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TRANSFORMING HEALTHCARE IN INDIA THROUGH ARTIFICIAL INTELLIGENCE

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Abstract

The healthcare sector in India is experiencing a significant transformation due to the implementation of Artificial Intelligence (AI) in its various aspects. AI's role in healthcare spans across diagnostics, treatment, drug discovery, and patient care, thereby enhancing the quality of healthcare delivery and reducing costs. With its magic being spread all over the globe, it is important to analyse its potential and the possible obstructions it is facing in the present time. This article will explore the various applications of AI in the Indian healthcare sector and discuss its potential in addressing the country's unique challenges. It will further delve into the main legal drawbacks for the use of AI in India's healthcare and examine the challenges in establishing liability and accountability for AI in India's healthcare sector and propose recommendations and suggestions which could possibly be potential solutions to address these concerns.

1. Introduction

Today, healthcare is one of those areas where we are seeking the most success. Life expectancy has increased globally due to significant advancements in medical technology, but as people live longer, healthcare systems must contend with expanding patient demand, rising expenditures, and a staff that is stretched thin. It is expensive to manage these patients, and systems must change from a mindset of episodic care to one that is considerably more pro-active and centered on long term care. Without a transformational change, the healthcare system would come at the hands of struggle to thrive and be sustainable in this changing universe. The global economy could foreseeably generate 40 million new employments in the health industry by 2030, but the World Health Organization projects that there will still be a global shortage of 9.9 million doctors, nurses, and midwives at that time. Health systems also require a larger workforce.[1] In addition to recruiting, educating, and keeping more healthcare professionals, we also need to make sure that

[1] Global Strategy for Human resources for Health: Workforce 2030, World Health Organisation, 2019, available at: www.who.int.com (accessed 08 May, 2023).

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they are spending their time on what matters most—care for patients.

In this era of technological revolution where Artificial Intelligence is taking a boost over almost all the industries around the globe, it is important to highlight and explore its vast scope in the healthcare sector. AI is something which is seen as similar to human intellect. It is intended to be a technological interface that enables a machine to perform a task that "feels" human. Artificial intelligence (AI) is the use of programmable computer software routines (algorithms) with precise instructions to carry out tasks that a human brain is typically thought to be required for. Such software can assist users in comprehending and processing language, identifying noises and objects, and using learning patterns to solve issues. An algorithm can be constantly improved using machine learning (ML). In order to update the algorithm and increase the artificial intelligence's accuracy, the refinement process uses a lot of data and is carried out automatically.[2] By drawing new and significant insights from the huge quantity of data generated on a daily basis, AI and Machine Learning (ML) based- technologies have the potential to revolutionize the healthcare sector for the greater good. AI has brought about a significant impact in health sector, changing the patterns of how we can identify, cure and monitor the patients. Not only the scope lies in cure of the diseases but AI can also make prevention of diseases a better run task too. It has the power to enhance and the effectiveness and productivity of care delivery. More time can be given to looking after patients which would help medical practitioners be more efficient. The COVID-19 viral pandemic, which from early 2020 drove the world into a public health catastrophe of unparalleled proportions, has given additional urgency to the need for investigating the potential prospects and risks of using AI systems for healthcare reasons.

However, with the optimistic approach with which inclusion of AI in healthcare is to be considered, the fact that, since AI is still in its infancy, its long-term effects are unknown. Future uses of AI could fundamentally alter how healthcare is provided, how innovation is approached, and how each of us views our own health. We can see a moment in the future when population-level data from wearables and implants will transform our knowledge of human biology and the mechanisms underlying the action of medications, enabling personalized and real-time care for all. Despite the uncertainties surrounding the final scope of applications for new technologies,

[2] Zandi, D., Reis, A., Vayena, E. and Goodman, K. (2019), 'New ethical challenges of digital technologies, machine learning and artificial intelligence in public health: a call for papers', *Bulletin of the World Health Organization*, 97(1), pp. 1–72, doi:10.2471/BLT.18.227686 (accessed 3 May. 2023).

