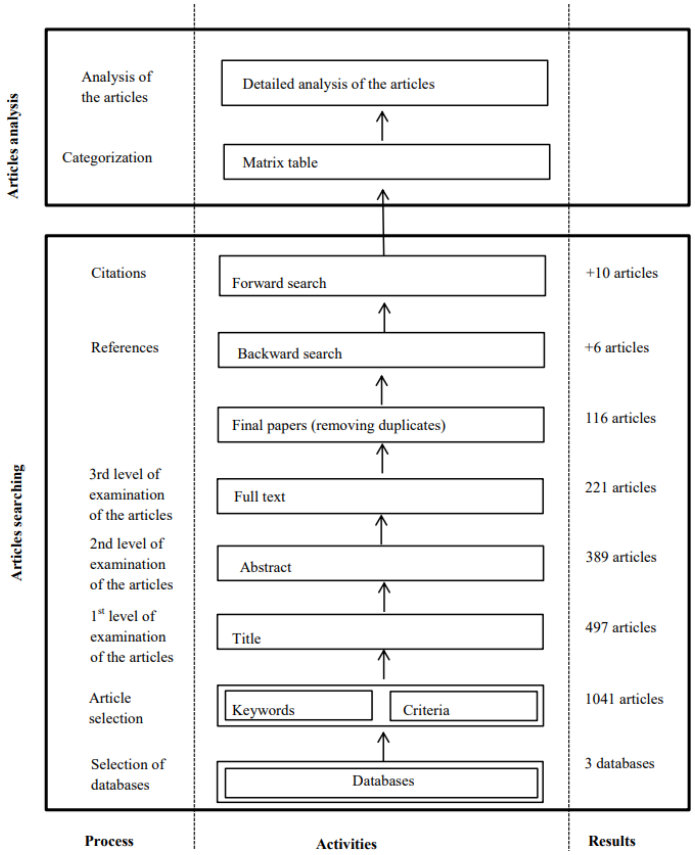


**Figure 1.** Article selection process

An study of 130 separate publications was carried out using a classification system. To help future researchers and scholars better understand AI in healthcare, have evaluated these articles along four main dimensions: healthcare activities using AI, benefits and drawbacks for the healthcare sector, ethical concerns about AI, and social sustainability and AI. Clusters that arose from the heat map after focussing on the core concepts are shown in Figures 2-4, which were created with the aid of the VosViewer program.

## *HEALTHCARE ACTIVITIES USING AI*

There are several ways in which healthcare facilities, individuals receiving treatment, and the sector as a whole may benefit from artificial intelligence (AI) technology. Making judgements [10,50,51], collecting current

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information [20,52], and sharing information [53-56] are all made possible by the use of technology in clinics.

By providing a tool for academics and medical professionals to uncover hidden information in the massive amounts of data accessible, machine learning also aids in decision making. If rely on human effort alone to uncover this information, it will be unavailable. Decisions may be improved in this way as well, thanks to machine learning. There has been a plethora of literature on the topic of healthcare decision-making with machine learning [10–13,19,57–63].

All healthcare operations revolve around the patient. Appointment scheduling and patient monitoring are only two of many other uses for artificial intelligence. Patients' diagnoses [14,50,51,64,65], treatments [10,66-68], consultations [15,19,51], and overall health can all benefit from the use of AI and related technologies.

observation [27,69,70].

Many people nevertheless need constant monitoring, even when they are in generally good health. Individuals falling within this age bracket may be in good health or severely disabled, or they may be elderly people who need round-the-clock care due to health issues or just the passage of time. Although it may be difficult, the patient's safety and well-being need the substantial investment of time, energy, and money required to carry out this type of health monitoring in accordance with conventional methods. A novel strategy for dealing with the issue is the implementation of remote patient monitoring. Oversight of remote patient monitoring is an emerging field in healthcare that focusses on health and sickness with the goal of treating or diagnosing illness using IT [71]. There are several advantages to remote patient monitoring for both patients and institutions. Plus, with the COVID-19 pandemic, telemedicine networks are becoming more and more importance.

