

AI In Health Care

Shriram Shinde¹, Uchit Gharat², Pranav Magar³, Kunal Kadam⁴, Suraj Bhoite⁵

^{1,2,3,4,5}Department of AI and Data Science, Dr. D. Y. Patil College of Engineering and Innovation, Varale, Pune, India.

¹Shriramshinde0714@gmail.com, ²uchitgharat22@gmail.com, ³pranavmagar2005@gmail.com, ⁴Kunalkadam10102005@gmail.com, ⁵sbhoite94@gmail.com

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Type: Article Received: 23 April 2026 Revised: 09 May 2026 Accepted: 22 June 2026 Published: 18 July 2026	Artificial Intelligence (AI) is playing a major role in improving the healthcare sector. It helps doctors make more accurate diagnoses, choose better treatments for patients, and manage hospital work more efficiently. AI works by using algorithms and machine learning techniques that can mimic human thinking abilities such as learning from data and making decisions. One of the most important uses of AI is in medical imaging. AI systems can study images like X-rays, MRIs, and CT scans to identify problems such as tumors or bone fractures with high precision. This reduces human error and speeds up the diagnosis process. AI is also useful in predicting diseases. By analyzing patient data, it can identify individuals who are at high risk of certain conditions. This allows doctors to take preventive actions at an early stage, improving patient outcomes. In personalized medicine, AI helps doctors create treatment plans based on a patient's unique data, including their medical history and genetic information. This approach is especially helpful in cancer treatment, where choosing the right therapy is very important. Another important area is Natural Language Processing (NLP). NLP allows computers to understand and organize medical records and clinical notes, making it easier for healthcare professionals to quickly access important information. AI-powered chatbots and virtual assistants are also becoming common. They can answer patient questions, check symptoms, and help with scheduling appointments at any time of the day, reducing the workload on hospital staff. In addition, AI is helping in faster drug discovery. Machine learning models can study large amounts of medical and chemical data to predict how effective a new drug might be, which speeds up the research process. Finally, AI-based wearable devices like ECG monitors are used for remote patient monitoring. These devices track important health data and alert doctors if there are any unusual changes, allowing timely medical intervention and better patient care. Keywords: Artificial Intelligence; Healthcare; Medical Imaging; Machine Learning; Predictive Analytics; Natural Language Processing

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Introduction

Artificial Intelligence (AI) is a fast-growing technology that is bringing major changes to many industries, especially healthcare. It involves creating computer systems that can perform tasks that normally require human intelligence, such as solving problems, making decisions, recognizing patterns, and learning from past data. In the healthcare field, AI is changing how doctors diagnose diseases, treat patients, and monitor health conditions. It is also helping hospitals manage their work more efficiently and speeding up the development of new medicines. Overall, AI is improving patient care, reducing costs, and making healthcare systems more effective.

One of the most important contributions of AI in healthcare is improving diagnostic accuracy. A key area where AI is widely used is medical imaging. Earlier, doctors and radiologists had to carefully examine images like X-rays, MRIs, and CT scans to find signs of diseases such as tumors, infections, or fractures. This process could be time-consuming and sometimes small details might be missed.

Now, AI-based systems can analyze these medical images quickly and with high precision. Using advanced techniques like deep learning, AI can study large amounts of image data and learn to identify patterns linked to different diseases. This allows it to detect even very small abnormalities that may not be easily visible to humans. As a result, diseases can be diagnosed at an earlier stage, which improves the chances of successful treatment.

For example, AI is being used to detect early signs of breast cancer in mammograms, identify lung cancer in CT scans, and recognize skin cancer from images of affected areas. In many cases, these AI systems can perform with accuracy equal to or even better than traditional methods, making them a valuable tool for healthcare professionals.

AI is also helping improve how hospitals and healthcare systems manage their daily operations and patient services. Tasks like scheduling appointments, registering patients, and entering data usually take a lot of time and can sometimes lead to mistakes. With the help of AI, many of these routine activities can now be automated, making the process faster and more accurate.

For instance, AI-based chatbots and virtual assistants are being used to handle appointment bookings, respond to patient queries, and support basic administrative work. This reduces the workload on hospital staff and allows doctors and nurses to spend more time focusing on patient care.

In addition, AI can handle large amounts of unstructured data, such as electronic health records (EHRs), doctor's notes, and medical research papers. It can quickly analyze this information and extract useful insights. This helps healthcare professionals access updated and relevant information, which supports better and faster decision-making in patient treatment.