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there are some short-term opportunities and initiatives that may be taken to help health practitioners and systems more quickly benefit from advancements in AI.

In India, AI is making deep strides in the sector of healthcare. Google, Microsoft and Siemens as well as other startups in India are working progressively to introduce AI solutions to enhance the already existing country's healthcare needs of the hour. Global observers anticipate that India's unsustainable patient-to-doctor ratio will push the government to more quickly integrate AI and Deep Learning (DL) into its current diagnosis and treatment procedures.[3]

Even while AI development is India's best chance to maintain its healthcare system, a lack of a strong legal framework and a visionless application of AI medical technology will simply exacerbate the crisis rather than help it. The question over here arises that with such efficient technologies available at the present day in the country which could enhance the healthcare sector progressively, we lack a legislation which covers the legal aspects of use of AI, its processes, its end result, the liability, data use, security and privacy.

With such advance technologies being incorporated in healthcare sector in India, there comes a number of challenges along with the legal conundrum that needs attention. While AI may enhance Indian healthcare, it won't be a quick remedy for the country's existing complicated healthcare system, which involves many different components, conflicting objectives, ingrained incentive structures, and institutional cultures.

Therefore, the understanding of incorporation of AI in healthcare sector in India along with a closer view to the challenges and risks involved in the development, adoption and deployment of AI is beneficial to understand the lacuna prevalent in the Indian Legislation to deal with such kinds of scientific advancements in healthcare.

Objective of the Study

The objectives of the study are:

a) To understand the concept of use of AI in healthcare sector.
b) To understand the application of AI in healthcare sector in India.

[3] Artificial Intelligence (AI), Healthcare and Regulatory Compliance, Forbes (March 20, 2018).

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c) To understand the challenges faced by AI in healthcare sector in India.
d) To propose suggestions for possible solutions to the problems faced by AI in healthcare sector in India.

Hypothesis

Based on intensive research the researchers have framed the following Hypothesis:

H01: Inspite of being a beneficial technological advancement, use of AI in healthcare sector face a lot of challenges and risks in India.

H02: There is a legal conundrum in using AI in healthcare sector in India with poor regulatory framework.

Research Methodology

The methodology opted for carrying out this research paper is doctrinal. It was difficult for the author to conduct empirical study. So, a doctrinal research with the help of both primary and secondary data is used. In primary data, the author has analysed various legislations. In secondary data, the author has analysed scholarly articles and research papers to get hold of the present applications and challenges in the use of AI in healthcare sector.

Research Questions

There are a few research questions around which the present piece revolves which are as followed:

1. What is the application of AI in healthcare sector and how it is beneficial?
2. What is the scenario of use of AI in healthcare sector in India?
3. What are the legal challenges that use of AI in healthcare sector in India is currently facing?
4. Whether a highly beneficial technological improvement be considered as not acceptable only because it does not fit into the existing legal framework?

2. Understanding AI in Healthcare

The World Economic Forum has suggested four ways artificial intelligence can make healthcare more efficient and affordable: enable customized treatment plans that improve patient outcomes, thereby reducing costs associated with treatment complications; enabling better and earlier

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diagnosis that reduces human error; enabling accelerated drug development; and enable patients to take a more active role in managing their health.[4] The potential savings that AI would bring to the healthcare sector is also a parameter that cannot be ignored. The utmost goal of having a great healthcare sector is achievable by given the most importance to care for the patients, AI in healthcare would be in a way lead to liberation of health workers from menial tasks and focus completely on patient care. This would also eventually lead to the medical practitioners to assess the patients closely and precisely which would lead to more accurate diagnosis. Use of AI for Administrative purpose is another facet which is important to highlight while talking about its other advantages. Doctors, nurses, and other healthcare professionals will be relieved of the laborious tasks that contribute to burnout, thereby also reducing human error in medical practice.[5] According to Accenture, the benefits of artificial intelligence are increasing incrementally, from automated surgeries, precision surgery and preventive interventions (thanks to predictive diagnostics) and are expected to fundamentally transform the field of healthcare within a decade.[6]