Artificial intelligence reduces hospital loads, resource consumption, hospital occupancy, and unnecessary medical intervention by reducing the frequency of false alerts and alleviating practitioners' workloads. By allowing practitioners more time to concentrate on higher-priority tasks, this is achieved. Having remote patient monitoring also has several advantages for patients, especially those who are elderly. One benefit is that it cuts down on unnecessary trips to the hospital, saving them time, energy, and money. The second important reason is that it helps ensure the patient's safety by alerting medical professionals when the patient's condition calls for urgent care. This

strategy improves dramatically in cases where the patient is very ill and unable to communicate for help. Health monitoring systems integrating various biological information recovery devices and machine learning have been the subject of much research and development [27,72–74]. As an example, in order to handle the ever-growing number of patients, Khan et al. [72] propose using AI in healthcare procedures. Integrating AI into healthcare settings allows for better management of the constant influx of biological data, they claim. In order to assess a person's overall cardiac health regardless of their location or time of day, the authors provide a prototype that can collect real-time biological data. To process the acquired data, the prototype used an algorithm that combined several machine-learning techniques. Using ensemble techniques, these approaches get their results. The authors claim that the approach was effective in eliminating mundane and unnecessary chores, which allowed for more time to be spent on more beneficial therapeutic activities and resulted in less effort and money being squandered.

There has been a lot of study into artificial intelligence and the internet of things with the hope of improving healthcare. The second piece of equipment is important for connecting internet and sensor network infrastructure, which together supply a wealth of data that can be analysed using AI models [27,73-79].

An accurate diagnosis is the starting point for effective treatment. Regardless, many illnesses, especially those in their early stages of development, can make this a challenging task. Despite this, early identification might change the game for many diseases because it saves so much time and money for everyone involved (patients, physicians, and hospitals). Many studies have looked at the possibility of AI in early diagnosis [35,73,80-83]. The success rate of cancer therapy and overall recovery time is greatly affected by how quickly the disease is detected. By increasing the proportion of curable cases, early cancer identification greatly improves patients' chances of surviving the disease and responding well to treatment. It can be significantly more useful for detecting cancer at an early stage, before it has spread.

To ascertain a woman's susceptibility to breast cancer, Gayathri et al. [80] put out a model that employs fuzzy logic. This model aims to reduce diagnostic time by using linear discriminant analysis (LDA) as a feature reduction approach. Katarya and Srinivas [81] used the preexisting Cleveland database to do a research comparing many AI systems. Decision trees and naive Bayes were determined to be the most effective models after extensive investigation. The authors propose using search methods for feature selection to achieve a

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high degree of accuracy. In order to resolve the current semantic challenges encountered by healthcare professionals, [84] explore possible machine learning-based solutions.

## BENEFITS AND CONS FOR THE MEDICAL FIELD

With all the pros and cons of the healthcare industry out of the way, AI does offer many benefits to people. These include simplified processes [19,37,62], early diagnosis [11,50,51,70,86,87], health surveillance [13,53,69,72,85], and streamlined decision making [10-12,19,61].

Individuals mostly face obstacles stemming from their collected medical data, which is often inconsistent, convoluted, and non-standardized. On top of that, you can usually get them in a variety of formats and in large quantities. When it comes to analysing massive data like this, AI has shown to be incredibly effective at coming up with unique recommendations that medical practitioners may use to help patients with their care, diagnosis, and treatment options. Artificial intelligence (AI) can be highly useful in analysing this kind of massive data, even if it poses a huge challenge for health practitioners. It usually takes a lot of energy and time to make decisions about diagnosis and treatment. Because of its ability to draw its own conclusions with minimal human intervention, AI offers a realistic solution to this challenge. Being able to overcome this difficulty is made much easier using this instrument. Some research suggest that AI can even outperform humans in some medical domains, like radiology, cardiology, and tumour detection [24].

In their discussion of chronic disorders, [19] provide an example. According to them, the medical industry is facing significant strain due to the high costs and effort required to treat chronic disorders. This is because people dealing with long-term health conditions have to keep in touch with their doctors often because their therapy is ongoing. It is a waste of time and resources because some of these trips are totally unnecessary. The authors state that they have come up with a plan that integrates health coaching with AI to help patients better manage their chronic conditions and cut down on unnecessary doctor's appointments. Visual analytics tools can display pertinent data in graphical and textual formats, sensors can collect biometric data, and artificial intelligence models can create insights about health issues. This system is highly similar to the one proposed by [84].