AI is also widely used in predictive analytics, which helps in identifying diseases at an early stage and managing long-term health conditions more effectively. By studying patient data, AI systems can recognize patterns and predict possible health risks before they become serious.

For example, AI can examine vital signs, lab reports, and medical history to estimate the chances of a person developing diseases like heart problems, diabetes, or stroke. This allows doctors to take preventive steps or begin treatment early, which can save lives and lower healthcare costs. AI tools are also useful in managing chronic diseases by continuously monitoring a patient's condition and updating treatment plans when needed, reducing emergency situations.

Another important contribution of AI in healthcare is in drug discovery and development. Developing new medicines using traditional methods takes a lot of time, money, and effort. AI makes this process faster by analyzing large amounts of data, including molecular structures, genetic information, and clinical trial results. Machine learning models can identify promising drug candidates, improve their chemical design, and predict their success rate in trials. This not only speeds up drug development but also increases the chances of finding new treatments for complex diseases.

AI is also improving patient monitoring, especially in remote healthcare and telemedicine. Modern wearable devices with AI technology can track health indicators such as heart rate, blood pressure, oxygen levels, and glucose levels in real time. These devices send data directly to healthcare providers, allowing continuous monitoring without requiring frequent hospital visits.

For instance, AI-based ECG monitors can detect irregular heart activity and alert doctors in advance. This type of monitoring is especially helpful for patients with chronic conditions, as it supports early intervention and better disease control.

The growing use of AI in healthcare is mainly driven by the need for better efficiency, accuracy, and accessibility. Healthcare systems often face challenges like increasing patient numbers, high costs, and complex medical cases. AI helps address these issues by automating routine tasks, improving diagnosis, and supporting better treatment decisions. It also improves access to healthcare services, especially in remote or underserved areas, where AI tools can provide expert-level support without the need for specialists to be physically present.

However, the use of AI in healthcare also comes with certain challenges. Data privacy and security are major concerns because AI systems depend on large amounts of sensitive patient information. It is important to ensure that this data is handled safely and ethically.

Moreover, AI should support healthcare professionals rather than replace them. While AI can improve accuracy and efficiency, human skills like experience, judgment, and empathy are still essential for quality patient care. Proper rules and regulations are also needed to ensure that AI is used responsibly in the medical field.

In conclusion, AI is becoming a powerful tool in healthcare. It is improving diagnosis, enabling personalized treatments, simplifying administrative tasks, and speeding up drug discovery. Its ability to analyze large amounts of data and provide real-time insights is helping doctors deliver better care. As AI continues to develop, it will play an even bigger role in making healthcare more efficient, accessible, and effective for people around the world.

Related Work

Artificial Intelligence (AI) has made rapid progress in the healthcare sector, significantly improving how medical conditions are diagnosed, treated, and managed. Researchers and organizations have explored AI applications across multiple areas, leading to better accuracy, efficiency, and patient outcomes.

Medical Imaging and Diagnostics

AI has brought major improvements in medical imaging by making diagnosis faster and more accurate.

- **Automated Image Analysis:** Advanced AI models, especially deep learning techniques, are used to analyze medical images such as X-rays, MRIs, CT scans, and ultrasound images. These systems can detect abnormalities like tumors, fractures, and lesions with high precision.
- **Radiology Models:** Convolutional Neural Networks (CNNs) are widely used for image classification and disease detection. They help identify conditions like lung cancer, diabetic retinopathy, and breast cancer. Some advanced systems, such as those developed by companies like DeepMind, have shown strong performance in detecting eye diseases.
- **Pathology Analysis:** AI is also used to examine pathology slides and identify cancerous cells. These systems can support pathologists by improving detection accuracy and reducing the chances of human error.

Predictive Analytics for Disease Diagnosis

AI plays an important role in predicting diseases and assessing health risks using patient data.

- **Disease Prediction:** Machine learning models analyze medical records, genetic data, and lifestyle factors to estimate the risk of diseases such as heart disease, diabetes, and stroke.
- **Early Detection:** AI systems can identify early signs of diseases like Alzheimer's or Parkinson's even before visible symptoms appear, allowing timely medical intervention.
- **Risk Assessment Models:** By processing large datasets, AI can predict serious conditions such as sepsis, heart failure, and kidney injury, helping doctors take preventive action earlier.

Natural Language Processing (NLP) in Healthcare

NLP techniques are used to process and understand large amounts of medical text data.