The definition of Artificial Intelligence is evolving. It includes Machine Learning (ML), natural language processing, speech recognition, robotics, systemization, optimization, decision making algorithm that resembles a human expert, all of this done under Deep Learning (DL) Mechanism. The most often used strategy for contemporary AI healthcare applications is machine learning (ML), a subset of AI that enables computational systems to learn from data and improve their performance without being explicitly programmed. A branch of machine learning called deep learning uses multiple-layered artificial neural networks to find patterns in very large datasets.[7] Artificial intelligence that uses deep learning focuses on algorithms that let computers adapt and learn from new data without having to be reprogrammed. More specifically, it refers to methods that enable machines to independently imitate human thought patterns using artificial neural networks made of information-cascading layers. To understand the solutions developed by AI in the health sector, it is important to understand AI under the heads Descriptive AI and Predictive

[4] World Economic Forum (2018), 'Four ways AI can make healthcare more efficient and affordable', 31 May 2018, https://www.weforum.org/agenda/2018/05/four-ways-ai-is-bringing-down-the-cost-of-healthcare (accessed 5 May. 2023).
[5] Ash, M., Petro, J. and Rab, S. (2019), 'How AI in the Exam Room Could Reduce Physician Burnout', Harvard Business Review, 12 November 2019, https://hbr.org/2019/11/how-ai-in-the-class="•-No-break">exam-room-could-reduce-physician-burnout (accessed 5 May. 2023).
[6] Forbes (2019), 'AI and Healthcare – a Giant Opportunity', 11 February 2019, https://www.forbes.com/sites/insights-intelai/2019/02/11/ai-and-healthcare-a-giant-opportunity/#60febfc4c682 (accessed 5 May. 2023).
[7] Mehta N, Devarakonda MV. Machine learning, natural language programming, and electronic health records: The next step in the artificial intelligence journey? J Allergy Clin Immunol 2018; 141:201921.

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AI.

Descriptive AI: In terms of immediate potential, descriptive AI is being applied most frequently in healthcare technologies. It quantifies past occurrences and makes use of this information to draw additional conclusions, such as identifying trends and minute alterations that could otherwise go undetected by medical experts.

Predictive AI: The goal of predictive AI is to forecast the future using descriptive data. Medical experts employ AI to offer insights and make action suggestions in a foresighted manner. Predictive healthcare technologies and hospital administration can both benefit greatly from AI. In triage, which is the process of ranking patients' therapies according to the seriousness of their conditions, predictive AI can be applied.[8] Predictive AI's ability to make decisions makes it the most intriguing and divisive use case in the near future, dramatically enhancing clinician productivity, capacity, and quality of treatment.[9]

Analysis of existent AI Medical Devices in India

In India, while technology that could replace doctors have the least probability of success, assistive AI has the greatest development potential, in part due to conflicts of interest among the medical establishment. India is a host to many startups and large scale companies which are harnessing AI solutions in healthcare using both the Descriptive AI as well as Predictive AI algorithms. A review of the existent AI solutions in healthcare gives a picture of how Deep Learning Mechanism of AI is coming handy in healthcare. India, a rapidly developing nation, is now leveraging the power of Artificial Intelligence (AI) to improve its healthcare sector. AI has immense potential in the healthcare industry, and in a country like India, with its vast population and varying socioeconomic conditions, the use of AI can revolutionize healthcare delivery, accessibility, and affordability. Enhanced Diagnostics

AI has significantly improved diagnostic capabilities by assisting medical professionals in accurately identifying diseases and conditions. AI-powered tools like machine learning

[8] Mathur, V. and ors. (2017), Billionfit: Technology redesigning healthcare [White paper]., from Grant Thornton India LLP: <http://www.grantthornton.in/ globalassets/1.-member-firms/india/assets/pdfs/billionfit-technology--redesigning-healthcare.pdf.> assessed 12 May, 2023.
[9] F. Dare (3 May, 2017,), Can High Tech Be High Touch in Healthcare? <https://www.accenture.com/us-en/blogs/blogs-high-tech-high-touchhealthcare> accessed 12 May 2023.

