Journal of The Gujarat Research Society

ISSN: 0374-8588
Volume 21 Issue 4, April 2019

An Overview of Artificial Intelligence in HealthCare

Dr. Aniket Kumar, Dr. Shiva Sharma, Mr. Hamid Ali

Shobhit Institute of Engineering and Technology (Deemed to be University), Meerut

Email Id- aniket.kumar@shobhituniversity.ac.in, shiva@shobhituniversity.ac.in, hamid.ali@shobhituniversity.ac.in

ABSTRACT: In this paper , an overview of current instances of artificial intelligence (hereafter AI) in healthcare is provided, as well as the possibilities and difficulties that may be encountered when integrating and utilizing AI technology. Several definitions of AI may be found in the literature, including dictionaries and research. In the article, these definitions are stated. In the context of this article, AI is defined as a machine's capacity to mimic intelligent human behavior. The study's focus is on artificial intelligence in healthcare. The study's aim is to provide a visual depiction of AI's current use in healthcare. The following activities help to achieve the goal: classifying AI systems used in healthcare and creating a global map of top AI companies in this area. The research technique was statistical observation based on a review of sources on current AI initiatives.

KEYWORDS: Artificial Intelligence, Health Care, Medical, Techniques, Treatment.

1. INTRODUCTION

The landscape of healthcare and biological research is progressively shifting due to artificial intelligence. In India, ophthalmologists and computer scientists are collaborating to test and implement an automated image analysis system. Millions of diabetes patients' retinal images will be screened using a categorization system. Diabetic retinopathy (DR) affects over 90 million individuals globally and is the main cause of adult blindness. Fundus photography is a useful tool for tracking the progression of DR and identifying individuals who will benefit from early therapy[1][2]. However, there are insufficient ophthalmologists in many areas of the globe to interpret fundus pictures and follow up with each diabetes patient. A group of researchers from Google Inc. and other universities demonstrated that an AI system trained on hundreds of pictures can diagnose referable DR5 with physician-level sensitivity and specificity, as well as in discovering previously unknown connections between picture patterns in the . Photograph of the fundus and cardiovascular risk factors[3]. The technology behemoth is already incorporating AI into clinical practice in an Indian network of eye centers.

The US Food and Drug Administration authorized a similar technology developed by the University of Iowa. For identifying moderate-to-severe DR7, the Food and Drug Administration (FDA) has developed a test. As new discoveries and technologies are revealed, AI has lately re-emerged in the scientific and popular consciousness. At a rapid speed from technological firms and scientists AI is a field of computer science that seeks to both comprehend and create intelligent creatures, typically manifested as software programs8, stripped of its science-fictional trappings and ambitions. AI has a lengthy history that dates back to a meeting at Dartmouth College in 1956, when the word was first used. 8 Since 2012, the effective development of image classifiers has led to AI9's current comeback. Despite significant development in recent decades, AI has been plagued by an inconsistency and changing understanding of what precisely constitutes "genuine AI." It is a well-known characteristic of AI research that achieving a particular performance objective

Journal of The Gujarat Research Society

ISSN: 0374-8588
Volume 21 Issue 4, April 2019

quickly disqualifies that performance as AI, making it impossible to monitor progress. Automated route planners, for example, were hailed as instances of sophisticated AI in the 1970s but are now so common that most people would be startled to hear them referred to as AI10. As a result, AI advances from the 1970s through the 1990s are no longer considered breakthroughs.

Automated interpretation of electrocardiograms (ECGs), for example, is currently considered helpful in medicine, although it is not widely used[4]. Considered to be genuine AI instances. Medical-image diagnosis systems have recently pushed AI's boundaries into areas that were previously only the province of human specialists. Other fields of medicine, such as clinical practice12, translational medical research13–16, and fundamental biological researc, are now part of this frontier. We concentrate on AI applications that may enhance or alter clinical practice in this Review Article, as well as provide a historical perspective on AI. In medicine to contextualize current advances, highlight successful application areas, evaluate the possible social effect of biomedical AI systems development and deployment, and propose future research paths. Box 1 contains a dictionary of important terminology[5].

1.1 History Of Artificial Intelligence In Medical:

Early on, medicine was recognized as one of AI's most potential application areas. Since the mid-twentieth century, scientists have been studying many clinical decision support systems have been suggested and developed. In the 1970s, rule-based methods had a lot of success, and they've been proven to read ECGs11, diagnose diseases, and select medications. Suitable treatments, offer clinical reasoning interpretations, and help doctors in developing diagnostic hypotheses in instances involving difficult patients[5]. However, rule-based systems are expensive to implement. Like any text book, they need explicit statements of decision rules and human-authored updates to develop and may be fragile. Furthermore, encoding higher-order interactions is challenging. Amidst many bits of information written by various professionals, and the systems' effectiveness is constrained by the extent to which previous medical information is comprehended26.

Furthermore, it was challenging to create a system that combines deterministic and probabilistic data.To filter down important clinical background, rank diagnostic hypotheses, and suggest therapy27, researchers used reasoning[6]. Unlike the previous generation of AI systems, which depended on expert curation of medical information and the development of hypotheses, the second generation of AI systems is based on machine learning. Recent AI research has included machine-learning techniques, which can account for complicated relationships, in the development of robust decision rules[7].To look for patterns in the data Basic machine-learning algorithms are divided into two groups based on the kinds of tasks they are intended to solve: supervised and unsupervised. Supervised machine-learning techniques gather a large number of ‘training' instances, which include inputs (such as fundus images) and output labels (such as the presence or absence of DR). The algorithm learns to generate the right output for a given input on fresh cases by analyzing the patterns in all of the labelled input–output pairs[8].

