# ARTIFICIAL INTELLIGENCE IN HEALTHCARE: A PROSPECTIVE APPROACH

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**ABSTRACT:**

*Artificial intelligence (AI) is the systems or machines that mimic intelligence to perform tasks and can iteratively improve themselves based on the information they collect. AI is being effectively utilized in a multitude of setting such as hospitals, and clinical laboratories as well as in research approaches. The basic or salient feature of AI in the medical field is treatment management as well as its diagnosis. AI systems in health care are succeeding because of the advanced algorithms for learning numerous characteristics from a huge amount of health care data that helps in problem-solving is achieved at a rate and amount futile for humans. The algorithms can be furnished with auto-learning to improve performance and accuracy. AI systems are utilized to facilitate physicians with advanced medical knowledge about journals, clinical papers to brief patient care and medical textbooks. AI can offer fewer diagnostic as well as therapeutic errors. For the learning process, it can make use of medical data, particularly from the patient population. There are different types of AI which can be used in the healthcare field like biomarkers, natural language processing, rule-basedexpert system, and physical robotics. AI is used in treatment design, disease progression, diagnosis aid, and health monitoring.*

**KEYWORDS: Artificial Intelligence, Healthcare, Robotic Process Automation**

## INTRODUCTION:

Artificial intelligence (AI) and the associated technologies are progressively being used in various fields and disciplines and are now imitated in the healthcare sector. AI is being effectively utilized in a multitude of settings such as hospitals, and clinical laboratories as well as in research approaches. Along with enhanced use in engines, machines etc., AI is utilized in electronic health records (EHR) and also in the development of disciplines included in life sciences as well as neurosciences. The basic or salient feature of AI in the medical field is in the diagnosis and treatment of diseases. (Reddy, et.al 2018)

In general, AI is referred to as the" field of science "as well as engineering and deals with the computational understanding of intelligence or intelligent behavior with the formation of artefacts that impart such behaviors. (Alsheibani et.al. 2018); (Guan, 2019). Furthermore, AI can be defined as the machine's proficiency to emulate intelligent human behavior employing especially assigned computer software to perform projects compelling human brain intelligence in less time and less cost. As the central motive of AI is to contribute systems that can think and act like the human brain, thus the systems are titled intelligent agents. The formal definition of AI can be expressed as a field of science concerned with the computational understanding of what is commonly called intelligent behavior and with the creation of intelligent agents that exhibits such behaviors. This can be interpreted as a machine with human-like proficiency extending via computers in the execution of assignments done by humans.

AI theory can be creditably inferred through the intelligent agent concept. Thence, it assimilates the essential qualities needed to qualify for the Turing test (Reddy, et.al 2018) given by the British mathematician Alan Turing, one of the benefactors of modern computer science as well as AI. Turing test analyzes computers as it possesses the ability of computers to perform like a human in tasks (Alsheibani et.al. 2018). The skills required in an intelligent agent are perception, practical reasoning and competence in accomplishing assigned tasks. (Reddy, et.al 2018). "As AI is an interdisciplinary concept embracing fundamentals and equipment of diversified areas like computation, mathematics, logic, and biology, it is used to deal with issues of understanding imitating intelligence and performing cognitive tasks with minimum human arbitrations". Guan (2019). AI systems in health care are successful because of the advanced algorithms for learning numerous characteristics from a huge amount of health care data that helps in problem-solving

and achieved at a rate and amount futile for humans. The algorithms can be furnished with -auto-learning to improve performance and accuracy. AI systems are utilized  to  support physicians with advancedmedical knowledge about journals, and clinical papers to inform patient care and medical textbooks in general. AI can offer fewer diagnostic as well as therapeutic errors. For the learning process, it can make use of medical  data,  particularly  from  patient  populations. (Khanna, 2020). The intelligent agents utilized for AI  systems  comprisea  computational  core with tangible actuators and sensors tilted as Robots, one with only a computational environment called infobot, if advising program combined with human experts then termed a decision support system (Reddy, et.al 2018). There are various applications of AI in medicine such as estimating disease liabilities, assessing treatment potency,  handling  treatment  complexity,  facilitating patient care, clinical investigation and drug advancement (Arnold, 2021)., performing surgeries Kiener (2020) diagnosing illness and directing researchers in developing expensive clinical trials companion.