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algorithms can analyze large volumes of medical images and data, such as X-rays, CT scans, and MRIs, to detect patterns that might be missed by the human eye. In India, AI is being used to diagnose conditions like diabetic retinopathy, tuberculosis, and various types of cancer more effectively and efficiently.

Predictive Analytics

Predictive analytics using AI can help in the early detection of potential health issues and aid in preventing the spread of infectious diseases. India has already started leveraging AI to predict and manage disease outbreaks like dengue and malaria. AI-driven predictive models can also identify high-risk individuals who may require additional medical attention or intervention, ensuring that resources are allocated effectively.

Telemedicine and Remote Monitoring

With the current limitations in healthcare infrastructure and a shortage of trained medical professionals in India, telemedicine and remote monitoring have emerged as critical tools in bridging the gap. AI-powered applications can facilitate remote consultations with medical professionals, enabling patients in rural areas to access quality healthcare without traveling long distances. Additionally, AI-enabled wearables and devices can monitor vital signs and alert doctors if any significant changes are detected.

Drug Discovery and Development

AI has the potential to expedite drug discovery and development, reducing the time and cost involved in the process. In India, pharmaceutical companies and research institutions are utilizing AI to analyze data, identify potential drug candidates, and predict their effectiveness. This approach can result in a faster delivery of life-saving drugs and therapies to patients.

Healthcare Chatbots

AI-powered chatbots are being used in India to provide instant medical advice and support to users. These chatbots can answer health-related questions, schedule appointments, and even provide reminders for medication. With the ability to communicate in multiple languages, healthcare chatbots have the potential to provide essential healthcare information and assistance to millions of people across the country.

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Few successful AI solutions in healthcare sector in India are enumerated herein to understand the scope and extreme potential of it bring success to the medical fraternity.

Thermalytix, an artificial intelligence-powered computer-aided diagnostic engine is the main component of **Niramai Health Analytix** which uses thermal analysis and machine intelligence driven automated device to detect early stages of breast cancer.[10]

Advenio Tecnosys diagnoses Tuberculosis from chest X-Rays and uses ultrasound pictures to detect chest infections by giving solution by using a high -resolution thermal sensor device and tool with cloud hosted analytics for analysing the thermal images.[11]

Qure.ai diagnoses diseases and recommends personalized data plans by using deep learning technology on healthcare imaging data.[12]

Through a smartphone app, **Cureskin** can identify and diagnose six different types of common skin issues, including pimples, acne, scars, dark spots, pigmentation, and dark circles. It asserts that for the six skin disorders it currently treats, the accuracy of its deep learning algorithms is at dermatologist level.[13]

Such AI devices are already in use in India and have gain progressive outcomes. India is among the top 20 markets for medical equipment in the world. In Asia, it ranks fourth in terms of market size for medical devices, behind South Korea, China, and Japan. The automatic route allows for up to 100% of Foreign Direct Investment (FDI) in medical devices. The majority of the equipment used in the manufacturing of medical devices is imported, with foreign sources accounting for around 75% of the total.[14] Between 2011–12 and 2014–15, both medical equipment imports and exports increased by more than 10% (according to a report by the department of pharmaceuticals). With a compound annual growth rate (CAGR) of 15.8%, the country's medical devices business

[10] Niramai Technology, <http://niramai.com/technology/.>accessed 12 May 2023.
[11] Chironx, <https://chironx.ai/>accessed 12 Ma7 2023.
[12] Qure.ai, <http://qure.ai/> accessed 12 May, 2023.
[13] S. Sharma (23 November, 2017), This AI-enabled dermatology app aims to save Indians the blushes, <https://factordaily.com/cureskin-ai-skincare/>accessed 12 May, 2023.
[14] Jatin Verma, Draft Medical Devices (Safety, Effectiveness and Innovation Bill, 2019 <https://www.jatinverma.org/uploads/downloads/Draft_Medical_Devices_(Safety,_Effectiveness_and_Innovation)_Bill,_2019.pdf> accessed 12 May, 2023.

