International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2025.0180
e ISSN: 2584-2854
Volume: 03
Issue:04 April 2025
Page No: 1100-1111

AI in Healthcare

Dr. Uma Devi A[1], Naveen Raj K[2], Mugilan M[3], Supriya Latha Ananthan[4], Neha S N[5], Sutharsan T[6]
[1]Assistant Professor, Department of Chemistry, St. Joseph's College of Engineering, Chennai, India.
[2,3,4,5,6]Artificial Intelligence and Machine Learning, UG, St. Joseph's College of Engineering, Chennai, India.
Email ID: *umadevia@stjosephs.ac.in[1], 24am133@stjosephs.ac.in[2], 24am807@stjosephs.ac.in[3], 24am135@stjosephs.ac.in[4], 24am801@stjosephs.ac.in[5], 24am167@stjosephs.ac.in[6]*

Abstract
Artificial Intelligence (AI) is revolutionizing healthcare by enhancing diagnostics, treatment planning, and patient care. This article provides an overview of the use of AI in healthcare by means of Electronic Health Records (EHRs), AI symptom checkers, drug discovery, predictive health analysis, and telemedicine. AI has significantly increased efficiency, reduced medical errors, and offered personalized treatments. But present AI-enabled healthcare systems lack some features such as the lack of physical examination, cybersecurity, poor internet connectivity, and medical miscommunication via telemedicine. The above can be addressed through the implementation of introduction of blockchain-based electronic health records, speech-to-text technology enabled by AI, remote diagnostic kits, and hybrid telemedicine. In addition, AI-enabled robotic surgeries ensure precision with minimal human error and reduced recovery time. The technical roadmap offers an AI-based, scalable healthcare solution that combines cloud computing, edge AI, and blockchain security to make it interoperable without any disruption. With the surmounting of the existing constraints, AI can potentially reshape healthcare accessibility, affordability, and efficiency with improved patient outcomes
Keywords: *AI in Healthcare; Telemedicine; Predictive Health Analytics; Blockchain EHR; AI-assisted Robotic Surgery*

1. Introduction
As we know, that the ai has been developing across the world in many different fields, there is need of implementing the AI in healthcare. This implementation has started from 1960s which was a scientific AI named Dendral at Stanford university in 1965 by three great scientists [2]. Then, the implementation of actual medical ai system was initiated by Edward Shortliffe from Stanford university in early 1970s[3]. From that the implementation of ai in healthcare has drastically improved especially in last decade. Artificial intelligence (AI) is revolutionizing the health sector by enhancing diagnoses, enhancing patient care, and streamlining administrative tasks. AI-powered medical devices, such as machine learning algorithms, natural language processing, and robotic automation, enable healthcare workers to analyze large volumes of data, detect diseases in their initial stages, and develop personalized treatment plans. In Current and upcoming generation Artificial intelligence AI is transforming into a large diverse in integration in the field of healthcare and services. Blending AI technologies into medical field rebuilds care methodology, optimizing diagnostic clarity, customized care, seamless operation. As technology continues to shape our lives, AI in healthcare provides the users with tech enthusiasts that exceed beyond what was once thought possible. In advancement through AI, Machine learning and data analytics are contributing for the improvement of patient outcomes, reduced healthcare expenses and boots patient's wellness. With emerging adults who values convenience, usability and accuracy, AI - driven healthcare is briskly becomes necessity. In reduction to administrative workloads, automating routine tasks and upgrading resource management AI helps healthcare system to function for more productivity ensuring providers can focus on what matters them more i.e., ensuring superiority patient outcomes. As we envision Tomorrow AI's ability to progress medical research, decrease in disparities in care and concerning about individuals' healthcare

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2025.0180
e ISSN: 2584-2854
Volume: 03
Issue:04 April 2025
Page No: 1100-1111

experience is immense. In addition to rise in telemedicine, wearable health devices, and real time data tracking, AI leading edge in E-health digitalization enables Swift and exact treatment analysis provided with genetic data, patient histories, which allows for timely diagnosis related to deadly disease such as cancer, heart disease and diabetes. Meanwhile AI tools has ability to predict patient outcomes, offers individualized therapy making healthcare more proactive and efficient.

2. Why AI in Healthcare?

Over the last decade, the human errors in the medical field have been increasing a lot, like wrong dosages, surgical errors, medical errors, etc. In the last decade, the deaths have been recorded at around 5 million per annum because of medicinal errors, and 5.2 million cases have been registered on medicinal malpractices. The deaths have increased around 80% because of surgical error, and also around 70% of deaths have been recorded because of emergency mismanagement around India. These could have been controlled if AI had been implemented in a correct way.

