

VIEW POINT

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Artificial Intelligence in Healthcare and Application in the Fight against Current Pandemic - COVID-19**Ipsa Mohapatra¹, Purushottam Giri²**

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ABSTRACT

The use of Artificial intelligence (AI) in healthcare in India is increasing with new start-ups and large ICT companies offering AI solutions for healthcare challenges in the country. India can be a stakeholder in revolutionizing Artificial intelligence as it is the second populous country in the world and has a fast-growing economy. Governments have proposed policies to mitigate the impacts of the COVID-19 pandemic. Artificial intelligence can prove to be an efficient tool for identification of early infections, monitoring patients with active infection, decision making and treatment, developing treatment protocols, prevention strategies, drugs and vaccine development. It can help at different directions starting from medical, epidemiological to molecular applications.

Key words: Artificial Intelligence, COVID-19, Health care, Pandemic

Introduction:

The use of Artificial intelligence (AI) in healthcare in India is increasing with new start-ups and large ICT companies offering AI solutions for healthcare challenges in the country. Such challenges and solutions include addressing the uneven ratio of skilled doctors to patients and making doctors more efficient at their jobs; the delivery of personalized healthcare and high quality healthcare to rural areas; and training doctors and nurses in complex procedures. The emerging use cases of Artificial intelligence (AI) in the healthcare sector can be seen as a collection of technologies enabling machines to sense, comprehend, act and learn so they can perform administrative and clinical healthcare functions, as well as be used in research and for training purposes.^[1] Artificial intelligence can revolutionize the practice of medicine and transform the role of the doctor. Artificial intelligence refers to the ability of machines to perform cognitive tasks like thinking, perceiving, learning, problem solving and decision making. Although, initially conceived as a technology that could mimic human intelligence, Artificial intelligence has evolved in ways that far exceed its original conception. With incredible advances made in data collection, processing and computation power, intelligent systems have taken over a variety of tasks, enabled connectivity and enhanced productivity.^[2]

While Artificial intelligence in healthcare promises great benefits to patients, it equally presents risks to patient safety, health equity and data security. Currently it has been used in medical diagnosis, in psychiatry and for treatment of certain medical ailments.^[3] Due to new start-ups and large IT companies offering AI solutions for healthcare challenges, there has been an increasing trend in use of Artificial intelligence in healthcare in the country.^[4]

Current strengths^[3] -

- AI has lately been found to be as effective as humans in the diagnosis of various medical conditions, and in some cases, more effective.
- It's ability to learn from a large data set and recognize patterns, has made it possible to be used to diagnose conditions; putting it in direct competition with medical specialties (like radiology and pathology) that are involved in diagnostic tests.
- When it comes to predicting suicide attempts, recent research suggest AI is better than human beings.

Challenges^[3,4] -

- Legal liability and attribution of negligence when errors occur, and the ethical issues relating to patient choices.

- Biases developed / learnt in AI systems need to be identified and mitigated.
- Training and testing on data that is not clinically meaningful
- Lack of independent blinded evaluation on real-world data
- Narrow applications that cannot generalize to clinical use
- Inconsistent means of measuring performance of algorithms
- Commercial developers' hype may be based on unpublished, untested and unverifiable results.

Future of AI in India (National Strategy for Artificial Intelligence by NITI Aayog, 2018) ^[2] - India can be a stakeholder in revolutionizing AI as it is the second

populous country in the world and has a fast growing economy. Hon'ble Finance Minister, in his budget speech for 2018-2019, mandated NITI Aayog to establish the National Program on AI, with a view to guiding the research and development in new and emerging technologies. NITI Aayog has adopted a three-pronged approach – undertaking exploratory proof-of-concept AI projects in various areas, crafting a national strategy for building a vibrant AI ecosystem in India and collaborating with various experts and stakeholders. NITI Aayog has decided to focus on five sectors that are envisioned to benefit the most from AI in solving societal needs:- a) Healthcare: increased access and affordability of quality healthcare, b) Agriculture: enhanced farmers' income, increased farm productivity and reduction of wastage, c) Education: improved access and quality of education, d) Smart Cities and Infrastructure: efficient and connectivity for the burgeoning urban population, and e) Smart Mobility and Transportation: smarter and safer modes of transportation and better traffic and congestion problems.

