

# USES AND CHALLENGES OF AI IN HEALTHCARE

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## Abstract

*The artificial intelligence in health care is mainly focused on the theory of medical science to provide accurate diagnosis and patient care and predicts the health outcomes and new advancements in the medical field. Large volumes of medical data can be analyzed by AI algorithms to find trends and patterns of diagnosis, and the creation of more individualized treatment regimens that are hard for humans. To see this may result in earlier disease identification. AI is mainly used for Better diagnostics, Medical pictures, including X-rays and mammograms can be analyzed by AI. It can be utilized in personalized medicine to examine each patient's unique medical records and create a customized treatment plan. AI can lower healthcare costs. To guarantee the safe and efficient application of AI in healthcare, a few issues must be resolved as well. After considering all these things, AI has the ability to completely transform healthcare by raising standards, cutting expenses, and expanding access. To guarantee its safe and efficient application, it is crucial to address the issues raised by AI.*

**Keywords:** *artificial intelligence, ai algorithms, medical imaging*

## Introduction

The quick development of artificial intelligence is changing medicine and many other facets of our life. By using advanced algorithms and approaches, artificial intelligence (AI) plays a vital role in helping clinicians. It enables them to detect any health issues and provide more precise diagnoses. A.I. transforms the healthcare industry by using vast amounts of data, with the potential to improve patient outcomes and create a more efficient healthcare system. To maximize A.I.'s advantages and guarantee moral medical practices, however, responsible deployment, privacy protection, and continued cooperation between AI specialists and medical practitioners are still essential. AI has the potential to revolutionize healthcare by offering effective and efficient answers to significant problems facing the industry. AI is able to use a wealth of medical data, such as imaging scans and test results. Deep learning algorithms were introduced in the early 2000s, marking a significant advancement in artificial intelligence that fundamentally changed the industry. These algorithms made it possible for computers to learn and adjust to new information in incredibly complex ways.

Resulting in the development of AI-powered medical systems that can evaluate vast volumes of medical data and generate precise forecasts. These days, artificial intelligence is widely used in several medical domains, such as health monitoring, diagnosis, and treatment planning. As technology develops, we anticipate even more astounding advancements in the use of artificial intelligence in healthcare. The goal of artificial intelligence (AI) is to replicate human cognitive capacities, which will drastically alter the healthcare industry. The increasing volume of healthcare data and the quick advancement of analytical techniques are the main drivers of this shift.

Artificial Intelligence is used to analyze both organized and unstructured healthcare data, including popular A.I. approaches for structured data including neural networks, traditional support vector machines, and modern deep learning algorithms. In order to handle unstructured data, artificial intelligence also makes use of natural language processing. In the three main illness areas of cardiology, neurology, and oncology, artificial intelligence has made tremendous strides in healthcare, these advancements have spurred a heated debate about

whether or not AI physicians will eventually take the place of human physicians. Although it is unlikely that machines will ever fully replace human physicians, artificial intelligence has demonstrated considerable promise.

### Here, We have Covered a Few Specific Applications of Artificial Intelligence in Healthcare

- Diagnostics and imaging in medicine
- Electronic Health Records (E.H.R.)
- Robotic assisted surgery
- Disease prediction and risk assessment
- Drug Development And Discovery
- Chatbots And Virtual Assistants
- Accurate Medicine
- Monitoring patients from away

#### 1) Diagnostics and imaging in medicine

With the development of technology, artificial intelligence's potential in radiology is predicted to increase. By using deep learning algorithms, artificial intelligence (AI) may identify patterns and Anomalies that human observation might overlook. Examine medical pictures such as Magnetic Resonance Imaging (MRI) or Computed Tomography (CT) scans. This increased precision could greatly help radiologists identify patients more accurately and treat them with the right treatments.

Furthermore, there is a great deal of promise for increasing treatment efficacy and reducing complications through the use of artificial intelligence (AI) in the creation of individualized treatment regimens by examining a patient's medical history and pertinent data.