Table 1. Year Vs INVESTMENT RATIO

Year	Ratio (Billion)
2015	1.2
2018	5
2020	6.9
2022	15.1
2024	27
2025	30

Healthcare needs AI because it can quickly process enormous quantities of medical information far more rapidly than humans, allowing for better diagnoses, individualized treatment strategies, enhanced forecasting of patient outcomes, and efficient clinical processes, ultimately resulting in higher quality care while potentially decreasing costs and enhancing efficiency throughout the healthcare system. Ai speeds up drug discovery, reducing a long process into a short process. The implementation of ai in drug discovery has played an important role in Barcitinib(Benevolent AI) for Covid - 19 and the personalized treatment plans allows a person to easily access personal treatment plans based on their past drug usage or past treatments [7]. In Current and upcoming generation Artificial intelligence AI is transforming into a large diverse in integration in the field of healthcare and services. Blending AI technologies into medical field rebuilds care methodology, optimizing diagnostic clarity, customized care, seamless operation. As technology continues to shape our lives, AI in healthcare provides the users with tech enthusiasts that exceed beyond what was once thought possible. In advancement through AI, Machine learning and data analytics are contributing for the improvement of patient outcomes, reduced healthcare expenses and boots patient's wellness. With emerging adults who values convenience, usability and accuracy, AI - driven healthcare is briskly becomes necessity. In reduction to administrative workloads, automating routine tasks and upgrading resource management AI helps healthcare system to function for more productivity ensuring providers can focus on what matters them more i.e., ensuring superiority patient outcomes. As we envision Tomorrow AI's ability to progress medical research, decrease in disparities in care and concerning about individuals' healthcare experience is immense. In addition to rise in telemedicine, wearable health devices, and real time data tracking, AI leading edge in E-health digitalization enables Swift and exact treatment analysis provided with genetic data, patient histories, which allows for timely diagnosis related to deadly disease such as cancer, heart disease and diabetes. Meanwhile AI tools have ability to predict patient outcomes, offers individualized therapy making healthcare more proactive and efficient Finally, there is a need of ai for low human error, faster and precise diagnosis, reduce cost, drug discovery and personalized treatment plans. These have been implemented already which is covered below.

3. Existing System

It all began with IBM's Watson artificial intelligence system, which was developed to answer questions accurately and quickly. Articles on artificial intelligence in healthcare mention IBM's launch of a healthcare-specific version of Watson in 2011 that

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2025.0180
e ISSN: 2584-2854
Volume: 03
Issue:04 April 2025
Page No: 1100-1111

focused on natural language processing—the technology used to understand and interpret human communication. Today, alongside IBM, other tech giants like Apple, Microsoft and Amazon are increasingly investing in AI technologies for the healthcare sector.[1] AI is revolutionizing healthcare through machine learning, natural language processing, computer vision, and robotics. AI-powered medical imaging (e.g., CNNs for MRI scans), predictive analytics, and robot-assisted surgeries (e.g., Da Vinci System) enhance diagnosis and treatment precision [4]. NLP aids in EHR analysis and AI chatbots (e.g., IBM Watson) assist in consultations. Wearable AI (e.g., Apple Watch) enables real-time health monitoring, while AI-driven drug discovery (e.g., AlphaFold) accelerates new treatments. These technologies improve efficiency, reduce costs, and pave the way for personalized medicine and autonomous AI-driven healthcare [6]. The new proficiency of Artificial intelligence has made real into advancement in hospital settings. AI and Machine Learning are widely used in medical field and health informatics in order to help the providers to improve exactness and for forecasting the potential high-risk conditions. Artificial intelligence AI has reformed the healthcare landscape game changing to analyze vast amounts of informative datas, identifying patterns, and make informed decisions. Existing AI technologies in healthcare includes a range of applications, including data mining for disease diagnosis, medical imaging assessment for effective image quality and irregularity detection, natural processing for clinical note analysis, and robot assisted surgery for improved precision and patient wellness. These AI powered solutions have proven significant ability in improving patient care, streamlining clinical workflows and decreased healthcare costs overlaying the way for a more enhancement in case of health-related system. In consolidation of evolving technologies such as Internet of Things (IoT), Artificial Intelligence (AI), and Blockchain has transformed the healthcare landscape. IoT- assisted wearable sensors enable continuous patient monitoring, while AI powered analytics improve disease diagnosis and treatment. Blockchain technology ensures secure diffused data management. Nevertheless, these advancements which includes lack of cost effectiveness flawless medicational sensors, unstandardized IoT system architectures and concerning about data interoperability and security. Therefore, this illustrates the advantages, restrictions i.e., merits and demerits of enhancing technologies in healthcare management systems (HMS) highlighting the importance for sustainable research in order to address existing challenges. Wearable devices are ruling healthcare by providing remote patient monitoring, early disease detection and live monitoring. They aid people with chronic conditions to be live monitored by the healthcare professionals to effectively take care and also reduce the costs of healthcare facilities. They help in diagnosing disease faster and reduce the risk factors of various health conditions. They give personalized health plans increasing individual's interaction for their improved health. They provide the best treatment by comparing human mind and AI. The real time data collected by them keeps the professional informed of decision making. People who are inaccessible for hospital facilities are benefitted by these devices. It takes care of our mental health by tracking our stress levels and moods, sleep patterns, physical activity and providing insights for healthy lifestyle choices. Though it has good beneficial factors the fear among people in those technologies still prevails because of data breaches, collecting personal information, the accuracy in data for decision making. Consider a doctor's office where high, thick paper files were flipped through by a doctor. Now, the doctor instantly calls up your complete medical history on a screen in front of him. Therein lies the real magic of Electronic Health Records (EHRs)—changing the face of modern health care, making things quicker, safer, and, above all, more efficient. Epic Systems allows doctors to track treatments; they utilize an AI tool to inform about health risk predictions and can offer telemedicine through the MyChart app, where patients can book appointments and check test results from their phones. Oracle Cerner Millennium, trusted by the Vet's Administration, provides tools to analyze health trends and proactively care for patients in a cloud-based manner. Allscripts (Veradigm EHR)