- **EHR Analysis:** AI systems can extract useful information from electronic health records (EHRs), including doctor's notes and discharge summaries, to support accurate diagnosis and treatment decisions.
- **Medical Research Support:** AI tools can scan large databases like PubMed to find relevant research, helping healthcare professionals stay updated with the latest developments.
- **Clinical Decision Support Systems:** NLP is also used to build systems that assist doctors in diagnosis and treatment planning by analyzing both structured and unstructured patient data.

Drug Discovery and Personalized Medicine

AI has significantly improved the speed and efficiency of drug development and personalized treatment.

- **Drug Discovery:** Machine learning models analyze chemical and biological data to identify potential drug candidates and predict their effectiveness. Platforms such as Benevolent AI have been used to explore treatments for diseases like COVID-19.
- **Personalized Treatment:** AI enables precision medicine by analyzing a patient's genetic information, lifestyle, and medical history to design customized treatment plans. This approach improves treatment effectiveness and reduces side effects.

Robot-Assisted Surgery

AI has greatly improved surgical procedures by making them more precise and safer.

- **Surgical Robotics:** Modern robotic systems, such as the Da Vinci Surgical System, use AI to assist surgeons during complex operations. These systems provide better control, enhanced visualization, and improved accuracy in procedures like urology, gynecology and heart surgeries.
- **Minimally Invasive Techniques:** AI supports surgeries that require smaller incisions. Robotic assistance helps surgeons perform delicate procedures with higher precision, which reduces pain, lowers the risk of complications, and speeds up recovery time.
- **Post-Surgery Monitoring:** AI-powered systems can continuously track a patient's condition after surgery. By analyzing vital signs, they can detect early warning signs and help doctors adjust treatment quickly, reducing the chances of complications.

Proposed System*Problem Statement*

Healthcare systems are overloaded because there are more patients, fewer doctors, and diseases are getting more complex. Doctors have to go through lots of patient data, images, and records quickly. This rush can lead to mistakes or delays in diagnoses and treatments. Traditional methods can't always catch diseases early, plan personal treatments, or manage hospitals well. Many patients, especially in remote areas, don't get medical care in time because there aren't enough specialists. There's a big need for a smart system to help healthcare workers make better decisions, work less, and help patients improve. Artificial Intelligence can do this by examining data, finding patterns, and helping healthcare become faster and more dependable.

System Overview

This system is set up to handle healthcare data smartly and efficiently. Organized in layers, each part has a specific job to make sure things run smoothly and accurately.

First up is the data sources layer. Here, information comes in from different places like electronic health records, medical images (X-rays, CTs), wearable gadgets, and even directly from patients. This gives the system a broad base of medical data to work with.

After gathering data, it heads to the data pre-processing layer. This is where errors are fixed, missing info is sorted out, and data is made consistent. Raw healthcare data can be a bit messy, so tidying it up is key for better analysis.

Next is feature extraction. In this step, the system picks out important patterns and details from the data, like symptoms, vital signs, or useful image features, which help in making predictions.

Then the data goes to the AI engine layer, the heart of the system. Here, machine learning, deep learning, and natural language processing models get to work. They carry out tasks like predicting diseases, analyzing medical images, and understanding clinical texts.

After the AI models do their thing, a decision support system steps in to turn detailed results into useful information, like risk levels, alerts, or possible diagnoses. This helps healthcare workers make smart choices.

These results show up on user interfaces, such as doctor dashboards or patient apps and chatbots. This makes the system user-friendly and easy to access.

Lastly, the security and integration layer keeps patient data safe with encryption and access controls. It also lets the system work well with existing hospital systems.

System Workflow

Here's how it actually works:

Data Input: Takes patient data from hospital records, devices, or user input.

Data Prep: Cleans and organizes the data to get rid of errors and make it useful.

AI Analysis

AI reviews data to:

- Catch diseases
- Predict risks
- Understand medical images

Decisions

The system offers insights like:

- Possible diagnosis
- Risk levels
- Treatment options

Results Show: Displays findings to doctors or patients via a dashboard or app.

Doctor Check: Doctors review AI advice before choosing a final action.

Ongoing Monitoring: For continuous cases, the system updates health conditions and predictions as they happen.