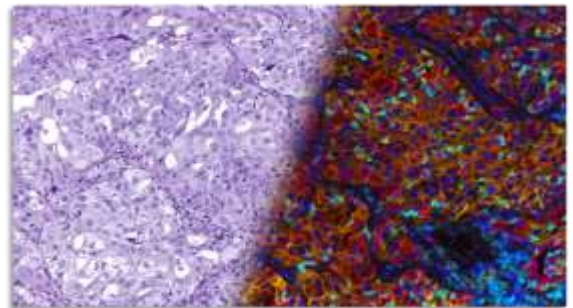


**Figure 1 Spot identification of tumor in brain by using AI**

**Source:** <https://www.scientificamerican.com/article/a-portable-mri-makes-imaging-more-democratic/>

AI algorithms are used by Computer-Aided Diagnosis (CAD) systems to help analyze medical images. They evaluate pictures and offer radiologists and other medical professionals diagnostic recommendations.

CAD is useful for early disease identification and anomalies, improving the likelihood of a successful outcome. Through the automation of processes like picture sorting, annotation, and measurement, it can optimize radiology procedures. Radiologists may now concentrate more on complex situations and diagnose patients more quickly and accurately. Deep learning techniques can also be used to increase picture quality and make minute features in medical images easier to see. More correct interpretations result from its assistance in lowering image noise, enhancing contrast, and improving resolution. Histopathology slides, which are often analyzed, can be automated.



**Figure 2: AI and Digital Pathology**

**Source:** <https://aws.amazon.com/blogs/publicsector/large-scale-ai-digital-pathology-without-heavy-lifting/>

Healthcare workers can receive real-time decision support from AI systems when they are acquiring and interpreting images. AI systems, for instance, can assist with ensuring image quality, optimizing image capture parameters, and giving prompt feedback on possible problems.

#### 2) Electronic Health Records (E.H.R.)

AI has a lot of potential as a useful tool in primary care, and one of its possible uses is the analysis of medical data, such as vital signs, lab findings, and imaging scans, using deep learning algorithms.

Artificial intelligence (AI) systems are able to recognize patterns and Abnormalities that human observation might miss, enabling medical professionals to identify patients more precisely and treat them specifically. Making individualized care plans is a further potential use. Healthcare professionals can create individualized treatment plans based on each patient's unique needs and preferences by using artificial intelligence (AI) to assess a patient's medical history and relevant data. This strategy has the potential to improve treatment efficacy and lower the likelihood of problems.



**Figure 3: Electronic Health Records**

**Source:** <https://www.medicalhubassist.ai/en/blog/electronic-health-record-with-artificial-intelligence>

### 3) Robot Assisted Surgery

By integrating artificial intelligence (A.I.) into surgical processes, robotic surgical assistants have revolutionized healthcare. These sophisticated systems combine the knowledge and decision-making power of A.I. algorithms with the accuracy and agility of automated technology.

Consequently a potent tool is developed that enhances surgeon proficiency and patient outcomes by enabling more accurate and efficient execution of intricate procedures. Typically, robotic arms equipped with specific surgical tools and a high-definition camera serve as robotic surgical assistants. Surgeons use simple hand gestures and controls to operate these arms from a console. In order to help the surgeon make well-informed decisions during the procedure, the artificial intelligence component provides real-time input and analysis. Robotic assistants support the surgeon during a variety of procedures, including cardiovascular, bladder, and rectal surgeries.



**Figure 4 Robot-Assisted Rectal Surgery Using Artificial Intelligence**

**Source:** <https://centinelamed.com/our-services/robotic-assisted-surgery/>



**Figure 5 AI Robot Assisted in Cardio Thoracic Surgery**

**Source:** <https://ctsurgery.ucsf.edu/patient/patient-education/robotic-thoracic-surgery.aspx>

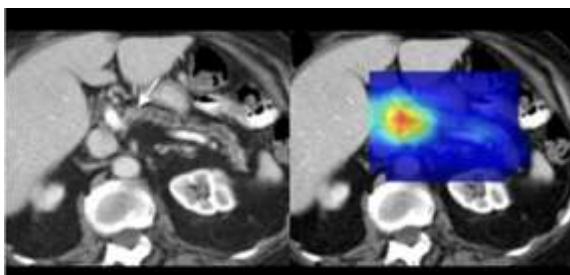
The ability of robotic surgical assistants to do minimally invasive treatments is one of its main advantages. Through tiny bodily incisions, robotic arms and tools are inserted to allow surgeons to reach difficult-to-reach places that would be difficult to get otherwise. through conventional open surgery. The robotic system's artificial intelligence (A.I.) algorithms help with precise motions, hand tremor reduction, and visualization enhancement, which improves surgical results and speeds up patient recovery.