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2025.0180
e ISSN: 2584-2854
Volume: 03
Issue:04 April 2025
Page No: 1100-1111

is ideal for smaller clinics, offering customizable mobile-friendly EHR. MEDITECH is aimed at mid-sized hospitals where everything from patient records to billing gets simplified. Athenahealth handles a cloud-based EHR; thus, with AI-impacted billing, real-time patient updates, and built-in telehealth services, patient care becomes even smoother. These systems ensure seamless and secure data sharing, so wherever you go, your medical history is readily accessible. EHRs not only supercharge a doctor's life but also empower the patients over their own health—thereby involving better, faster, and personalized care. Having been developed over the past decade, robotic surgery quickly gained validation from the medical community as a more accurate, less invasive, and best of all, faster way to recover from surgery. The surgeon, interfacing remotely, navigates the robotic arms featuring instrumentation with greater precision and stability than would ever be possible by hand. The da Vinci system is perhaps one of the most well-known robotic systems of the coming ages, with applications in heart, prostate, and gynecological surgeries; beyond that, systems like MAKO Robotic-Arm Assisted Surgery bring focused applications in orthopedic work, such as knee and hip replacements, allowing doctors even further planning and execution of operations with extreme precision. Neurosurgery is performed with the help of ROSA Robotic System and Excelsius GPS for navigation within brain and spine surgeries and minimizing the risk involved [8]. Finally, the Versius promises to 'stand out' among other systems for minimally invasive laparoscopic surgeries: small and flexible in design, making it affordable for smaller hospitals. In addition to improved surgical outcomes, robotic systems are designed to limit pain, decrease scarring, and shorten the healing time. With continuous development in AI and robotics, the future of surgery is in further automation, increased precision, and access to safer, faster, and better treatments for patients across the globe. Telemedicine allows remote healthcare through video calling, messaging, and AI-assisted consultations, increasing accessibility, convenience, cost-effectiveness, and reducing infection risks. However, it is beset with huge challenges. Physical tests (blood tests, X-rays) are generally not accessible remotely, and therefore complex cases are difficult to assess remotely because of avoided diagnoses and misinterpretation. Poor internet connectivity in rural areas and lack of awareness hinder adoption. Threats of security against the data are due to unauthorized access to electronic health records (EHRs), which leads to privacy concerns. Misinterpretation due to poor audio/video quality or lack of patient data in virtual consultations affects the correct diagnosis. Over reliance for minor conditions may lead to delay in in-person medical person for serious diseases. To overcome these challenges, AI-driven remote diagnostic kits and collecting the samples directly at home to enhance the diagnosis. Blockchain-secured Electronic Health Records ensure tamper-proof and patient-managed data sharing. AI-driven speech-to-text and smart summaries reduce miscommunication during virtual consultations. Last but not least, an AI-driven triage system can route patients such that urgent cases are addressed in person while minor ailments are addressed remotely. A hybrid telemedicine model featuring these solutions has the potential to overcome current limitations and improve healthcare delivery. Nanotechnology is transforming medicine through the delivery of drugs to specific areas, detection of disease at an early stage, regenerative medicine, and intricate surgery at a molecular level. Targeted drug delivery through nanoparticles makes treatment more effective, particularly in the case of cancer treatment, by targeting infected cells directly with less damage to normal tissues, reducing side effects, and increasing drug efficiency. Nano-robots (nanobots), little machines, support precision surgery, drug delivery through the blood supply, and even the displacement of arterial clog, as an alternative out of science fiction for minimally invasive surgery. Nanocoating to prevent infection for implantable devices, wounds dressings, and hospital floors nip bacterial activity in the bud.