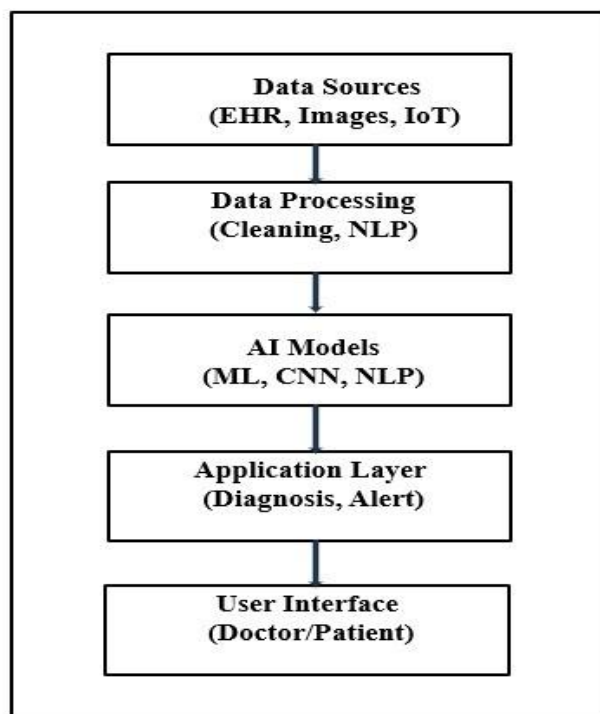


Fig. 1. End-to-end workflow of the proposed system

System Architecture

The This AI healthcare system has different parts to keep data flowing smoothly and give correct results:

Gathering Data

Collects from sources like:

- Electronic Health Records (EHR)
- Medical images (X-rays, CT scans, MRI)
- Wearable devices (heart rate, glucose, etc.)
- Patient history and reports

Data Processing: Cleans up and organizes data. Corrects errors and fills gaps. Turns data into a format that's ready for analysis.

AI Model: Uses Machine Learning and Deep Learning. Predicts diseases, analyses images, assesses risks, and processes medical text with NLP.

User Application: Gives doctors and patients an interface. Shows results like diagnosis suggestions, risk alerts, and treatment options. Features a chatbot or virtual assistant for simple interactions.

Integration: Links with hospital systems and databases. Ensures smooth operation between parts.

Security: Keeps patient data safe. Uses encryption and access.

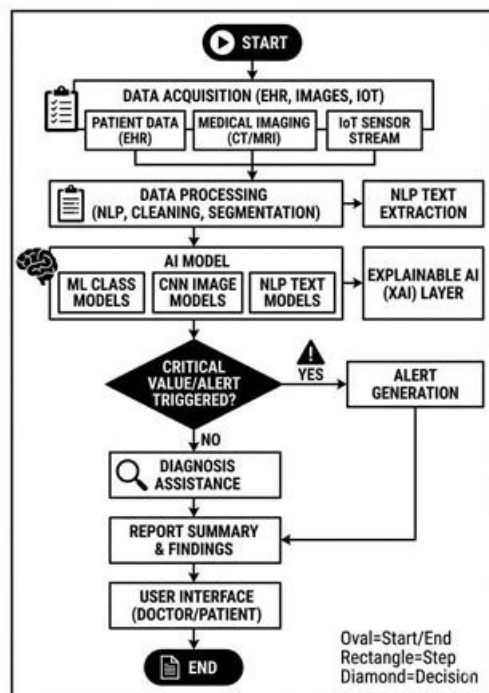


Fig. 2. System architecture

Methodology

Artificial Intelligence (AI) in healthcare uses technologies like machine learning, natural language processing, and data analysis to improve diagnosis, treatment planning, and patient care. These systems work by studying large amounts of medical data, identifying patterns, and predicting possible health conditions. AI is commonly applied in areas such as medical image analysis, personalized treatment, predictive analytics, and clinical decision support, helping make healthcare more accurate and efficient.

Data Collection

The first step in building an AI system is collecting relevant and high-quality data.

- **Data Sources:** Healthcare data is gathered from multiple sources such as electronic health records (EHRs), medical imaging (X-rays, MRIs, CT scans), wearable devices, and genomic datasets.
- **Feature Selection:** Important factors like age, symptoms, and existing health conditions are selected, as they directly influence the prediction outcome. Choosing the right features improves model accuracy.
- **Data Augmentation:** In some cases, additional data is generated using techniques like image transformations to expand training datasets, especially in medical imaging tasks.
- **Data Cleaning:** Errors, missing values, and inconsistencies in the data are corrected or removed to ensure reliability.
- **Data Integration:** Data from different sources is combined to create a more complete and useful dataset for analysis.