Businesses utilise AI apps and IT technologies to help with workflow [14,37,53,90], save money [19,20,24,88], detect fraud [17,89], boost performance [10,27,51], and more. The difficulty of automatically extracting

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knowledge using medical IS is emphasised, for instance, by Murray et al. [84]. This problem mostly arises because these systems do not have a sufficient degree of data standardisation and integration. The authors suggest an artificial intelligence–driven synthetic network as a solution to these problems. This is done on top of the physicians' initial notes to make sure all the data is standard and integrated from different sources. There are essentially three main phases to running this network. Data normalisation is the first step in applying the transformation rules. Following data transformation with validated ontologies, the resulting sets are merged. Finally, it extracts actionable insights from the aggregated data by use of a data analytics model. To lessen resource usage, AI has been suggested as a remedy for comparable problems in healthcare [19,20,24,88].

When faced with similar problems, some research have turned to AI for help. The healthcare business can also benefit from AI's ability to detect false claims. The prevalence of health insurance fraud presents a formidable challenge to the insurance sector. It is becoming more difficult to detect fraudulent behaviour as the data volume continues to expand at an exponential rate. Many researchers [17,89] have focused on finding ways to prevent health insurance fraud. [89] provide a hybrid technique that combines clustering and classification in their 2015 work to identify duplicate insurance claims. In order to detect duplicate claims, the authors note that clustering techniques and classification algorithms are insufficient on their own. A two-stage model is proposed by the authors to address this issue.

There has to be claim clustering done, and the developing clustering method should be used for that. The second stage, which employs the classification step and is based on the support vector machine algorithm, takes the first step's result as input.

A health insurance system that utilises extreme gradient acceleration (XGBoost) is laid out by [17]. Lessening the need for human engagement, securing insurance operations, identifying dangerous customers, reducing income losses for the insurance sector, and alerting and notifying them are all goals of this framework. Results from an analysis of a vehicle insurance dataset using the XGboost algorithm shown significant performance improvements over other popular learning algorithms. Companies that have used AI systems have reaped several benefits from the latest AI developments, and these are only a handful of the many instances.

By extending the application of AI technology to this crucial area, the healthcare industry stands to gain a great deal. As a result, less time and

money are spent on therapy and less resources are consumed overall [10]. It also speeds up the decision-making process by decreasing the time required to make a diagnosis. This changes the game when it comes to treatment plans and results, and in the worst case scenario, it might save lives. Data interchange in healthcare, when done by different healthcare providers at different hospitals, is a crucial part of people's health. Beyond this, it is critical for the advancement of research in the scientific community. Paranjape et al. [7] propose a methodology that incorporates AI into the training program for medical professionals and advocate for the use of AI in education. In the healthcare sector, AI may have far-reaching positive effects.

A large quantity of data is needed to process certain AI algorithms. Collecting data, especially patient data, can be difficult at times due to the ethical considerations involved. Results from applying certain clustering and classification approaches to a little sample of data may be quite precise; nevertheless, this approach might not be applicable or helpful in the real world [60,64,84]. Data must be preprocessed before AI technologies may function properly. For text data in particular, considerable natural language processing is required prior to usage. Integrating many data types with a single algorithm might be a real challenge when processing medical records [60,64,84]. For this and other reasons, a wide variety of algorithms is available. Medical imaging, still images, quantitative data, and 3D video sequences are just a few examples of the many sources and formats from which data may be collected for use in medicine. Accurate, trustworthy, and effective data gathering is one of several issues associated with healthcare data analysis.

Improving the diagnostic process is where most AI applications in healthcare are concentrated. There can be devastating repercussions if computerised diagnosis is inaccurate. Data obtained from healthcare facilities is not always accurate or of sufficient quality. Evidence from studies that data errors provide a major challenge when it comes to AI processing of medical details. Also, machine learning algorithms aren't perfect, and they can make mistakes sometimes. A number of research have uncovered potential health-related decision-making obstacles and their potential solutions. At now, healthcare is one industry that heavily utilises AI, IoT, and gadgets. Having said that, not every one of them is mechanised. It is possible for medical practitioners and AI frameworks to interact in a way that leads to incorrect diagnoses and treatment results, but ultimately, doctors make the call.