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increased from $2.02 billion in 2009 to $3.9 billion in 2015.[15]

However, even after these advancements, there are still a lot of challenges at the hand of the use of AI in healthcare sector which are needed to be addressed in the light of legal as well as other aspects.

Challenges and Future Outlook

Despite the numerous benefits that AI brings to the healthcare sector in India, there are challenges that need to be addressed. These include the availability of quality healthcare data, privacy concerns, and the digital divide between urban and rural areas. Moreover, AI algorithms need to be developed with cultural and regional diversity in mind to ensure equitable access and benefits.

To overcome these challenges, the government, private sector, and academia must work together to create an ecosystem that encourages research, innovation, and the ethical use of AI in healthcare. By prioritizing AI integration and addressing these challenges, India has the potential to transform its healthcare sector and improve the quality of life for its citizens.

3. Navigation Legal Conundrum: AI in Medical Sector in India

The rapid advancement of Artificial Intelligence (AI) in the Indian healthcare sector presents numerous benefits, such as improved diagnostics, personalized medicine, and efficient resource allocation. However, the integration of AI in healthcare also raises several legal concerns that need to be addressed to ensure its responsible and ethical deployment. This article will delve into the main legal drawbacks for the use of AI in India's healthcare sector and discuss potential solutions.

Data Privacy and Protection

AI relies on vast amounts of data to function effectively, and in healthcare, this means accessing sensitive patient information.[16] India's current data protection framework, the Information

[15] Kumar Chebrolu, Smart use of AI in Healthcare<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6779111/https://www2.deloitte.com/us/en/insights/industry/health-care/artificial-intelligence-in-health-care.html> accessed12 May, 2023..

[16] Hern, A. (2017), 'Royal Free breached UK data law in 1.6m patient deal with Google's DeepMind', Guardian, 3 July 2017, https://www.theguardian.com/technology/2017/jul/03/class="•-No-break">google-deepmind-16m-patient-royal-free-deal-data-protection-act (accessed 14 May. 2023)

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Technology (Reasonable Security Practices and Procedures and Sensitive Personal Data or Information) Rules, 2011, is inadequate to address the unique challenges posed by AI. The Personal Data Protection Bill, 2019, aims to strengthen the data protection landscape in India, but its passage and implementation remain pending.

Liability and Accountability

Determining liability in cases where AI-driven healthcare tools cause harm or misdiagnose patients is complex. Traditional medical malpractice laws focus on human negligence, making it challenging to hold AI systems, their developers, or healthcare providers accountable.

Moreover, there is complexity of AI-driven decision-making. AI systems in healthcare can make highly complex decisions based on large volumes of data, making it difficult to trace the reasoning behind specific outcomes. This lack of transparency, often referred to as the "black box" problem, complicates assigning responsibility when errors occur. [17]

Current medical malpractice laws in India are centered around human negligence and may not be well-suited to address the unique challenges posed by AI-driven healthcare tools. Assigning liability to heahcare providers, AI developers, or manufacturers may be difficult when AI systems make errors or cause harm.

Determining the appropriate standard of care for AI-driven healthcare tools is crucial in assessing liability. As AI technologies become more sophisticated, it may be challenging to determine whether a particular tool meets the expected standard of care or if a human healthcare provider could have achieved a better outcome.

In cases where AI systems and human healthcare providers both contribute to errors or harm, assigning liability becomes even more complex. Shared liability scenarios may arise, requiring a reevaluation of traditional liability structures.

[17] Gershgorn, D. (2018), 'If AI is going to be the world's doctor, it needs better textbooks', Quartz, 6 September 2018, https://qz.com/1367177/if-ai-is-going-to-be-the-worlds-doctor-it-class="•-No-break">needs-better-textbooks (accessed 11 May. 2023).