Healthcare is one of the most dynamic, yet challenging sectors in India, and is expected to grow to USD 280 billion by 2020, at a compound annual growth rate (CAGR) of upwards of 16%, from the current ~USD 100 billion.

Still it faces major challenges of quality, accessibility and affordability for a large section of the population: a) Shortage of qualified healthcare professionals and services and infrastructure: as evidenced in 0.76 doctors and 2.09 nurses per 1,000 population (as compared to WHO recommendations of 1 doctor and 2.5 nurses per 1,000 population respectively) and 1.3 hospital beds per 1,000 population as compared to WHO recommended 3.5 hospital beds per 1,000 population. b) Non-uniform accessibility to healthcare across the country in terms of physical access, which acts as a barrier to both preventive and curative health services. There is also a wide disparity between rural and urban healthcare in India. c) Lack of consistent quality in healthcare across India, most of the services provided is individual driven rather than institution driven, and less than 2% of hospitals in India

are accredited. d) Affordability remains a problem with private expenditure accounting for ~70% of healthcare expenses, of which ~62% is out-of-pocket expenditure, probably one of the highest in the world. The poor and marginalized community being hit the most; according to recent government estimates around 63 million face poverty each year because of their healthcare expenditure. Significant portion of hospital costs in both rural (~47%) and urban India (~31%) are financed by loans and sale of assets. e) Reactive approach to essential healthcare largely due to lack of awareness, access to services and behavioural factors implies that majority of patients approach a hospital / physician only when a disease has reached an advanced stage, thus increasing the cost of care and reducing the chances of recovery.

Artificial intelligence (AI) has solutions to tackle the scarce personnel and lab facilities; help overcome the barriers to access and solve the accessibility problem; through early detection, diagnostic, decision making and treatment, thereby catering to a large part of the country. India has an incidence of more than one million new cases of cancer every year. AI provides scope for targeted large scale interventions in areas of cancer screening and treatment. Early detection and management being crucial, AI can help in an optimum cancer treatment regimen across the country. NITI Aayog is in an advanced stage for launching a programme to develop a national repository of annotated and curated pathology images. Another related project under discussions is an Imaging Biobank for Cancer. NITI Aayog is working with Microsoft and Forus Health to roll out a technology for early detection of diabetic retinopathy as a pilot project. 3Nethra, developed by Forus Health, is a portable device that can screen for common eye problem. Integrating AI capabilities to this device using Microsoft's retinal imaging APIs enables operators of 3Nethra device to get AI-powered insights even when they are working at eye checkup camps in remote areas with nil or intermittent connectivity to the cloud. The resultant technology solution also solves for quality issues with image capture and systems checks in place to evaluate the usability of the image captured. AI based healthcare solutions can also help in making healthcare services more proactive moving from "sick" care to true "health" care, with emphasis on preventive techniques.

Artificial intelligence in the context of fight against COVID-19 - Globally, as of 4th May 2020, there have been 34,35,894 confirmed cases of COVID-19, including 2,39,604 deaths, reported to WHO.^[5] In this hour of health crisis, with the medical industry looking for newer technologies, AI can play an important role ^[6,7] in -

2,39,604 deaths, reported to WHO.^[5] In this hour of health crisis, with the medical industry looking for newer technologies, AI can play an important role ^[6,7] in -

- Early detection and diagnosis of the infection
- Monitoring treatment
- Contact tracing
- Futuristic projections of cases and mortality
- Development of drugs and vaccines
- Reducing workload of healthcare workers
- Prevention of disease

viii. Computational Biology and Medicine

i. Early detection and diagnosis of the infection: with the help of Artificial intelligence, we can analyze the irregular symptoms, provide quicker diagnosis and still keep it cost-effective.