## TYPES OF AI:

AI is a compilation of technologies instead of a single technology.  Many  technologies  are directly  concerned  with  healthcare,  each  supporting  particular  mechanisms  and  tasks.  A  few important AI technologies in healthcare are detailed as  follows:

1. **Machine Learning: neural networks and deep learning**

    One  of  the  highest  prevailing  types  of  AI  is  machine  learning  which  is  a  statistical method.  The  prevalent  utilization  of  conventional  machine  learning  is  as  precision medicine.  It  is  beneficial  for  assessing  the  exact  condition  of  the  patient  based  on  the peculiarities and medical background and it estimates the procedure for the treatment of patients (Reddy, et.al 2018); (Davenport & Kalakota 2019). The neural network is an intricate  technology  which  has  feasible  after  the  1960s.  For  many  decades  it  has  been ratified  in  healthcare  research.  It  is  utilized  to  find  out  whether  a  patient  will  develop  a specific disease. It works similarly toa neuron's function in processing signals  but it is not as functional when compared to the  brain's functions (Reddy, et.al  2018). Deep  learning is useful in diagnosing lacerations and contusions by making use of  radiology  images. Deep learning is progressively utilized for  speech recognition and fundamentally is a type

of natural language processing (NLP) (Reddy, et.al 2018); (Khanna, 2020).

2. **Natural language processing**

In the medical dataset, data is categorized as structured and unstructured. NLP utilizes unstructured healthcare data which is locked in electronic health record systems. NLP is utilized for converting data into a usable and analyzable form. NLP studies patients' records and extricates important information such as prescriptions, medication plans and medical issues. It can estimate customers' caliber or analyze tendencies in social media. It has been trying to embrace human language for speech recognition and text analyses. AI is employed to develop NLP algorithms for the assimilation and assortment of clinical papers.

3. **Rule-based expert systems**

The purpose of using rule-based expert system in health care is clinical decision support. It is purposed for over a few decades and is still in use. These are set of rules which are provided by numerous electronic health records (EHR). The rule-based expert system involves data scientists and it attempts to reason similarly to human beings (Davenport & Kalakota 2019); (Kourou et al., (2021).

4. **Physical Robots:**

They execute pre-detailed functions such as lifting, repositioning, welding, assorting objects in places like factories, and warehouses and delivering supplies to hospitals. Robots have become synergetic with humans and are easily instructed by passing them through a required process. In 2000, surgical robots were certified and they provide a "superpower" to surgeons by enhancing their ability to see, constitute explicit and less intrusive incisions, stitch wounds and many more. The surgical protocol utilizing robotic surgery comprises gynecologic surgery, prostate surgery and head and neck surgery. (Davenport & Kalakota 2019).

5. **Robotic Process Automation**

It is inexpensive, easily programmable and transparent in action when compared with

other AI programs. It only comprises of computer programs on screens rather than actual robots. In healthcare they are utilized for proceeding endorsements, revising patient records or billing. They can also be used to extricate data from a faxed image when combined with image recognition.

6. **Artificial neural networking**

The computation of simulations galvanized by the human brain is known as artificial neural networks (ANN). In ANN AI developments include voice recognition, images and robotics recognition. The main objectives of ANN are to reflect the activities of human brain nerve cells utilizing neural networks of algorithms and maintaining a correlation between a set of data like the human brain. The response is instantaneous for biological neurons but data processing is slower, hence response takes a longer time. But the advantage is that data processing is a continuous process. Kourou et.al., (2021); Alsheibani et.al. (2018).

7. **Clinical Decision Support System(CDSS)**

The main motive of CDSS is to diagnose the disease accurately by making use of previous patient data. CDSS allows clinicians to integrate their knowledge with CDSS information. CDSS applies web applications or integrates with electronic health records (EHR) and computerized provider order data (CPOE) systems. CDSS is categorized into knowledge-based and non-knowledge-based categories. Knowledge-based CDSS is utilized for AI in medicine but it cannot understand the reasoning to generate data availability issues. Kourou et al., (2021); Amann et al., (2020).

8. **Biomarkers:**

Biomarkers testing also known as molecular study intricate numerous tests to identify molecular signs of health so that the best treatment can be provided to the patient. Machine learning-aided biomarker discovery is on trend. Machine learning algorithms assess a couple of hypotheses on the basis of input features. The algorithms can be categorized as classification algorithms and feature-based algorithms. The algorithms are

employed for gene expression data devised for RNA sequencing data of human cells. Kourou et al., (2021).

9. **Arterial Spin Labelling Imaging (ASL)**

It is a non-invasive system of assessing brain perfusion. It has multiple variety modes of functioning software to evaluate data that yields high diagnosis accuracy. It is successfully utilized to monitor Alzheimer's disease. Kourou et al., (2021).