3.1. Merits of Existing System

The existing system has paved a path to a new beginning of AI in healthcare in such a way by integrating wearable health devices, telemedicine, robotic surgery, EHR's and Nanotechnology. It has

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2025.0180
e ISSN: 2584-2854
Volume: 03
Issue:04 April 2025
Page No: 1100-1111

been implemented to reduce the medicinal errors, time and cost.

3.1.1.Merits for Wearable Health Devices

- Includes real time health monitoring using wearable technologies by mainly focusing on patient's heart rate, blood pressure, being hydrated.
- Powered by personalized health recommendations based on users specifications for enriching the individuals concerned about their wellness.
- Helps in managing the chronic diseases like diabetes or hypertension by forwarding notification if any emergency medical assistance is required.
- Engagement of interaction with the patient involves active participation and motivated with guidance which in return enhanced with better supremacy health outcome.

3.1.2.Merits of Telemedicine

- It is feasible for people in remote areas and disabled people. Appointments can be scheduled after the convenient time of both patient and Healthcare provider.
- It reduces exposure to infection spreading areas like crowded Healthcare facilities.
- It is cost effective lowering the in- person visits.
- It helps to identify potential issues earlier and intervene before a condition worsens.
- It makes patients feel comfortable discussing sensitive issues and providing personalized treatment plans from the privacy of their own home.

3.1.3.Merits Robotic Surgery System

- Robots are integrated with AI compiled programs which helps in performing surgeries with benefits of high precision, accuracy, faster recovery time for patients.
- It is appended with detailed real time 3D visuals, boosted with problem solving and critical thinking abilities.
- Supplement of dexterity i.e. the robotic arms are skillfulness than human hands which

3.1.4.Merits of EHR's

- It predicts the upcoming health risks just by analyzing the patients' health records taken before the issues burst into critical stage.
- It enhances efficiency in automation of administrative tasks in which it reduces the time spending in billing, data entry and enabling more time for patient's health.
- It mainly focuses on providing better and accurate level of medicine required for the patient and decreases manual error prescriptions.
- It empowers medical breakthroughs in clinical research by revealing disease trends and improve treatment outcomes.

3.1.5.Merits of Nanotechnology

- Enabling aimed drug delivery which is straightly induced into affected tissue or organ and performs lowering in side effects.
- With data quantitative evaluation it analyzes the data from nanodevice by recognizing patterns and predicting patient outcome.
- By prognostication AI create predictive models to forecast disease.
- Featuring nanotechnology and AI expands health access reducing healthcare cost by identifying the prior detection and minimized hospitalization.
- Embedding nano sensors with patient can monitor continuously and indicates quick responses in case of emergency.
- Implanting nanotech allows regenerative of self-healing and prompting longevity.

3.2. Demerits of Existing System

Though the existing system has many advantages but it has many major demerits which are as follows:

3.2.1.Demerits of Wearable Health Devices

- They collect significant datas like heart rate, pulse rate, activity levels and location data. there is a risk of the personal health information been monitored and shared by third party.
- Overdependence on data causes only overloading of data but don't diagnose or give personalized treatments with accuracy of 100%.
- They are not beneficial for all as not all health

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2025.0180
e ISSN: 2584-2854
Volume: 03
Issue:04 April 2025
Page No: 1100-1111

conditions are same, they lead to medical errors, they are expensive not affordable by all.

- Awareness and trust on such devices are not achieved completely. People suffer with wearables disconformable as it causes skin irritation for some individuals.

3.2.2. Demerits of Telemedicine

- It fails in conducting physical test like blood test, x-ray leading to missed diagnosis.
- Patients suffer internet accessibility, awareness and trust on telemedicine.
- It lies on risk on breaching data and unauthorized access to sensitive patient information.
- Video calls are not much effective may increase misunderstanding between patients and doctors.
- Overuse of telemedicine for minor ailments and delaying in person visits for issues complex diagnosis that needs physical exams

3.2.3. Demerits of Robotic Surgery System

- The surgery is performed by a machine with complete dependence on data not by human monitoring, during emergencies or complications no alternative help is done by the robots.
- Any malfunctioning or failure leads to major mis happenings.
- Patient- doctor trust is completely absent. It lacks live monitoring and communication.
- It is very much cost effective due to which it has limited accessibility. a sensitive care of initial setup, correct data source, maintenance.

3.2.4. Demerits of EHR's

- It is expensive on purchasing software, maintenance, skilled labor force and live monitoring.
- Privacy concerns play effectively, it increases cyberattacks and privacy violations due to unauthorized access, data breaches.
- It needs skilled and experienced labors to reduce technical problems, data overload which is resulted by improper management, to use the interfaces or clunky workshops effectively.
- Training for staffs to transforming paper-based records to EHR's.
- Wrong entry or mis management of patient data leads to critical issues like misdiagnosis lead to death.