ii. Monitoring treatment: Artificial intelligence can help design a platform which will make monitoring easier and predict the course of disease by using a neural network which will help extract the visual features of the disease.

iii. Contact tracing: by identifying the clusters and ‘hot spots’, Artificial intelligence can help in contact tracing.

iv. Futuristic projections of cases and mortality: Artificial intelligence technology can track and forecast the nature and its likely spread of the virus. It can also predict the number of positive cases and deaths in any region. It utilizes the available data, records from media and social media for this.

v. Development of drugs and vaccines: Helps in drug research, drug delivery design, making the drug testing time less and hence accelerates the process. Artificial intelligence has also proved to be a boon in developing vaccines and treatments. It is a powerful tool for diagnostic test designs and vaccine development.

vi. Reducing workload of healthcare workers: with the increasing number of cases, there is an increase in the workload of healthcare professionals. By early diagnosis, using digital approaches in decision making it shows a promising role in future in reducing the workload of healthcare workers.

vii. Prevention of disease: real-time data analysis provides updated information, which helps in prevention. By helping in predicting the probable sites of infection, need for the health infrastructure and professionals in this crisis, it indirectly helps in preparedness and secondary prevention.

viii. Computational Biology and Medicine: As it is able to predict structures of a protein, it helps understand the functions. AlphaFold the latest version of Google Deep Mind is using this protein structure prediction system, to predict structures of several proteins associated with COVID-19 based on their corresponding amino acid sequences. These predictions are expected to help in development of therapeutics against COVID-19 in future. AI methods can automatically extract useful information from high-dimensional data and construct molecules without manually designing features and learning the relationships between molecular structures and their pharmacological properties. This proposed approach will not only be cost-effective but being time-efficient, will help in making novel drug compounds against COVID-19.

Conclusion:

The chaos and health crisis, due to novel corona virus disease (COVID-19), affecting people’s lives, causing large number of deaths, has proven to be one of the greatest challenges for mankind. Starting with its first case being detected in Wuhan, China in December 2019

and now it has been spread to almost every country. Governments have proposed policies to mitigate the impacts of the COVID-19 pandemic. AI can prove to be an efficient tool for identification of early infections, monitoring patients with active infection, decision making and treatment, developing treatment protocols, prevention strategies, drugs and vaccine development. It can help at different directions starting from medical, epidemiological to molecular applications.

Doctors, especially those in leadership roles, need to be aware of how fast AI is advancing in health, so that they are ready to lead the change required for its adoption by the health system. As doctors and health leaders, we need to start preparing the profession to be supported by, partnered with the advanced robotics systems. Although AI has the potential to transform the role of the doctor and revolutionize the practice of medicine in future, still policy makers should avoid thinking that AI is going to solve all the problems the health and healthcare systems across our country. Artificial intelligence in India is still in its infancy. In health and healthcare, it has hardly started despite the claims of some high profile players. As with traditional clinical activity, patient safety must remain paramount and AI must be developed in a regulated way in partnership between clinicians and computer scientists. AI should be used to reduce, not increase, health inequality – geographically, economically and socially.

Recommendations:

Encouraging AI research and development: Enabling medical colleges to develop centers devoted to research on Artificial intelligence, and facilitates the exchange of knowledge between academic centers across countries. This can be achieved by collaborations between the government and large companies to promote accessibility and encourage innovation through greater R&D spending. The Government of Karnataka, for instance, is collaborating with NASSCOM to set up a Centre of Excellence for Data Science and Artificial Intelligence (CoE-DS&AI) on a public-private partnership model to accelerate the ecosystem in Karnataka by providing the impetus for the development of data science and artificial intelligence across the country.^[8] Similar centers could be incubated in hospitals and medical colleges in India.

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