## PROBLEMS WITH AI ETHICS

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The use of artificial intelligence (AI) in medical research has been the subject of heated debate in recent years [11,12]. A variety of moral principles have been identified as promising avenues for the advancement of artificial intelligence systems. Nevertheless, a considerable amount of current AI-driven research disregards the essential practical, regulatory, and ethical considerations for extensive use [13]. The lack of a unified framework to regulate AI is the reason for this [56]. The intricacy of AI ethical challenges has led to several revisions of AI ethical frameworks, yet these frameworks still fail to provide much direction on how policies might best promote the ethical use of AI. This remains valid notwithstanding the fact that models for AI ethics have been extensively revised to address the intricacy of these issues [17].

There are valid reasons to be concerned about the patient's right to privacy if their data is accessed, altered, distributed, or used. Artificial intelligence (AI) and cloud computing are finding more and more uses in the healthcare industry. Data gathering, processing, storage, monitoring, and collaboration are all handled by these systems [86]. These systems have many advantages, but they also come with a lot of problems, such as ethical and security issues, potential privacy invasion, and cybersecurity risks. Ethical guidelines for data gathering and distribution are often provided by healthcare facilities and government agencies. Data collection and use still require approval from a government-approved body, even when done for academic objectives [67]. Many other ethical concerns have been voiced with regard to artificial intelligence (AI) in healthcare and other sectors, including issues of inequality, unemployment, humanity, cause dedication, regulatory approaches, behavioural biases, demographic biases, and linking biases [21]. Researchers are working to address the ethical issues that have been highlighted by AI applications in medicine by studying how to prevent undesirable side effects, reward hacking, unsafe exploration, and robustness [24]. Officials in charge of healthcare have voiced worries about how these computerised procedures may affect patients' rights. In response to these concerns, several rules have been enacted governing data collection, processing, and use, as well as the standards for data quality and analytic procedures [62].

Both [23] and [44] argue that a virtue ethics viewpoint can help advance ethical AI. As opposed to focussing on whether an action is suitable or what the consequences of that behaviour would be, the virtue ethics theory asks, "What would a virtuous person do in this particular setting?". Managers can benefit from virtue ethics by making more moral judgements on management methods. Companies may also "direct a firm in its day-to-day activities and

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operations," "increase the risks associated with using a service," and "increase a firm's reputation and moral standing in the society in which it operates" by implementing virtue ethics. This concept may be expanded to encompass healthcare practitioners who are utilising artificial intelligence. So, to build a responsible AI project framework in healthcare, virtue ethics provides a good theoretical foundation. The reason for this is that prior studies have shown that agents whose character traits are noble, including honesty and fairness, tend to conduct in a more commendable manner.

As of yet, healthcare providers have a limited understanding of the ethical challenges that new AI systems may pose when applied to patient care. As of right now, it is not apparent what kind of artificial intelligence ethics training should be required of students aspiring to careers in medicine [35]. The three primary ethical concerns that AI brings to light for society are privacy and surveillance, prejudice and discrimination, and the role of human judgement, which is arguably the most complex and difficult philosophical problem now facing the world are all aware that there have been conversations about the need to safeguard personal information and find solutions to the problem of bias in algorithmic decision-making processes related to parole, employment, and punishment. In order to determine the appropriate level of regulation and the proper position for large tech and social media in our organisations need to think about the moral consequences of their actions thoroughly. As members of a democratic society, also have a responsibility to learn as much as can about the ethical and social effects of new technologies.

## PROMOTING SOCIAL SUSTAINABILITY USING AI

Academics and industry professionals alike have taken an increasing interest in artificial intelligence (AI) as it pertains to sustainability in the past few years. When using AI, it is important to think about the bigger picture and how it will impact people and the environment. Healthcare institutions must responsibly deploy AI in a way that addresses stakeholder concerns, minimises ethical issues, and produces sustainable revenue. The legitimacy and image of a healthcare organisation might take a serious hit if its artificial intelligence algorithms endanger human rights and wellness, whether that's deliberate or not. As an example, there is a need to address the problem of unethical usage of AI, such as replacing traditional health services with smart technology [7]. This could exacerbate preexisting health inequities, say Abramoff et al. [138]. Using AI to develop solutions that help healthcare organisations remain financially and socially viable should be a top priority. In particular, they should integrate AI ethics into their social responsibility

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strategy, formulate ethical governance policies that account for socially undesirable behaviour, and deal with ethical issues both during and after the design and implementation of AI systems [19].