3.2.5. Demerits of Nanotechnology

- Developing and manufacturing of nanotechnology-based drugs, medical devices is expensive. it relies on safety concerns as the injection of a small nanoparticle accumulate in lungs kidney liver could cause harmful effects overtime.
- The targeting of nanoparticles is difficult as mis delivery provides unintended side effects, the fear of nanobots persists because of lack of awareness.
- The risk of abuse in the market is too high and there are many medical trails in gene therapy etc. (Figure 1)

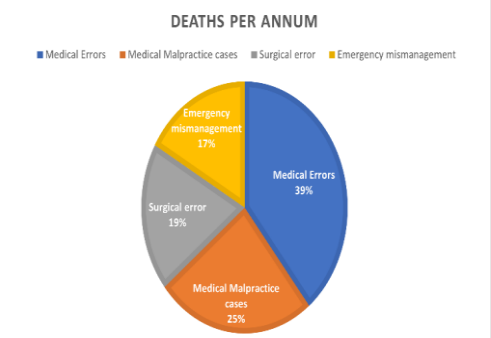

Figure 1 Error in Healthcare

4. Proposed System

To overcome the demerits of the existing system, reduce the mortality rate and medicinal errors. This can be done by Application (APP) and implementation of human-assisted robots for performing surgeries and with use of core technologies like: Machine Learning - Enables systems to learn from data and improve performance over time, used for tasks like diagnosis, prediction and treatment optimization[10]. Natural Language Processing (NLP)- Allows computers to understand and process human language, used in areas like medical transcription and chatbot development Deep Learning - A type of machine learning that uses

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2025.0180
e ISSN: 2584-2854
Volume: 03
Issue:04 April 2025
Page No: 1100-1111

artificial neutral networks to analyze complex data, used in medical imaging and drug discovery. Both radiomics and deep learning are most commonly found in oncology-oriented image analysis. Their combination appears to promise greater accuracy in diagnosis than the previous generation of automated tools for image analysis, known as computer-aided detection or CAD. It also seems increasingly clear that AI systems will not replace human clinicians on a large scale, but rather will augment their efforts to care for patients. Over time, human clinicians may move toward tasks and job designs that draw on uniquely human skills like empathy, persuasion and big-picture integration. Perhaps the only healthcare providers who will lose their jobs over time may be those who refuse to work alongside artificial intelligence.

5. Application

Application integrates the core features like EHRs Symptom checker drug discovery and predictive health analysis and telemedicine and platform remote diagnostics and home testing. Technical roadmap and architecture for the application

Core features and AI components:

- **EHR** - It is Blockchain based such that tamper proof and can be controlled only by patients [5].
- **AI symptom checker** - It integrates NLP powered chat box for early diagnosis
- **Drug discovery and predictive analysis** - It contains AI models for disease prediction and drug effectiveness
- **Telemedicine platform** - It is AI powered speech to text easy for communication and it provides smart consultation summaries and should contain low bandwidth mode
- **Remote diagnostics and home testing** - It is an AI driven analysis of medical imaging where diagnostic kits connected with IOT.

6. System architecture

It includes frontend component, backend components, security and complaints deployment and scalability and AI components.

6.1. Frontend UI UX Component

- It contains patient app, doctor dashboard and admin portal.
- Patient app - It is built using react native / flutter. It features AI symptom checker EHR telemedicine.
- Doctor dashboard - It is built with react / Vue.js it provides AI driven health insights, speech to text and risk assessment
- Admin portal - It is completely web based unlike doctor's dashboard and patient's app which allows hospital management security controls and performance tracking.

Table 2 Demerits of Existing System and Solutions

Demerits	Solutions
Lack of Physical Test	AI integrated remote diagnostics
Limited Internet accessibility	Low band width mode
Risk of Data breaches and unauthorized access	Blockchain powered security
Miscommunication	AI powered speech to text
Over use of Telemedicine	AI driven prioritization and hybrid telemedicine model

6.2. Backend AI Components

- It includes microservices architecture, AI engine, database and storage.
- Microservices architecture - It is an API driven structure with Node.js, FastAPI(Python) for AI integration
- AI Engine - TensorFlow(google), Pytorch(meta), OpenAI (AI research organization) for symptom checking predictive analysis and speech processing
- Database and storage - Blockchain based storages like Postgresql, Mongodb and IPFS are used for decentralized EHR management.

6.3. Security and Compliance [9]

- High security can be implemented through block chain EHR storage, multifactor authentication and role-based access control

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2025.0180
e ISSN: 2584-2854
Volume: 03
Issue:04 April 2025
Page No: 1100-1111

the services meet legal requirements with FHIR and HL7 standard compliance.