The special capacity of robots to replicate precise movements is especially useful in hair transplant procedures. The robot efficiently removes hair follicles

during these processes and carefully places them in specific scalp locations. The robot is equipped with sophisticated force detecting technology, which guarantees that it will maintain the required force throughout implantation and harvesting. their eyes. Additionally, the device has haptic feedback, which allows surgeons to feel the stresses that the robotic arms are subjected to while performing surgery.

#### 4) Disease prediction and risk assessment

AI has developed into a powerful instrument in the medical field, particularly for risk assessment and disease prediction. Artificial intelligence (AI) systems may examine vast amounts of patient data using sophisticated algorithms and machine learning approaches to find trends that point to illness growth or increased danger. By processing data from several sources, such as wearable technology, genetic profiles, medical imaging scans, and electronic health records, these algorithms are able to identify minute correlations that human observers might miss. Healthcare providers may quickly act and put preventive measures or treatment plans into place when diseases like diabetes, cancer, and cardiovascular issues are detected early thanks to artificial intelligence's predictive powers, which improves patient outcomes.



**Figure 6 Uses of AI for Identifying Pancreatic Cancer**

**Source:** <https://www.mayoclinic.org/medical-professionals/cancer/news/from-challenge-to-change-ai-leap-in-early-pancreatic-cancer-identification/mac-20558901>

Artificial intelligence has broad promise for cancer treatment, including clinical validation, medication development, and discovery. A recent study examined several flexible machine-learning algorithms that can identify lung cancer and have links to the Internet of

Things. It's also important to remember that the main cause of elevated blood sugar levels is diabetes mellitus, or simply diabetes. AI is a low-cost way to prevent preventable blindness and ocular problems associated with diabetes. Artificial intelligence has been shown by researchers to aid in the simplification of chronic illness care. In order to identify patients who are at a high risk of acquiring chronic disease, a variety of machine learning algorithms are being created. Researchers claim that artificial intelligence can forecast the death dates of people with heart disease.

As a result, different algorithms have been used to predict the severity of the heart rate and identify possible problems. Artificial Intelligence is being explored as a potential treatment for tuberculosis. Researchers discovered that the AI system can recognize signs of stroke in medical pictures if it thinks a patient may be having a stroke. Furthermore, AI can identify hypertension via examining input data, including demographics, blood pressure, and other pertinent variables. An artificial intelligence system developed by a group of researchers can correctly classify cutaneous skin conditions, providing doctors with important assistance in improving their diagnostic abilities accuracy. Additionally, scientists have discovered that artificial intelligence (AI) may be able to detect and treat liver illness early on, boosting the prognosis and rate of recovery for those who are impacted.

The capacity of artificial intelligence to continuously learn and enhance its performance is a significant benefit in disease prediction and risk assessment. Artificial intelligence systems can modify and improve their predictions when new patterns are found and more data becomes available, improving their precision and dependability throughout time. AI systems can stay up to date with new research and medical developments thanks to this iterative learning process, which eventually improves patient care and results. AI can also assist in resolving issues related to the distribution of healthcare resources.

Healthcare professionals can more effectively manage resources by properly estimating each patient's risk of disease. This ensures that individuals at higher risk receive the right interventions while minimizing needless



procedures and treatments for those at lower risk. This focused strategy maximizes the use of available resources and raises the general effectiveness of the healthcare system.

### 5) Drug Development and Discovery

The use of Artificial Intelligence (AI) has recently increased across a number of societal domains, with the pharmaceutical sector setting the standard. Massive datasets of chemical compounds can be quickly analyzed by AI algorithms to determine their capacity to bind to certain pharmacological targets. In contrast to conventional techniques, this allows for virtual screening, which saves time and money by identifying possible drug candidates based on their anticipated interactions with target molecules.



**Figure 7 AI Assisted to Discover a New Drug for Disease**

**Source:** [https://vial.com/blog/articles/are-ai-generated-drugs-being-tested-on-humans/?https://vial.com/blog/articles/are-ai-generated-drugs-being-tested-on-humans/?utm\\_source=organic](https://vial.com/blog/articles/are-ai-generated-drugs-being-tested-on-humans/?https://vial.com/blog/articles/are-ai-generated-drugs-being-tested-on-humans/?utm_source=organic)

Artificial intelligence (AI) models can produce new molecules with desired attributes by learning from current drugs and their interactions, maximizing bioavailability, safety, and efficacy. By examining a large amount of biological data, it can assist in finding new drug targets. Including medical literature, proteomics and genomics. Algorithms can identify previously unidentified or understudied possible therapy targets by revealing patterns and linkages associated to the disease.

