

INVOLVEMENT OF ARTIFICIAL INTELLIGENCE IN HEALTHCARE

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Abstract: With the coming of the digital age, there is a compelling need to integrate Artificial intelligence (AI) with healthcare and other aspects of social development which will improve well-being and the quality of life of the population. Availability to the average users, rather than only rich organizations, will help revolutionize healthcare in a more rapid manner. AI technologies are largely developed by high income countries, whereas their use in low-income countries is urgent. AI is thus needed to make a transformation in overall health systems and not to be seen as only a technological solution to solve any one health problem. With innovative and sustainable development of AI in the health sector, we can come close to achieving reliable and quality universal health care for all.

Keywords: Artificial Intelligence, Machine learning, Natural Language Processing, Diagnosis, Privacy and Healthcare.

I. INTRODUCTION

One of the first things that come to mind when one hears the word Artificial Intelligence is the sci-fi movies and shows that depict how robots and cyborgs take over human intelligence and render mankind helpless in purpose. But the reality is far from this. AI is the ability of a machine to display human-like capabilities such as reasoning, learning, planning, and creativity. AI enables technical systems to perceive their environment, deal with what they perceive, solve problems and act to achieve a specific goal. The computer receives data - already prepared or gathered through its own sensors such as a camera - processes it and responds. AI systems can adapt their behaviour to a certain degree by analysing the effects of previous actions and working autonomously.

AI essentially presents ways to complement and supplement human intelligence to devise methods that enrich people's lives. Artificial intelligence is the simulation of human elements by machines/computers that are capable of performing tasks, such as decision making, object detection and solving complex problems.

Artificial Intelligence in Daily Life and Health

Ubiquity of smart devices in society- Everyday uses of AI like Google Maps to predict traffic, Uber for ETAs, Autopilot mode in commercial flights, even our Turnitin reports, show how common AI has become in daily life. Easy access of services at home like those provided by technology companies – fitness apps, e-commerce for home delivery of drugs, telemedicine, are all facilities that use AI in their implementation and are already widely used in homes. Dissatisfaction with the existing medical systems both among the health professionals as well as patients. We are aware of the challenges of accessibility, affordability, inconsistency, and quality of public health services in the country. India thus happens to have the most room for growth in technology in ways to improve the above. Healthcare data is extensive as it needs records of every aspect of a person's life (age, gender, residential address, occupation, etc.), in addition to medical records, to promote a healthy lifestyle and individual well-being. AI can provide a database for the same, for hassle-free future use.

Artificial intelligence is not just one technology, but rather a collection of them. Most of these technologies that we see have immediate relevance to the healthcare field, but the specific processes and tasks that they support, vary widely.

AI Technologies of High Importance to Healthcare

1. Machine learning

Machine learning is one of the most common forms of AI. In healthcare, the most widely used application of traditional machine learning is precision medicine i.e. predicting which treatment protocols can be effective on a patient, depending on various patient attributes and the treatment context. A more complex form of machine learning is the Artificial Neural Network (ANN) can have single or multiple layers, and consist of processing units (nodes or neurons) that are interconnected that allows signals to travel through the network in parallel and consecutively. It views problems in terms of inputs, outputs and weights of variables that associate inputs with outputs.

As for example, if a doctor must make prediction regarding a patient's health as to whether he or she is suffering from a certain disease, how would he ascertain that information? In most cases, it would involve using blood tests, taking the test of patient's vitals, or identifying features that have



proven to be good indicators of patient's health. However, what if the doctors only know a handful of risk factors for a specific disease – or worse, they do not know the risk factors at all? It would be impossible to make predictions. That is where ANN comes into play. They help to provide the predictions in healthcare that doctors and surgeons simply could not address alone. They capture complex relationships that might not be initially obvious but they eventually lead to better prediction for public health.

The most complex forms of machine learning involve deep learning with many levels of features or variables that predict outcomes. A common application of deep learning in healthcare is recognition of potentially cancerous lesions in radiology images. It can also be used to address Healthcare concerns like reducing the rate of misdiagnosis and predicting the outcome procedures using data stored in the Electronic Health Records (EHR).