- Blockchain EHR storage - Use of already existing Ethereum or Hyperledger Blockchain security for tamper proof, patient-controlled health records[5].
- FHIR and HL7 standard compliance - These standards ensure interoperability allowing health care applications, hospitals and telemedicine platforms to communicate seamlessly.
- Multifactor authentication and role-based access control - It helps in preventing authorized access that is provides different access for different roles like patient, doctor, hospital management.

6.4. Deployment and Scalability

- For deploying it in wide areas use of cloud deployment services, Kubernetes and edge computing.
- Cloud deployment - for higher availability it is hosted on AWS/GCP/Azure
- Kubernetes for auto scaling - it is load balancing and optimize performance
- Edge computing for remote areas - ai model interference on Mobile devices to reduce reliance on cloud connectivity. (Figure 2)

Figure 2 Next Steps and Implementation Timeline

This roadmap ensures a scalable, AI-powered, and patient-friendly healthcare solution with enhanced security, accessibility, and real-time AI insights. Here are the advantages and disadvantages of the health app driven by AI:

6.4.1. Merits

- **Ease in Access to Medical Care:** Medical facilities are accessed at home by the patients, thereby saving time and energy otherwise wasted on travel.
- **AI Symptom Checker:** It has pre-installed AI symptom checker which provides immediate answers and likely diagnoses to the patients.
- **Telemedicine Integration**: Access to health through the convenience of health video consultations, particularly for rural populations.
- **Predictive Health Analysis:** The AI predicts potential health risks from patient history in an attempt to provide preventive medication.
- **Remote Diagnostics:** Remote diagnostics such as home diagnosis kits and medical image diagnosis by AI fall under the app.
- **Improved Efficiency:** Physicians can quickly browse through EHRs, diagnose, and treat a patient with improved overall healthcare efficiency.
- **Security through Blockchain:** The patient information is stored safely with the help of blockchain to make it tamper-proof and transparent for observation [5].
- Personalized Health Insights: AI offers personalized insights to the patient data to make the treatments.
- **Emergency Notification:** AI will recognize health risk and initiate emergency notification, prioritizing emergency situations.

6.4.2. Demerits

- **No Conducting Physical Examination:** The program will not be able to perform a physical examination like X-ray or blood test and therefore the likely diagnosis won't be covered.
- **Technological Interdependence:** The

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2025.0180
e ISSN: 2584-2854
Volume: 03
Issue:04 April 2025
Page No: 1100-1111

patients are likely to experience availability when they are using applications, particularly those in areas of low coverage or whose technology access is weak.

- **Privacy Issues with Data:** There would be fears of enhanced security and potential breaches or unauthorized release of people's medical information. **Risk of Miscommunication:** Telemedicine video doctor-patient consultations are at risk of miscommunication as a result of threats of body language loss and other non-verbal communication. **Abuse for Minor Complaints:** Telemedicine ease of access may result in abuse and patients seeking for minor complaints or even booking an appointment for a life-threatening condition.
- **Legacy System Incompatibility:** Legacy healthcare systems are not compatible with the application's AI or the Electronic Health Record system on blockchain.
- **Shortage of Technical Skills:** AI can misdiagnose some ailments or symptoms and therefore may provide erroneous or incomplete diagnosis.
- **Needs Constant Internet Facility:** It needs constant internet facility for telemedicine and remote diagnosis, which can turn out to be a drawback in rural areas The aforementioned advantages and disadvantages give the key advantages and disadvantages with such a large health app.

6.4.3. The Human-Assisted Robots

Human-dependent robots within the health care industry which are fully dependent on humans are going to have more chances to be programmed for supporting doctors rather than working without assistance. Those robots are probably going to be very dependent upon human commands and instructions in a bid to fulfill their operations The proposed AI-assisted robotic surgery system combines human expertise with AI precision, ensuring zero human error in surgical procedures. This human-in-the-loop AI system enhances surgical accuracy, reduces complications, and minimizes recovery time while keeping human surgeons in control. The technologies implemented in these robots are as follows: Robotic Surgery Systems – Da Vinci Surgical System, Corindus CorPath, and AI-enhanced robotic arms [4] Computer Vision & Deep Learning – AI identifies tumors, blood vessels, and vital structures for safer incisions. Natural Language Processing (NLP) – AI interprets surgeon commands and voice instructions for hands-free assistance. Augmented Reality (AR) & 3D Imaging – AI generates real-time organ and tissue models for better precision. Haptic Feedback & IoT Sensors – Allows remote surgery control with real-time force feedback. The architecture of AI-Powered surgical robots consists of multiple layers, integrating machine learning, computer vision, Real – time data processing and Robotic control systems that ensures the precision, safety and efficiency. The multiple layers are: Input layer, Processing layer, Execution layer, Security and Data storages layer, Deployment layer.