**APPLICATIONS OF ARTIFICIAL INTELLIGENCE:**

a. **Healthcare drug creation:** Machine learning algorithms are utilized to decrease drug discovery time. AI utilization to improve the discovery process parts will be faster, safer and more economical. It can assist in the discovery of new compounds as possible drugs for a disease. It can also be utilized for the identification of the application of previously tested compounds. For instance, two medicines for the treatment of the Ebola outbreak in West Africa were identified through AI in one day, which otherwise takes months to years. Thence, AI can be proficiently integrated with in-memory computing technology to beutilized in drug creation, and this leads to the enhancement of capacity to offer accelerated drug discovery and development. Khanna, (2018).

b. **Treatment design:** AI has the ability to precisely identify and analyze the signs and symptoms of medical images such as X-rays, CT scans, MRIs, ultrasounds, and PET scans. It helps in faster diagnosis of disease. AI is of benefit collecting information about a patient, diagnosis records, testing process and assorting billing information with the help of medical assistant systems. Thence, AI techniques can be used for better care design and satisfaction of the patient. Khanna, (2018).

c. **Disease progression:** By employing biomarkers, AI helps document the progression of disease at different stages. AI can find better ways to record, store and process patient data. All this is achieved through the use of artificial intelligence algorithms that come up with disease models. Kourou et al., (2021).

d. **Diagnosis aid:** AI is used for the detection of diseases such as skin cancer more accurately than an experienced doctor. AI systems are automated, they take all significant

data variables into the model and provide the diagnosis. (Reddy, et.al 2018); (Kourou et al., 2021).

e. **Health monitoring:** Numerous wearables and fitness gadgets can monitor the health of individuals. These gadgets work through AI to monitor health, analyze data and provide to users in order to determine their health status (Kourou et al., 2021).

f. **Managing medical data and records:** AI has an important role in the management of data. AI helps in collecting, storing, normalizing and tracing data sources. Compilation and examination of data are important steps in healthcare; thus, AI is utilized for this purpose. Khanna, (2018).

**CONCERNS IN HEALTHCARE:**

1. **Administrative workflow:** There is a lot of paperwork in healthcare managed by doctors, nurses, and other healthcare employees. They also have to manage time-consuming administrative tasks. The medical officers attending to patients under these circumstances may get exhausted and lose focus which can lead to misdiagnosis. So, AI should be employed for such repetitive tasks. (Kourou et al., 2021).

2. **Inadequate nurses:** There are not adequate doctors and nurses for patient care. Patients have to wait for a longer period which causes anxiety that is harmful to them. Doctors and nurses are also under pressure to serve too many patients waiting in the queue within the limited time available. (Kourou et al., 2021).

3. **Surgery:** There are different forms of surgery such as minor, major and non-invasive surgeries. The surgeries should be conducted efficiently. As surgeons take a long time for surgeries, they may get exhausted and lose focus in such a long time. (Kourou et al., 2021).

4. **Diagnosis:** Doctors and nurses utilize the symptoms observed in patients to diagnose the issue. They employ their knowledge from limited sources available around them. Therefore, fast and more adequate alternatives should also be taken into consideration for diagnosis. (Kourou et al., 2021).

5. **Health monitoring:** Routine health monitoring needs patients' visits to the hospital to

monitor their health status. This time-consuming process makes patients negligent

towards their health status. They only visit the hospital when their health issues severely increase. Thus,faster and more precise AI techniques should be incorporated to solve their issues (Kourou et al., 2021).

**ADVANTAGES OF ARTIFICIAL INTELLIGENCE:**

a.  **Expanded healthcare access:** The human body should be handled professionally to prevent misdiagnosis, mishandling, or wrong treatment. But developing and under-developed nations lack enough physicians. Therefore, these nations can utilize mechanisms based on AI algorithms for diagnosis. (Kourou et al., 2021).

b.  **Improves record-keeping:** With the use of Electronic Health Records (EHR) in hospitals, storing and managing record data becomes easier. AI technologies like voice recognition and dictation further improve the documentation process. (Kourou et al., 2021).

c.  **Advanced immunotherapy:** In advancing immunotherapy for cancer treatment AI plays an important role. Since there is no particular cure for cancer, immunotherapy is being utilized for medication. But immunotherapy is not beneficial for all patients. Thence, AI is efficiently used for the identification of patients who can benefit from immunotherapy. (Kourou et al., 2021).

d.  **Improves quality of services:** AI is beneficial in time-saving as machines utilized are faster than human beings. Therefore diagnosis, treatment, and record keeping becomes easy and can be done in less time, reduced labor employment. This leads to less treatment cost and offers improved quality of services. (Kourou et al., 2021).