2. Natural Language Processing (NLP)

Making sense of human language has been a goal of AI researchers since the 1950s. This field, NLP, includes applications such as speech recognition, text analysis, translation and other goals related to language. In healthcare, the dominant applications of NLP involve the creation, understanding and classification of clinical documentation and published research. These systems can analyse unstructured clinical notes on patients, prepare reports (e.g. on radiology examinations), transcribe patient interactions and conduct conversational AI.

3. Rule Based Expert System

AI expert systems are programmed with comprehensive rules and domain-specific data to fetch pre-defined outputs. They require human experts and knowledge engineers to construct a series of rules in a particular knowledge domain. They work well up to a point and are easy to understand. However, when the number of rules is large and the rules begin to conflict with each other, they tend to break down. They are slowly being replaced in healthcare by more approaches based on data and machine learning algorithms. They are extensively being used in diagnosis for diabetes and heart failure tele-monitoring system.

4. Surgical Robots

They provide 'superpowers' to surgeons, improving their ability to see, create precise and minimally invasive incisions, stitch wounds and so forth. Important decisions are still made by the human surgeons, however. Common surgical procedures using robotic surgery include gynaecological surgery, prostate surgery and head and neck surgery.

Benefits and Emerging Opportunities of AI

1. Keeping well

AI increases the ability for healthcare professionals to better understand the day to day patterns and needs of people, for better feedback, guidance, and support. It can be used for health monitoring. For example, wearable health trackers (like those from Fitbit, Apple, and others) which monitors heart rate and activity levels. They can send alerts to the user to get more exercise and can share the information to doctors.

2. Early detection

AI is already being used to detect diseases, such as cancer, more accurately and in their early stages. For example, according to the American Cancer Society, the use of AI is enabling review and translation of mammograms 30 times faster with 99% accuracy, reducing the need for unnecessary biopsies.

3. Diagnosis

Machine learning algorithms can process unimaginable amounts of information in the blink of an eye and has proved to be more precise than humans in spotting even the smallest details in medical imaging. For example, The company Zebra medical vision has partnered with Apollo hospitals in India and developed a new platform called profound which analyse all types of medical imaging reports that is able to find every sign of potential conditions such as osteoporosis, breast cancer and many more.

4. Decision Making

AI technologies are also being used for digital consultation. Improving care requires the alignment of big health data with appropriate and timely decisions, and predictive analytics can support clinical decision making and actions as well as prioritise administrative tasks. For example, Apps like Babylon in the UK uses AI to give medical consultation based on personal medical history and common medical knowledge.

5. Treatment Plan

Artificial intelligence systems can be used in designing the treatment plan. They analyse data notes and reports from a patient's file to help select the correct, individually customised treatment path. Instead of developing treatments for populations and making the same medical decisions based on a few similar physical characteristics among patients, medicine has shifted towards prevention, personalisation and Precision.

6. Research

It can be used to search the scientific literature for relevant studies, and to combine different kinds of data; for example, to aid drug discovery. The Institute of Cancer Research's database combines genetic and clinical data from patients



with information from scientific research, and uses AI to make predictions about new targets for cancer drugs.

7. Training

AI allows those in training to go through naturalistic simulations in a way that simple computer driven algorithms cannot.

AI Adoption Challenges:

Absence of collaborative effort between various stakeholders: while India has adopted electronic health record (EHR) policy sharing of data between various hospital chains remains a work in progress. Since different hospital chains have adopted different interpretations of 'digitising records and relevant data is unavailable. There is absence of robust open clinical data sets and concerns on privacy and security of data, including lack of formal regulation around, Anonymisation of data, Lack of enabling data ecosystems, Low intensity of AI research, Core research in fundamental technologies, transforming core research into market applications, Inadequate availability of AI expertise, manpower and skilling opportunities, High resource cost and low awareness for adopting AI in business processes. Unclear privacy, security and ethical regulations, Unattractive Intellectual Property regime to incentivise research and adoption of AI and Types of AI relevant to healthcare.