## AI FOR HEALTHCARE ADMINISTRATION

In order to improve the efficiency of medical resources and the standard of treatment offered, healthcare facilities have lately made extensive use of AI-supported technology. Machine learning, natural language processing, and intelligent robots are a few examples of the AI-based technologies that provide great promise for innovation in the knowledge-intensive healthcare industry [10,14]. Researchers, medics, tech and program developers, and consumers from all walks of life are interested in AI because of the dramatic changes it might bring to public health and the treatment of human ailments [42].

Providing patients with services that are individual, proactive, predictive, and interactive should be the top priority for every healthcare provider. E-health, or the integration of artificial intelligence with healthcare, may be characterised as AI's potential to greatly improve this field [14]. Electronic health has changed the conventional wisdom of healthcare in many ways, including patient tracking, medical diagnosis, treatment, and follow-up. Investigations must be carried out accurately, and healthcare workers are expected to meet high standards. Accurate data extraction from the massive amounts of available data is a tedious process, but technology helps overcome all obstacles. Artificial intelligence (AI) enables e-health systems to surpass traditional systems in several key areas, including patient data management, sophisticated and rapid diagnosis, illness investigation, suggested therapy, and improved outcomes. Consequently, the overall efficiency of the healthcare system is enhanced by reducing medical errors [54].

There is no denying that artificial intelligence has revolutionised the healthcare industry. It has changed the revolution in treatment procedures since it improves patient results. By enhancing accuracy and speeding up decision making, complex operations may be efficiently automated. Artificial intelligence (AI) allows for faster data extraction, optimisation of time requirements, faster solutions, elimination of redundancy, and, most importantly, improved performance when dealing with massive data sets. Artificial intelligence (AI) does patient complications, analyses, and document measurements in defined formats; it also helps electronic health records with voice-based enquiries. By using this approach, the process of retrieving specific patient data becomes more easier. On top of that, it can make narration into a work that can be finished right away [48].

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## APPLYING AI AND ML TO THE DIAGNOSIS OF DISEASE

A wide range of health-related fields rely heavily on AI techniques, including deep learning and machine learning, for tasks such as managing patient data, treating diseases, and creating new healthcare systems [15]. Additionally, AI techniques can greatly improve the accuracy of illness diagnoses. The application of AI in healthcare has opened up new possibilities for recovering patient and clinical group results while reducing expenditures, which is unprecedented [14].

Everyone knows that "early diagnosis saves lives" and that health is paramount. Disease diagnosis is the process of identifying something based on pre-existing classification, which allows a clinician to pinpoint a specific illness [44]. The process is organised and centred around the patient, on the whole. The presence of specific symptoms necessitates a visit to a medical facility, such as a clinic or hospital. During the initial appointment, the doctor will take a thorough medical history and, if needed, do a physical exam. Based on the collection, integration, and interpretation of all relevant information, a disease diagnosis is determined and a suitable course of therapy is indicated. Even if patients have achieved their goals, they still need to make hospital visits for monitoring and any necessary course corrections throughout treatment. All of this particular data will be utilised for an additional patient in the event that it is required [94].

Artificial intelligence (AI) has revolutionised our lives in every way imaginable. Due to the ever-increasing volume of data pertaining to healthcare, researchers have attempted to employ AI to aid in the early detection of diseases, with mixed results. Artificial intelligence (AI) programs have been developed and trained using data sets. These sets contain information about patients' diagnoses and treatments in the past as well as their current symptoms, medical history, lab results, and scan results. When these programs or algorithms are run, they help with decision making and can even predict exact disease-related information based on unobserved data. For example, a diagnosis is necessary for breast cancer, liver cancer, cervical cancer, kidney-related issues, hepatitis, dermatological, cataract, heart-related, pancreatic illnesses, etc. [46].

Machine learning is an umbrella term for a set of practices that draw on concepts from several fields, such as statistics, genetic algorithms, pattern recognition, computational learning theory, and artificial neural networks. Closest neighbour and example-based learning, discriminant analysis, Bayesian classifiers, and many more fall under this umbrella of approaches

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because of the variety of manipulations that occur throughout the learning process. There are two or three problems with learning from patient data: first, the datasets aren't complete (missing parameter values), second, there are systematic or unexpected movements in the data, third, there aren't enough representative patient records available, and finally, the datasets aren't accurately selected (inadequate parameter selection) [47].