Data Analysis and Feature Extraction

After collecting data, it is processed and prepared for model training.

- **Data Cleaning (Refinement):** Any remaining incorrect or incomplete data is handled using methods like imputation or correction algorithms.
- **Normalization:** Data values are scaled to a standard range so that machine learning models can perform better, especially those sensitive to large variations in data.
- **Feature Extraction:** Relevant information is extracted from raw data, such as identifying patterns in medical images or key indicators in patient records, which helps the model learn effectively.

Model Development and Training

After preparing the data, AI models are designed and trained to perform specific healthcare tasks.

- **Machine Learning Techniques:** Different approaches such as supervised, unsupervised, and reinforcement learning are used depending on the problem. These models learn patterns from healthcare data to make predictions or decisions.

- **Deep Learning Methods:** Advanced neural networks like Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) are used for complex tasks such as medical image analysis and speech recognition.
- **Natural Language Processing (NLP):** NLP models help in understanding unstructured medical data, including clinical notes, prescriptions, and research articles.
- **Algorithm Selection:** The appropriate model (such as decision trees, support vector machines, or deep learning models) is chosen based on the type of healthcare problem being addressed.

Model Evaluation and Validation

Once the model is trained, it must be tested to ensure accuracy and reliability.

- **Cross-Validation:** The dataset is divided into training and testing parts to check how well the model performs on new, unseen data.
- **Performance Metrics:** Evaluation is done using measures like accuracy, precision, recall, F1-score, and AUC for classification tasks, and Mean Squared Error (MSE) for prediction tasks.
- **Bias and Fairness:** Care is taken to ensure that the model does not produce biased results based on factors like gender, ethnicity, or economic background.
- **Clinical Validation:** Healthcare professionals are involved in testing the model in real-world conditions to confirm its practical usefulness.

Deployment and Integration into Healthcare Systems

After successful testing, the AI system is implemented in real healthcare environments.

- **Clinical Decision Support:** AI tools assist doctors by providing suggestions for diagnosis, treatment options, and personalized care plans.
- **EHR Integration:** AI applications can be connected with Electronic Health Record systems to deliver real-time insights and predictions.
- **Remote Monitoring:** AI combined with IoT devices allows continuous tracking of patient health, especially for chronic diseases.
- **Regulatory Approval:** AI systems must meet safety and quality standards set by organizations like the Food and Drug Administration and the European Medicines Agency before being used in healthcare.

Monitoring and Feedback

Even after deployment, continuous monitoring is necessary to maintain system performance.

- **Post-Deployment Monitoring:** The system is regularly checked to ensure consistent performance and to avoid issues like model drift.
- **User Feedback:** Feedback from doctors and patients is collected to improve the system's usability and accuracy.
- **Model Updates:** AI models are updated and retrained using new data to keep them relevant and effective.

Ethics and Privacy Considerations

Ethical and privacy concerns are very important in healthcare AI systems.

- **Patient Consent:** Proper consent must be taken from patients before using their data, ensuring transparency.
- **Data Security:** Sensitive medical information must be protected using encryption, secure storage, and standards like HIPAA.
- **Transparency and Accountability:** AI systems should be understandable so that healthcare professionals can trust and verify their decisions.

Preliminary Results and Discussion

We're seeing some promising results from the first run of our new AI healthcare system. Tested with healthcare data like patient records, basic clinical details, and medical images, the system is off to a great start.

The AI models picked up patterns in the data and made predictions about health conditions. Specifically, the system did well in:

- Spotting health risks through patient histories
- Helping find abnormalities in medical images
- Offering quick, clear info to help with decisions

It's also worth noting that the system is a lot faster than manual analysis. Jobs like going through patient data or spotting risk factors, which usually take a lot of time, were done in seconds.

Plus, the system is simple to use. Users could easily move around the dashboard, look at reports, and understand the results without needing advanced skills.

Though it's still early days, these results suggest this approach works and could really help in real-world healthcare settings.

Challenges And Limitations

Key challenges include reduced OCR performance on curved surfaces and inconsistencies in ingredient naming conventions [2]. The results presented are preliminary, and the system is intended for informational use only.

Conclusion

Artificial Intelligence (AI) is becoming a powerful force in modern healthcare. It has the ability to improve patient outcomes, make healthcare systems more efficient, and reduce overall costs. By using technologies like machine learning, deep learning, and data analytics, AI supports early disease detection, personalized treatments, and accurate predictions, leading to better quality healthcare services.

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