Algorithms using artificial intelligence (AI) can examine patient data to find appropriate subjects for clinical trials. AI can improve trial design, patient recruitment, and outcome prediction by taking into account a variety of characteristics, including demographics, genetics, and medical history. This leads to more effective and sufficient clinical trials. It can hasten the process of finding current medications that might be modified for novel therapeutic applications. Artificial intelligence (AI) systems can find promising medication candidates that have already been approved or evaluated for other purposes by examining vast amounts of data, such as gene expression profiles, protein interactions, and illness databases. Artificial intelligence (AI) can examine patient data and electronic medical records to find trends that might point to potential side effects from particular medications

Artificial intelligence (A.I.) can help researchers and regulators make well-informed judgments about drug safety and optimize drug formulation and delivery techniques by identifying warning signs of safety risks early. By examining the stability, solubility, and using pharmacokinetic information, artificial intelligence algorithms can assist in creating formulations that improve medication effectiveness and patient adherence.

AI has the ability to completely transform the process of finding new therapeutic compounds by taking the place of the conventional trial-and-error method. Quantitative Structure-Property Relationship (Q.S.P.R.) is one computational approach that artificial intelligence (AI) can use to solve formulation design problems. Pertaining to porosity, stability, dissolution, and other factors.

Rule-based decision-support systems that AI chooses the right excipients according to the physicochemical characteristics of the medicine and uses feedback mechanisms to continuously modify the procedure. As production procedures

Modern manufacturing systems seek to transmit human expertise to machines, changing industrial methods as they grow more sophisticated and the demand for efficiency and product quality increases. There are several benefits to incorporating artificial intelligence (AI) into pharmaceutical production procedures. For example, by

analyzing agitation and stress levels in machinery such as stirred tanks, Computational Fluid Dynamics (C.F.D.), which uses Reynolds-Averaged Navier-Stokes solvers, makes it possible to automate a variety of pharmaceutical processes. Furthermore, complex industrial flow issues are addressed by advanced techniques including extensive eddy simulations and direct numerical, demonstrating AI's capacity to maximize pharmaceutical production.

## 6) Chatbots And Virtual Assistants

The development of chat bots and virtual assistants in the healthcare industry has been greatly aided by AI. These clever devices are made to interact with users, provide information, and help with a range of medical duties. Although chat bots have been utilized extensively in online retail, their involvement in healthcare is progressively gaining traction. Effective chat bots may improve customer retention, draw in new users, and deliver first-rate customer support. Better relationships with members and patients are required in light of the expanding trend of healthcare consumerism, which seeks to improve the effectiveness and convenience of healthcare delivery. Thankfully, there are many plans available in the healthcare sector. data and comprehensive information from electronic health records, allowing for more engaging customer interactions. AI-enabled virtual assistants designed for members, payers, and clinicians can help streamline and customize user experiences across the healthcare industry.

Chat bots and virtual assistants can provide patients with individualized instruction and support. They are able to respond to frequently asked questions about health, give information about medications, describe medical procedures, and give general health advice. These systems are made possible by AI. Comprehend customer questions, obtain pertinent data from medical databases, and provide precise answers. Chat bots and virtual assistants can assist users in evaluating their symptoms and choosing the best course of action. AI-powered systems can offer initial evaluations and triage suggestions by inquiring about symptoms and medical history. These recommendations may include recommending self-care practices, recommending a visit to the doctor, or signaling the need for immediate medical

care. When it comes to making appointments with medical professionals, driven virtual assistants can help users. These assistants can verify availability, suggest appropriate appointment times, and streamline booking by connecting with scheduling systems. Patients and medical personnel both save time because to this automation.

## 7) Accurate Medicine

Precision medicine combined with artificial intelligence (A.I.) has the potential to revolutionize healthcare. The goal of precision medicine approaches is to pinpoint patient characteristics that have particular therapy reactions or medical requirements. AI helps with this transformation by utilizing sophisticated computing and inference, which allowed the system to successfully learn and reason. The end effect is augmented intelligence, which gives medical professionals insightful information to improve their ability to make decisions.