Ethical Concerns of AI:

Using AI to monitor health in daily life or in public health screening procedures come laden with major ethical concerns because after all, it is but an algorithm only mimicking human intelligence.

There can be misdiagnoses or even missed diagnoses due to a fault in the working of the device used. But the doctor/patient/organization using it will be blind to this fault as it occurs internally in the machine. They then carry on with the treatment procedure trusting the technology at the cost of health and human life too. Based on the same diagnosis, the further course of prescribing drugs and recommending health promoting practices are made.

A misdiagnosis could lead to faulty prescriptions, either under or over-prescribing of medicines, which can be detrimental to the health of the individual.

One who is dependent on the AI for health investigations and recommendations, has limited insight on how the information that he/she has provided is being used and this limits the capability of an individual to challenge any recommendations made. The level of eHealth literacy in the population is also low, to track the working of these system, making them trust it blindly or completely dismissing them. It thus impinges on the integrity and autonomy of the individual using the system. This could also be an attack on civil liberty.

Normally, the healthcare provider interacts with an individual seeking healthcare based on experience, recommends steps using skills that he/has developed over the years, a moral stance that helps make a decision that could be life-threatening. With the use of automated machines, this is undermined. The agency to decide on treatment protocols and integrity of the healthcare provider too, is hindered in the process.

Breach of data privacy can occur when consent is undermined. One also has no control about sharing of this data with other actors and stakeholders who might use it for their advantage.

The interpersonal relationship between the healthcare worker and the patient is of utmost importance. An individual first gauges the environment and behaviour of the healthcare provider before disclosing any information about himself/herself. To replace a human personality and ease of conversation with technology that is considered to be a black box, having only input and output mechanisms, would be unfair to the recipient. The trust that is needed while discussing matters of such importance as health, would be somewhat diluted if replaced by AI mechanisms. De-personalization of care is a hindrance to achieving good quality healthcare.

Consistent use of these methods from the point of diagnosis to rehabilitation, could make health care institutions over-reliant on them. The technical approach given by the AI databases in terms of diagnosis and recommendations, though apt, have very little focus on the overall well-being of the individual. The psychological aspects and concepts of quality of life, when it comes to handling cancer patients, or chronically ill ones, are not dealt with.

Accountability issues- In a healthcare setting without the use of AI, all the levels of human resources are involved in contributing to a decision about a patient. In case of a positive/negative outcome, it becomes easy to sketch the causal chain that has led to the outcomes, so that the organization can either replicate or improve from the outcomes. But in the wake of an algorithm driven process, the individual contribution of all the levels of healthcare (organizing and brokering of data, analysing it, etc. is singly fed into one system. This makes allocation of responsibility a problem, in case of negative or even positive outcomes.

Google Flu Trends tracked people's Google searches looking for information related to flu, during the spread of the influenza virus in the US. This gave an idea about the prevalence of the condition. But the initial algorithm failed because it had miss-classified influenza like illnesses and symptoms as actual cases of influenza. This distorted the epidemiological calculations, owing to the failure of the project. Learning from such failure of AI integration, is a way forward to improve its implementation in India.



II. CONCLUSION

Strict regulations should be kept in place as challenges and ethical concerns can lead to largely distorted healthcare provision and quality. Every aspect of health is crucial to the life of a person and thus, must be dealt with in a legitimate way, if AI is integrated. Greater transparency would lead to increased trust in the AI systems and their resultant acceptance into society. Regular and judicial use of the AI systems, keeping in mind the security and integrity of healthcare providers as well as the health-seeking individuals, will be a benchmark in achieving better health outcomes in India. The healthcare providers can eventually learn to balance their expertise with the technological inputs of the AI systems, to give comprehensive treatment to the people. This way, the inter-personal relationship is also not jeopardized. Beginning to train the health personnel to work with these AI-infused systems will not only speed up the process, but also increase our quality standards of healthcare.