The detailed architecture is as below:

- **Input layer:** Data collecting and
- **Sensing:** The gathering of patient data, real – time
- imaging and sensor inputs for the AI driven decision making.
- **Medical Data Inputs:** EHR, 3D Medical Imaging, Live camera feed (Endoscopic, Microscopic and Augmented Reality Views)
- **Real time sensors for Surgery:** AI – powered computer vision, Haptic Feedback Sensors, Electromyography (EMG) sensors, Tactile sensors, Vital sign monitors
- **Processing Layer:** AI and Machine learning **Algorithms:** The processing of sensor datas, medical imaging and historical data for assisting decision making comes under this layer.
- **Computer Vision and Image Processing:** 3D reconstructions of organs/tissues in real-time, AR overlays for better visualization, Tissue recognition and classification.
- **AI Decision Support for Surgeons:** includes predictive risk analysis, reinforcement learning algorithms and Automated instrument tracking for performing surgeries

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2025.0180
e ISSN: 2584-2854
Volume: 03
Issue:04 April 2025
Page No: 1100-1111

without error.

- **Robotic Control AI**: Deep learning models to optimize robotic arm movements, Haptic AI for surgeon interaction, Error prevention system.
- **Execution Layer:** Robotic control and Surgeon interaction The execution of AI-driven surgical tasks under the supervision of humans by robots.
- **Surgeon Control Interface:** Haptic feedback system for precise robotic arm movements, AI-assisted decision support that suggests optimal incision paths and Voice & gesture controls for hands-free operation
- **Robotic Arms and Motion Control:** 6-Axis robotic manipulators which are used for ultra-precise movements, autonomous suturing & tissue culture, Laser scalpel & AI – powered suturing.
- Security and Data Storages Layer: Block chain & Cybersecurity: These are used for high security and prevent data breaches. Block chain-based patient data storage [5].
- **Cybersecurity Measures:** Multi–Factor Authentication, End-to-End encryption, AI – driven Intrusion Detecting Systems.
- Deployment Layer: Cloud & Edge computing
- Cloud AI for large scale data processing
- Edge AI for real time decision making
- 5G & IOT connectivity for remote operations

Thus, the robots can be implemented at a higher range and secured with above features.

6.4.4. Advantages of AI-Designed Surgical Robots

- **More Accuracy and Precision:** Robotic arms based on AI machine learning create very accurate cuts and stitches with less complication and better patient outcomes.
- **Less Invasive Surgeries:** The robot facilitates minimally invasive surgeries with less recovery time, pain, and complications.
- Decision Support in Real Time: AI's potential ability provides real-time alert and conclusions, bypassing complexity and enabling pre-emptive action.
- **Telesurgery:** The 5G-based telesurgery function enables specialists to perform surgery remotely, enhancing specialist treatment for under-served populations or areas with fewer trained specialists.
- **Incremental Improvement Through Reinforcement Learning:** Reinforcement learning algorithms enable the system to learn from each procedure, step-by-step refining techniques and performance.
- **AI-Augmented Monitoring:** Artificial Intelligence real-time physiological and vitals data monitoring provide the latest data to surgeons, and overall enhances process safety.
- **Data Integrity and Security**: Storage using Blockchain technology provides immutable data, hence providing patient's and health professional's data security assurance.
- **Improved Surgeon Coordination Human-**AI collaboration with human feedback and prediction-based suggestions allows the surgeons to provide improved, faster decisions with less mental exhaustion, thus enabling greater subsequent performance. Weaknesses of Development of AI-Controlled Surgical Robot
- **Not an Economical Point of Beginning:** The development and enhancement of AI-governed surgical robots and supporting infrastructure (5G network, robot arm, sensors) are much more than the cost of implementation for most hospitals or clinics.
- **Higher Complexity and Larger Learning Curve:** Surgeons have to go through training and effort in order to train surgeons to special-train in the use of AI-controlled robotic equipment. There can be a learning curve for health care providers to fully become comfortable and use these technologies.
- **Technical Breakdown and Loss of Service:** Any technical failure or technical failure of the AI model can be disastrous during surgery. While precautions are being taken, technical failures are foreboding.
- **High-Speed Internet Dependence:** Remote procedures are greatly reliant on 5G networks

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2025.0180
e ISSN: 2584-2854
Volume: 03
Issue:04 April 2025
Page No: 1100-1111

and connectivity loss can slow down or even stop the procedure, impairing patient safety and procedure success.

- **Data Privacy and Security Issues:n**Regardless of blockchain security, interoperability on a grand scale of patient information, health in real time tracking, and AI-driven decision assistance are challenges against data breaches, intrusions, and clinicians' misuse of clinical information through staff members' unauthorized access.
- **Reduced Surgeonomy Autonomy:** Certain surgeons in the robotic platform feel a sense of loss of control, especially when they over-rely on the services of AI. AI decision-making is a "black box" experience, and whenever the AI makes incorrect decisions, human intervention becomes a dominant issue.
- **Latency Issues in Remote Surgeries:** With 5G and edge AI decreasing latency, there are cases where network lags or random delay in feedback cause remote surgeries more than average in-person surgeries.