Large-scale genomic data, such as gene expression, genetic variants, and deoxyribonucleic acid (D.N.A.) sequencing, are analyzed using artificial intelligence (AI) algorithms. AI can help detect genetic changes by finding patterns and correlations in this data. Biomarkers, forecasting the likelihood of a disease, and identifying the best therapies based on a person's genetic makeup. Algorithms can help with complex disease diagnosis, treatment outcome prediction, and the suggestion of individualized treatment plans based on patient characteristics. It can also integrate patient-specific data, such as medical records, imaging results, and genomic information, to give clinicians evidence-based recommendations.

AI plays a key role in speeding up the drug discovery and development process in precision medicine. Large volumes of biological data can be analyzed by machine learning algorithms to find possible therapeutic targets, improve drug candidates, and forecast medication response based on personal traits. Additionally, AI can help repurpose current medications for particular genetic patient subgroups. Biomedical research, wearable technology, and electronic health records are just a few of the many data sources that precision medicine incorporates. A thorough grasp of patient health and available treatments is made possible by the ability of

artificial intelligence (AI) techniques like data mining and natural language processing to evaluate and extract valuable insights from these diverse data sources.

### 8) Monitoring patients from away

AI has revolutionized the gathering, analysis, and use of patient data in healthcare remote patient monitoring (R.P.M.). Remote patient monitoring, or R.P.M., is the practice of remotely monitoring patients' health through technology, allowing medical professionals to keep an eye on their health outside of traditional medical institutions. By enhancing data analysis, enabling early health issue diagnosis, and simplifying individualized care, artificial intelligence (A.I.) improves R.P.M.

Large amounts of patient data, like as vital signs, medical history, and symptoms reported by the patient, can be analyzed by A.I. algorithms to find patterns, trends, and anomalies. AI can deliver healthcare by utilizing machine learning and predictive analytics.

Experts who offer insightful advice and assistance in reaching precise diagnoses and treatment choices. Vital signs and other health parameters can be continuously monitored by powered wearable technology, such as fitness trackers or smart watches. These gadgets analyze the gathered data using artificial intelligence (AI) algorithms to find anomalies or notable shifts in the patient's condition. By evaluating patient data, real-time monitoring forecasts possible health risks or consequences and facilitates early action, prompt alarms, and better patient outcomes. Algorithms using artificial intelligence (AI) can identify patients who are at high risk of acquiring particular ailments or going through unfavorable experiences. This makes it possible for medical professionals to take proactive measures and offer focused interventions to reduce hazards. Based on each patient's distinct health profile, it may evaluate their data and provide individualized care recommendations. Artificial intelligence algorithms can suggest customized treatments and medications by taking into account medical history, genetics, lifestyle, and environmental factors. Modifications or lifestyle shifts to improve the health of patients. AI-powered technologies can analyze pictures such as pathology slides, CT scans, and X-rays to provide remote diagnoses.

By learning to recognize and analyze patterns suggestive of illnesses, deep learning algorithms can help medical personnel make precise remote diagnosis.

All things considered, AI in remote patient monitoring has enormous potential to optimize the use of healthcare resources, improve patient experiences, and improve healthcare outcomes. It makes it possible for prompt actions, early health issue detection, and individualized treatment. Ultimately resulting in the delivery of healthcare that is more effective and efficient.

### Difficulties with Artificial Intelligence in Medical Care

The growing use of artificial intelligence (AI) in healthcare by various organizations presents issues that need to be addressed right away. These difficulties center on moral and legal issues that are strikingly particular to the healthcare industry. The most important of these is the matter of security and privacy of data. Large volumes of personal health data are collected by A.I. systems, necessitating strict safeguards against any abuse or illegal access. In healthcare A.I. applications, accuracy and patient safety are crucial. Transparency in the decision-making process and thorough validation are crucial for ensuring the safety and dependability of AI-generated decisions. Furthermore, developing algorithms to detect patterns in medical data is a challenging undertaking that requires a variety of representative datasets and intentional bias correction.