General practitioners will have greater authority as a result of machine learning's capacity to speed up decision-making in the healthcare facility, improve illness diagnosis, and organise and categorise health information. The healthcare system records massive volumes of data on each patient, and people find it difficult and time-consuming to go through all this data. The use of machine learning methods allows managers to generate data interpretations and decision support models. They allow doctors and nurses a better way to analyse data and diagnose illnesses with more accuracy [17]. Given the potential for AI to augment or replace human doctors in diagnostic, therapeutic, and surgical procedures, some may argue that doctors may soon be irrelevant. It is essential to assess the potential of AI before delving into the challenges and opportunities of AI applications in healthcare. Evidence from a wide variety of real-world AI applications shows that AI's potential uses are vast and varied, spanning from the most basic forms of operational process improvement to the most advanced treatment plans for difficult emergency patients [40].

## REMOTE PATIENT MONITORING USING AI AND ML

As a result of technological advancements, numerous industries are seeing rapid expansion at the present time. An example of a scientific technique that significantly affects healthcare computer programs. Remote patient monitoring is one area of e-health that has grown substantially in recent years [18]. One very successful method for controlling common to chronic diseases is remote patient monitoring driven by AI. The primary requirement for remote patient monitoring is the collection and transmission of data to healthcare providers through an interconnected device. Consequently, the conventional approach to patient care is being replaced by remote patient monitoring, which the vast majority of healthcare facilities have already adopted. Even with high-risk patients, it is possible to readily follow difficulties, diagnoses, health improvements, and other patient data, and patients have shown faith in this system [44].

The specific steps involved in remote patient monitoring could change based on the technology utilised to collect the required patient data. For remote

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patient monitoring, most wireless sensors collect data that is subsequently sent to computers in the cloud. Clinical decision making is provided to healthcare practitioners through the application of AI algorithms in the analysis. The doctor and patient may consult with one another face-to-face, via notification, or with other experts when making a challenging diagnosis. now are a number of new tools out now with nice user interfaces that let you see what medicines are available, keep tabs on your health information, get treatment recommendations from doctors and hospitals, and get alerts when anything important happens [14].

Without a doubt, the application of AI to medical diagnosis and treatment will gain widespread recognition and acceptance in the next years. Among the main reasons for its remarkable ability for wide adaption is the utilisation of diverse AI approaches, including structured and unstructured data, for the different types of data. This quality greatly broadens the disease's potential detection range. It is considerably easier and cheaper to start treatment when a condition is identified fast. There has been a meteoric rise in the amount of healthcare data. With the help of the AI-based system, a large amount of medical data may be better understood, which is crucial for clinical processes. These algorithms can also improve their performance and accuracy with the help of feedback because of their built-in self-correcting capabilities. In addition to improving patient care, the AI-based system may assist physicians by compiling the most recent medical information from a variety of sources (e.g., journals, textbooks, clinical practices, etc.). With the use of AI, can now predict human genomes and prescribe appropriate medicines, enabling patients to get utterly personalised care. As they grow, different functions are integrated with human intelligence through learning, reasoning, and problem-solving abilities; this enhances the efficacy and capabilities of medical professionals. One can use a wide variety of methodologies, such as rule-based structures, case-based deduction, ambiguous models, computational neural networks, cellular automated processes, genetic algorithms, swarm cognitive ability, multi-agent systems, hybrid systems, reinforcement learning, and many more [49].