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Intellectual Property (IP) Rights

AI's involvement in drug discovery and medical innovation raises questions about IP rights. Current Indian patent laws do not provide clear guidance on whether AI-generated inventions qualify for patent protection, creating uncertainty for AI-driven healthcare startups and companies.[18]

Ethical Considerations

AI in healthcare can inadvertently perpetuate biases present in the data used for training. This may lead to disparities in treatment recommendations and access to healthcare services for certain demographic groups.

Regulatory Framework

The Indian healthcare sector lacks a comprehensive regulatory framework for AI applications. Without proper guidelines, there is a risk of adopting substandard AI technologies, which could compromise patient safety and the overall quality of healthcare delivery.

4. Recommendations and Suggestions

India must expedite the adoption of comprehensive data protection legislation, ensuring that AI applications in healthcare adhere to strict privacy standards and informed consent protocols. Legislators need to develop clear guidelines that establish responsibility in cases involving AI errors, possibly considering new forms of liability that recognize the role of both human and AI actors in healthcare decision-making. To address the black box problem, AI developers should strive for algorithmic transparency, providing clear explanations for AI-generated outcomes. This will enable healthcare providers and patients to better understand the decision-making process and more easily identify the responsible parties in cases of errors.

India's legal framework must evolve to consider the role of AI in healthcare decision-making. Lawmakers should consider new forms of liability that recognize the involvement of both human and AI actors in healthcare outcomes. This may include introducing laws that specifically address AI malpractice or updating existing regulations to accommodate AI's role in healthcare.

[18] The Lancet (2017), 'Artificial intelligence in health care: within touching distance', The Lancet, 390(10114), doi:10.1016/S0140-6736(17)31540-4 (accessed 13 May. 2023).

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Establishing clear guidelines and industry standards for AI-driven healthcare tools can help clarify the expected standard of care. This may involve collaboration between healthcare providers, AI developers, and regulatory authorities to develop performance benchmarks and best practices for AI in healthcare.

Lawmakers should consider creating legal frameworks that accommodate shared liability, taking into account the contributions of both AI systems and human healthcare providers in cases of errors or harm. This may involve adapting existing negligence laws or creating new legal categories that specifically address AI's role in healthcare.

Indian IP laws need to be updated to clarify the patentability of AI-generated inventions, ensuring that AI developers and healthcare organizations receive appropriate recognition and protection for their innovations.

To address ethical concerns, healthcare organizations and AI developers should adopt inclusive data collection and algorithmic fairness practices, ensuring that AI tools are free from biases and provide equitable healthcare solutions for all.

India needs to develop a robust regulatory framework specific to AI in healthcare, setting rigorous standards for AI-driven tools and technologies, and providing a clear pathway for their approval and implementation.

5. Conclusion

With the rapid inclusion of AI in every industry worldwide, from ChatGpt to MusicLM which turns text into music, it is time to explore the mind-boggling results of using AI in healthcare. India is already on the way of adding new AI solutions to healthcare industry which makes it important to analyse every facet of it. Artificial intelligence plays an important role in the healthcare offerings of the future. In the form of machine learning, it is the primary capability behind the development of precision medicine, which is widely recognized as a much-needed advance in care. Although early efforts to provide diagnostic and treatment recommendations have proven challenging, we expect AI to eventually master this domain as well. Given the rapid advances in AI for imaging analysis, it seems likely that most radiology and pathology images

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will be examined by a machine at some point. Speech and text recognition are already used for tasks such as patient communication and clinical note capture, and their use will increase. As AI continues to transform India's healthcare sector, addressing these legal challenges is essential to ensure that its deployment is responsible and beneficial to all. By establishing comprehensive data protection laws, clarifying liability and IP issues, addressing ethical concerns, and developing a robust regulatory framework, India can harness the full potential of AI in healthcare, while safeguarding the interests of patients, healthcare providers, and AI developers.