Another urgent issue is seamlessly integrating AI with current IT systems. To optimize the advantages of artificial intelligence while reducing interference with current procedures, seamless integration is essential. It's critical to get doctors' acceptance and trust. For the effective use of artificial intelligence. Appropriate communication and education may allay worries and highlight the benefits of artificial intelligence, which will eventually lead to its practical application in medical settings. When it comes to healthcare data, compliance with federal laws like the Health Insurance Portability and Accountability Act (HIPAA) cannot be compromised. Strict adherence is required to safeguard patient confidentiality and avoid legal repercussions.

When using artificial intelligence (AI) in healthcare, it is crucial to integrate strong security measures to protect

private patient information from possible hostile exploitation Accuracy and patient safety are:

- Major issues with the application of AI.
- Requiring artificial intelligence (AI) systems to be adept at identifying trends in medical data.
- Recognizing the connections between treatments and diagnosis.
- Giving each patient specific, tailored advice

For medical professionals, integrating artificial intelligence (AI) with current IT systems might present challenges, requiring a thorough grasp of the state of the art to guarantee smooth functioning. However, certain occupational roles may be replaced by AI automation. Resulting in changes to employment prospects or unemployment in particular industries or professions. The workforce may need to be retrained or up skilled in order to accommodate new roles in AI-driven healthcare.

Beyond the technological constraints that exist in comparison to human abilities in vision, language processing, and context-specific thinking, integrating artificial intelligence (AI) approaches into healthcare delivery presents unique problems. Historically, medical personnel have been conservative when using new technologies, frequently favoring tried-and-true approaches to clinical care. The healthcare sector will probably oppose and reject the introduction of AI-enabled technologies, even with the right regulatory approval.

Lastly, acquiring the trust and acceptance of healthcare professionals is essential to the successful application of artificial intelligence in healthcare. Doctors need to have faith in AI systems' dependability and capacity to deliver precise advice. Transparency becomes essential since doctors must comprehend the A.I. system's decision-making process and make sure it is based on reliable and up-to-date medical research. Furthermore, following federal standards is crucial to guaranteeing the moral application of AI systems and protecting the health and safety of patients.

### Conclusion

AI integration in basic healthcare facilities has the potential to lower expenses and increase access to and affordability of necessary treatment. As new virus infections and

infectious and non-communicable diseases increase, artificial intelligence will play a critical role in preventing disease. Detection and improved patient treatment. Healthcare workers are under stress due to the growing population, which is having a negative impact on patient care by causing sleep deprivation and mental fatigue. However, given the speed at which A.I. research is developing and the support of both the government and industry, it is very likely that A.I. will be extensively used in the provision of healthcare, providing significant cost savings and enhanced service quality. AI-smart robots will lessen the workload of medical personnel by helping them provide more effective patient care. Giving people access to intelligent watches and bands with AI capabilities would help them identify mild illnesses, saving time and money that would otherwise be spent on hospital visits. With continued advancements, artificial intelligence's enormous potential promises to significantly benefit humanity. will be extensively used in the provision of healthcare, providing significant cost savings and enhanced service quality. AI-smart robots will lessen the workload of medical personnel by helping them provide more effective patient care. Giving people access to intelligent watches and bands with AI capabilities would help them identify mild illnesses, saving time and money that would otherwise be spent on hospital visits. With continued advancements, artificial intelligence's enormous potential promises to significantly benefit humanity. But issues like prejudice, data quality, ethical issues, human-AI cooperation, and technological constraints need to be resolved. Additionally, ethical AI procedures and legal frameworks need to lessen any potential negative effects of AI in issues related to healthcare, including loss of employment, prejudice and discrimination, privacy and security threats, and moral dilemmas. We can fully utilize AI's potential to enhance patient care, optimize treatment results, and improve the healthcare experience by overcoming these obstacles and implementing it ethically. Artificial intelligence, when used morally and in Working together with medical professionals can help improve healthcare delivery and have a good effect on people's health around the world.



**References**

1. Murphy, E. K.-J. (2021). AI in healthcare. *AI in Health Care* , 284.
2. Nordling, L. (2019). A fairer way forward for AI in health care. *Nature Publishing Group* , 285-290.
3. Sandeep Reddy, S. A. (2019). A governance model for the application of AI in health care. *Journal of the American Medical Informatics Association* , 491-497.
4. Weerarathna, I. N. (2024). *Artificial Intelligence in Health Care*. Maharashtra: IIP Series.