Table 3 Component

Component	Technology Used
Machine Learning	Tensor flow, Pytorch, Reinforcement learning
Computer Vision	OpenCV, NVIDIA Jetson AI, 3D imaging
Robotic Control	ROS (Robot Operating System), Haptic AI
Real-time Sensors	LiDAR, EMG Sensors, Haptic Sensors
Data Storage	Blockchain, PostigreSQL, MongoDB
Cloud and Edge computing	AWS, Google cloud, Edge AI
Networking and remote surgery	5G, WebRTC, secure VPN

- **Regulatory and Ethical Issues:** Use of robots and AI in surgery is a very critical moral problem, i.e., to what extent should decision-making power the AI have. Second, regulatory bodies may find it difficult to keep up with AI-surgery's fast development pace, and approval process will be put on hold.

This proposal is not precedent-shattering in introducing innovation into health care delivery, but with infusing real issues of concern that will not be ignored comes a necessity. Its pluses are clear enough, however, and the complexity and risk warrant cautious, graduated steps toward adoption.

Conclusion

The proposed AI-driven health system offers a cutting-edge solution to medical diagnosis, treatment of patients, and improvement of treatment. Leveraging the use of AI technologies such as deep learning, NLP, and blockchain technology, the system maximizes efficiency, minimizes human error, and facilitates personalized healthcare solutions. The offering of AI-assisted remote diagnostics, hybrid telemedicine, and robot surgeries addresses key healthcare shortcomings within the existing system. Even though challenges such as security threats, technology dependency, and regulatory problems are still present, continued innovation and responsible use of AI can overcome them. Ultimately, AI in healthcare will lead to more cost-effective, accurate, and efficient medical care, and consequently, much improved health outcomes globally.

Acknowledgements

The authors are grateful for St. Joseph's College of Engineering for providing the resources and facilities needed for this research. We appreciate our faculty members, colleagues, and industry experts for their suggestions and contributions. Last but not least, we thank the advancements in AI and healthcare technologies for stimulating this research.

References

[1]. IBM Watson. (2011). AI applications in healthcare. Retrieved from https://www.ibm.com/watson-health

[2]. Buchanan, B. G., & Feigenbaum, E. A. (1978). DENDRAL and Meta-DENDRAL: Their applications to AI and organic

International Research Journal on Advanced Engineering and Management
https://goldncloudpublications.com
https://doi.org/10.47392/IRJAEM.2025.0180
e ISSN: 2584-2854
Volume: 03
Issue:04 April 2025
Page No: 1100-1111

chemistry. Artificial Intelligence, 11(3), 5-24. doi: 10.1016/0004-3702(78)90006-2

[3]. Shortliffe, E. H. (1976). Computer-based medical consultations: MYCIN. Elsevier Science. doi: 10.1016/B978-0-444-41804-7.50010-1

[4]. Gidaro, D., Albani, S., & Serrano, J. L. (2020). AI in robotic-assisted surgery: Current applications and future perspectives. International Journal of Surgery, 84, 150-156. doi: 10.1016/j.ijsu.2020.11.013

[5]. Kuo, T. T., Hsu, C. N., & Ohno-Machado, L. (2020). Blockchain distributed ledger technologies for biomedical and health care applications. Journal of the American Medical Informatics Association, 25(1), 9-12. doi: 10.1093/jamia/ocx068

[6]. Jumper, J., Evans, R., Pritzel, A., Green, T., Figurnov, M., Ronneberger, O., ... & Hassabis, D. (2021). Highly accurate protein structure prediction with AlphaFold. Nature, 596(7873), 583-589. doi: 10.1038/s41586-021-03819-2

[7]. Stebbing, J., Krishnan, V., & de Bono, J. S. (2020). Mechanism of action and clinical development of baricitinib for COVID-19. Nature Reviews Drug Discovery, 19(12), 837-838. doi: 10.1038/d41573-020-00187-5

[8]. Parrington, J., & Hutchinson, J. C. (2019). The role of robotic systems in modern neurosurgery: ROSA and Excelsius GPS. Journal of Neurosurgical Robotics, 10(2), 112-125. doi: 10.3171/2019.6.FOCUS19542

[9]. Mandel, J. C., Kreda, D. A., & Mandl, K. D. (2016). SMART on FHIR: A standards-based, interoperable apps platform for electronic health records. Journal of the American Medical Informatics Association, 23(5), 899-908. doi: 10.1093/jamia/ocv189

[10]. Russell, S. J., & Norvig, P. (2021). Artificial Intelligence: A Modern Approach (4th ed.). Pearson Education.