The field of molecular diagnosis relies on nucleic acid testing due to its high specificity and sensitivity; this technique is especially useful for the diagnosis of infectious diseases, neoplastic diseases, cancer biomarkers, genetic mutations, genotyping, and environmental monitoring and food safety control. When it comes to molecular diagnostics, nucleic acid testing is known for its great specificity and sensitivity. This is especially true when it comes to diagnosing infectious diseases, neoplastic diseases, cancer biomarkers, genetic

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mutations, and genotyping. It also helps with food safety control and environmental monitoring. Compared to other methods like immunological detection and microbial culture, nucleic acid testing offers several significant benefits, such as a short operating time span, high levels of sensitivity, and accuracy. Consequently, medical issues may be identified swiftly using nucleic acid testing, allowing for early treatment. An international epidemic of COVID-19 started in early 2020 and is still going strong today. Despite ongoing efforts to contain it, this virus has the ability to spread far and wide. Nucleic acid testing was crucial in the diagnosis and containment of the COVID-19 pandemic. As this pandemic continues to grow, it is placing any country's ability to diagnose medical conditions; hence, nucleic acid testing technology is now more needed than ever before. Despite the enormous demand, there was insufficient supply of nucleic acid testing throughout the pandemic. Actually, "mix-testing" has been utilised extensively to speed up the diagnostic process. Before testing, many samples are mixed into one; when abnormalities are detected, individual samples are examined using this procedure [50].

The Chinese leader has proposed point-of-care testing for nucleic acid advancements on two separate occasions. It was clear that this specific need might be met by point-of-care diagnostics for nucleic acid analysis. It seems that China was especially slow to respond to major illnesses because of the prohibitive cost of this technology and the fact that nucleic acid testing equipment in China was previously mostly imported. Research into the development of portable, low-cost, extremely sensitive nucleic acid testing equipment is becoming increasing importance in developing countries like China. In the past, several companies have been successful in developing point-of-care testing instruments that may be utilised to detect certain viruses with corresponding kits. Formerly listed on global stock markets, polymerase chain reaction amplification devices like GeneXpert, Filmarray, and Cobas Liat were fast and automated, but they were too costly and not generally used in China. This pandemic has prompted the creation and promotion of domestic point-of-care nucleic acid testing devices like EasyNAT, Galaxy Nano, boxarray, GenPlex, iPonatic, and AutoSAT [50], in response to the dearth of such devices in China, which played a significant role in the epidemic.

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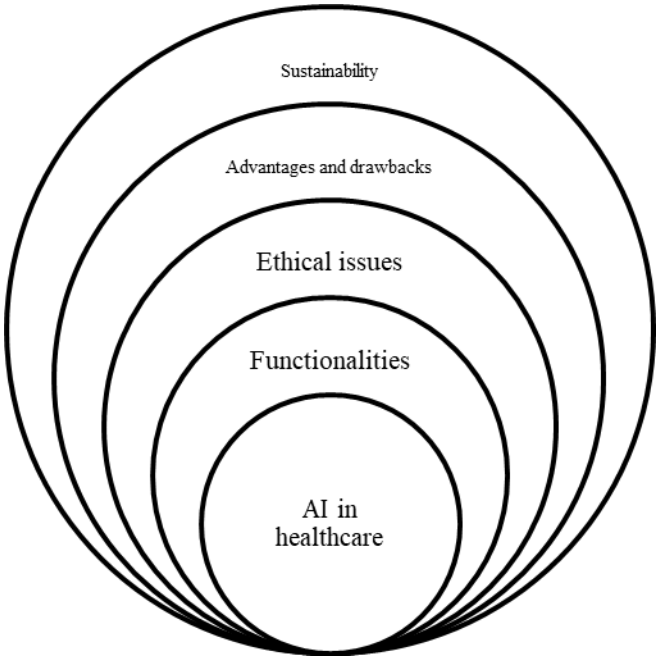


**Figure 2.** Theoretical framework

## CONCLUSIONS

According to the results of this study, AI and its subfields provide benefits for people, businesses, and the healthcare industry. Problems include keeping patients safe, integrating the data, addressing legal concerns, and preserving patients' privacy. The research presented in this paper suggests that AI has the potential to carry out a wide range of tasks, such as diagnosis, treatment, information sharing, security, consultation, monitoring, data collection, and even remote surgery. The current status of artificial intelligence research and its practical applications in healthcare are discussed in this paper. In more than one manner, the results of this study are limited. To start, there was a scarcity of accessible AI operations. Since the inner workings of AI are often considered private, it is standard practice for research articles to leave these details out. The second issue is that not all publications discussing AI in healthcare were included in the research, even though used a comprehensive search method. In order to gain a more complex understanding of the pros, disadvantages, and long-term viability of AI in healthcare, researchers should think about searching for and analysing papers from different languages or countries in the future.

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