III. REFERENCES

- [1]. Fehrmann, R.S., van Kruchten, M., & de Vries, E. (2024). How to critically appraise and direct the trajectory of AI development and application in oncology. *ESMO Real World Data and Digital Oncology*.
- [2]. Gupta RK, Kumari R. 2017. Artificial intelligence in public health: Opportunities and challenges. *JK Science*. (19(4):191–2).
- [3]. Joshi, G., Jain, A., Araveeti, S.R., Adhikari, S., Garg, H., & Bhandari, M. (2024). FDA-Approved Artificial Intelligence and Machine Learning (AI/ML)-Enabled Medical Devices: An Updated Landscape. *Electronics*.
- [4]. Krishna, K.V., & Uma, K. (2023). A Review on Current Applications of Artificial Intelligence in Medical Field. *International Journal of Advanced Research in Science, Communication and Technology*.
- [5]. Kulikowski, C.A. (2019). Beginnings of Artificial Intelligence in Medicine (AIM): Computational Artifice Assisting Scientific Inquiry and Clinical Art – with Reflections on Present AIM Challenges. *Yearbook of Medical Informatics*, 28, 249 - 256.
- [6]. Kumar, A., Gupta, A., & Raj, U. (2024). New Era of Intelligent Medicine: Future Scope and Challenges. 2024 11th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO), 1-6.
- [7]. Meskó, B., & Topol, E.J. (2023). The imperative for regulatory oversight of large language models (or generative AI) in healthcare. *NPJ Digital Medicine*, 6.
- [8]. Morley J, Machado CCV, Burr C, Cowls J, Joshi I, Taddeo M, et al. (2020). The ethics of AI in health care: A mapping review. Vol. 260, *Social Science and Medicine*. Elsevier Ltd; (p. 113172).
- [9]. Morley J, Machado CCV, Burr C, Cowls J, Joshi I, Taddeo M, et al. (June 2020). The ethics of AI in health care: A mapping review. *Social Science and Medicine*. (260).
- [10]. Morley, J., Floridi, L., Kinsey, L., & Elhalal, A. (2019). From What to How. An Overview of AI Ethics Tools, Methods, and Research to Translate Principles into Practices. *ArXiv*, abs/1905.06876.
- [11]. Nassiri, K., & Akhloufi, M.A. (2024). Recent Advances in Large Language Models for Healthcare. *BioMedInformatics*.
- [12]. Panch T, Pearson-Stuttard J, Greaves F, Atun R. (2019). Artificial intelligence: opportunities and risks for public health. Vol. 1, *The Lancet Digital Health*. Elsevier Ltd; (p. e13–4). Available from: <http://www.nature.com/>
- [13]. Panch T, Szolovits P, Atun R. (2018). Artificial intelligence, machine learning and health systems. *J Glob Health*; (8:020303).
- [14]. WHO. (2012); 4(August). Innovative and sustainable healthcare management: Strategies for growth Conference background note. (120–30).
- [15]. AI and Data Analytics to Combat Health Pandemic - Express Healthcare. https://www.expresshealthcare.in/blogs/guest-blogs-healthcare/ai-and-data-analytics-to-combat-health-pandemic/419327/?fbclid=IwAR1HgB8dB87iSkXS7Hjzgjik_Tfde-GiCzdL7budQjzxi7zVnoDoSY3rNQ
- [16]. AI and Public Health - AI for VL Prevention - Microsoft Research. <https://www.microsoft.com/en-us/research/video/ai-and-public-health-ai-for-vl-prevention>
- [17]. Artificial Intelligence changing healthcare landscape — Healthcare Executive. <https://www.healthcareexecutive.in/blog/artificial-intelligence-changing-healthcare-landscape>
- [18]. Future of AI in Healthcare in India: Opportunities and Challenges – New Age Healthcare. <https://newagehealthcare.in/2020/05/21/future-of-ai-in-healthcare-in-india-opportunities-and-challenges/>
- [19]. How Artificial Intelligence Could Transform Public Health | SD Global. <https://www.sdglobaltech.com/blog/how-artificial-intelligence-could-transform-public-health>
- [20]. Top 12 Ways Artificial Intelligence Will Impact Healthcare. <https://healthitanalytics.com/news/top-12-ways-artificial-intelligence-will-impact-healthcare>