**RISK FACTORS:**

**Cyber-attacks:** As AI systems are computer-based systems, they are prone to cyber-attacks. The academic research is focused on finding new ways of attacking the current state of art AI that highlights the significance of cyber security in medicine. The attacks on AI system sabotage the accuracy of diagnosis and administration of the legal dose of drugs. (Reddy, et.al 2018); (Arnold , 2021); (Kiener, 2020),

**Systematic bias:** Medical AI is skilled with a huge amount of data. Such data could not prevent

it from being biased and giving biased results. It can be biased due to insufficient diverse training. The AI system needs skilled persons who can match the input data. AI may be biased against particular minorities who are underprivileged in society and provides worse healthcare to them. AI may also be biased because of the decisions taken by human physicians who trained the AI system. Here we face bias-in and bias-out scenarios. As AI is provided with biased input so it gives biased output. (Reddy, et.al 2018); (Arnold , 2021); (Kiener (2020).

**Mismatch:** There is a huge amount of data in medicine. The utilization of such data i.e. EHR could advance healthcare by illustrating treatment to an individual patient and lowering costs by providing precise medical resources. Even the best-performing AI systems impose a critical challenge known as a mismatch. AI systems are inadequately conscious towards the cause. They may endorse such a course of action that does not correlate with the previous condition of the particular patient and may result into potential great harm to the patient. (Reddy, et.al 2018); (Arnold , 2021); (Kiener (2020).

### ETHICAL AND MEDICOLEGAL CONCERNS:

- **Informed consent:** The application of AI in healthcare like imaging, surgery and diagnostics has straight forward influence on the relationship between patient and clinician. There is still a concern about how AI is conventional in assisting patient's side interface and under which chances informed consent is enforced. There should be guidelines regarding AI implementation. Some of the AI programs utilize complex black box testing algorithms which are difficult to understand even by clinicians. Thence, they are watchful for use of AI in healthcare. Health apps and chatbots also provoke consideration regarding bioethicists specifically on user approval aboutinformed consent. When AI is used, informed content is mostly ignored because there is no face-to-face dialogue like traditional informed consent. The considerable concern about AI is that the information communicated to patients is through chatbots. Some of the medical proclamations should be barred to be handed over by a professional not via a DIY application. (Guan, 2019); (Amann, 2020); (Kourou et. al., 2021).

- **Safety and transparency:** Safety is predominant in healthcare and there should be no prejudice in it. AI is predominantly utilized in keeping and assessing patient s' medical records leading to the expedition of treatment options for the patients. If the algorithms are imprecise or improperly trained it leads to unsafe and inappropriate treatment recommendations. The ethical concern here is how to ensure AI keeps the transparency, reliability and validity of datasets. High-quality data must be utilized to train these AI algorithms to ensure reliable performance and valid outcomes. After the analysis of data, data sharing should be confidential to prevent cybersecurity risks. Transparency proclaims the types of data utilized and their limitations. Most medical AI employs black box testing which makes it difficult to establish transparency in this context. (Guan, 2019); (Amann, 2020); (Kourou et al., 2021).

- **Algorithmic fairness and biases:** AI can enhance healthcare overall levels by ensuring the globalization of healthcare. The quality of trained data determines the cohesion and authenticity of the algorithm. Thence, AI produces the risk of bias imparting discrimination based on skin colour or gender, other than bias peculiarities like disabilities. It is challenging to test whether algorithms are biased because of the sophisticated and non-transparent algorithm. If black-box testing is used then it becomes more complicated. Despite all these issues, AI in healthcare must be assessed across all demographics equally for commendable outcomes. (Guan, 2019); (Amann, 2020); (Kourou et al., 2021).

- **Data privacy:** Healthcare information of patients should be confidential. The ethical concern regarding it is that governments and medical institutions might misuse it for their benefits and money making, and often against the interest of the patient. Sometimes AI trainers agree with other partners to utilize patients' data for training and testing their algorithms. The other considerable issue is the type of data being utilized and the degree of privacy invasion. (Guan, 2019); (Amann, 2020); (Kourou et al., 2021).

- **Medicolegal issues:** When patients suffer damage due to AI use, who is liable? Legislations and regulations have largely lagged behind innovations in technologies and their application to medicine. Price & Cohen (2019). Therefore, AI in healthcare must be considered within the relevant legal framework for the protection of the patients, the health practitioner and the healthcare system in general.

**CONCLUSION:**

Artificial Intelligence has a sanguine effect on healthcare because it has the capability to accommodate and analyze gigantic data that produce more precise results. With the use of AI technology, doctors will have to rethink the manner in which they treat their patients. Robotics used in AI play a vital role in the automatic processes in medical science. These robots are used in performing surgeries, and monitoring patients. Using AI in healthcare would reduce cost and it would be convenient to extend medical care to remote areas where health support is limited.

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