The goal of supervised machine-learning algorithms is to find the best parameters in the models to minimize the differences between their predictions for training instances and the actual results. Outcomes in these instances, with the expectation that the asocial- tions found will be generalizable to cases not in the training dataset. The test set may be used to assess the model's generalizability. supervised machine-learning models are often used for classification, regression, and

ISSN: 0374-8588
Volume 21 Issue 4, April 2019

characterization of similarity across occurrences with identical result labels[9]. Unsupervised learning infers underlying patterns from unlabeled data in order to discover sub-clusters of the original data, identify outliers, or generate low-dimensional representations of the data. It should be noted that supervised identification of low-dimensional representations for tagged cases may be more successful. Machine-learning techniques enable the creation of AI applications that allow for the identification of previously unnoticed patterns in data without the need to define decision rules for each job or account for complicated relationships among input characteristics. As a result, machine learning has emerged as the ideal foundation for developing[10].

1.2 Application Of Artificial Intelligence In Health care:

- *Assisting with clinical decisions*: When diagnosing patients, it's clear that health professionals must take into account every relevant piece of information. As a consequence, sorting through different complex unstructured notes maintained in medical records becomes necessary. A patient's life may be jeopardized if a mistake is made in keeping track of even a single important information. Doctors may more easily filter down all essential information from patient reports with the use of Natural Language Processing (NLP). Artificial intelligence has the capacity to store and analyze huge amounts of data, which may be used to create knowledge databases and make examination and recommendations more personalized for each patient, thus improving clinical decision support.
- *Use chatbots to improve primary care and triage*: People have a propensity to schedule appointments with their doctors at the first sign of danger or a medical problem, which may turn out to be a false alarm or something that can be treated with self-treatment. Artificial Intelligence aids in the seamless flow and automation of basic care, freeing physicians to focus on more critical and life-threatening situations. Patients can benefit from medical chatbots, which are an AI-powered service incorporated with smart algorithms that provide patients with instant answers to all their health-related queries and concerns while also guiding them on how to deal with any potential problems, saving money on unnecessary trips to the doctor. These chatbots are accessible 24 hours a day, seven days a week, and can handle several patients at once.
- *Surgical Robotics*: In terms of speed and depth while performing delicate incisions, AI and collaborating robots have transformed surgery. Because robots don't get weary, they don't get tired in the midst of long and critical operations. Data from previous surgeries may be used by AI computers to create novel surgical techniques. The precision of these devices eliminates the risk of tremors or unintentional or inadvertent movements during surgery.
- *Nursing assistants who work remotely*: Virtual nursing assistants can undertake a variety of duties, from chatting with patients to sending them to the most appropriate and effective care unit, thanks to AI algorithms. These virtual nurses are accessible 24 hours a day, 7 days a week to answer questions, evaluate patients, and offer immediate answers. Many AI-powered virtual nursing assistant apps now allow for more frequent contacts between patients and care providers between office visits, reducing the need for needless hospital trips.

ISSN: 0374-8588
Volume 21 Issue 4, April 2019

- *Assisting with the correct diagnosis*: AI has the potential to outperform human physicians in terms of detecting, predicting, and diagnosing illnesses with greater accuracy and speed. In the case of identifying diabetic retinopathy, AI algorithms have shown to be not only accurate and precise at specialty-level diagnoses, but also cost-effective. PathAI, for example, is working on machine learning technologies to help pathologists make more accurate diagnosis. Reduced cancer diagnostic inaccuracy and the development of techniques for personalized medical treatment are two of the company's current objectives.
- *Keeping the burden of EHR usage to a minimum*: Although EHRs have played an important part in the healthcare industry's transition to digitalization, the move has resulted in a number of problems such as cognitive overload, unending paperwork, and user fatigue. EHR developers have begun to utilize AI to create more intuitive interfaces and automate a few of the regular procedures that take up a significant amount of the user's time.
- *Disease Early Detection*: Computer-based intelligence is now being used to identify illnesses, such as cancer, more accurately and in their early stages. According to the American Cancer Society, a large percentage of mammograms provide false results, leading to one out of every two healthy women being informed they have cancer. AI is allowing mammography surveys and interpretations to be completed several times faster and with 99 percent accuracy, reducing the need for unnecessary biopsies. Wearables like Apple's iWatch and other healthcare devices combined with AI are also being used to control early-stage coronary disease, allowing doctors and other parental figures to more easily scan and detect potentially dangerous situations at earlier, more curable stages. Better Decision Making Improving consideration necessitates the integration of vast amounts of health-related data with appropriate and timely decisions. Predictive analysis may help to improve clinical dynamics and activities, as well as manage regulatory tasks. Predictive analytics is showing growing promise in assisting doctors in diagnosing and treating patients. Another area where AI is beginning to take root in human services is the use of prior data of patients who had previously suffered from similar illnesses to identify people at risk of developing a problem – or seeing it fall apart – due to lifestyle, ecological, genetic, or other factors.
- *Improved Medical Services Access*: Deficiencies in prepared human services providers, such as ultrasound experts and radiologists, may obstruct access to life-saving treatment in developing nations all over the world. More radiologists work at roughly six medical clinics along Boston's prestigious Longwood Avenue than in the whole West African region, which was the focus of the conference. By taking responsibility of a part of the symptomatic duties usually given to humans, computerized reasoning may assist mitigate the consequences of this severe lack of trained clinical personnel. When questioned about the increasing use of AI in healthcare, Jayashree Kalpathy-Cramer, Ph.D., Assistant in Neuroscience at MGH and Associate Professor of Radiology at HMS, stated, "The potential for this innovation to create access to social insurance is enormous."

Journal of The Gujarat Research Society

ISSN: 0374-8588
Volume 21 Issue 4, April 2019

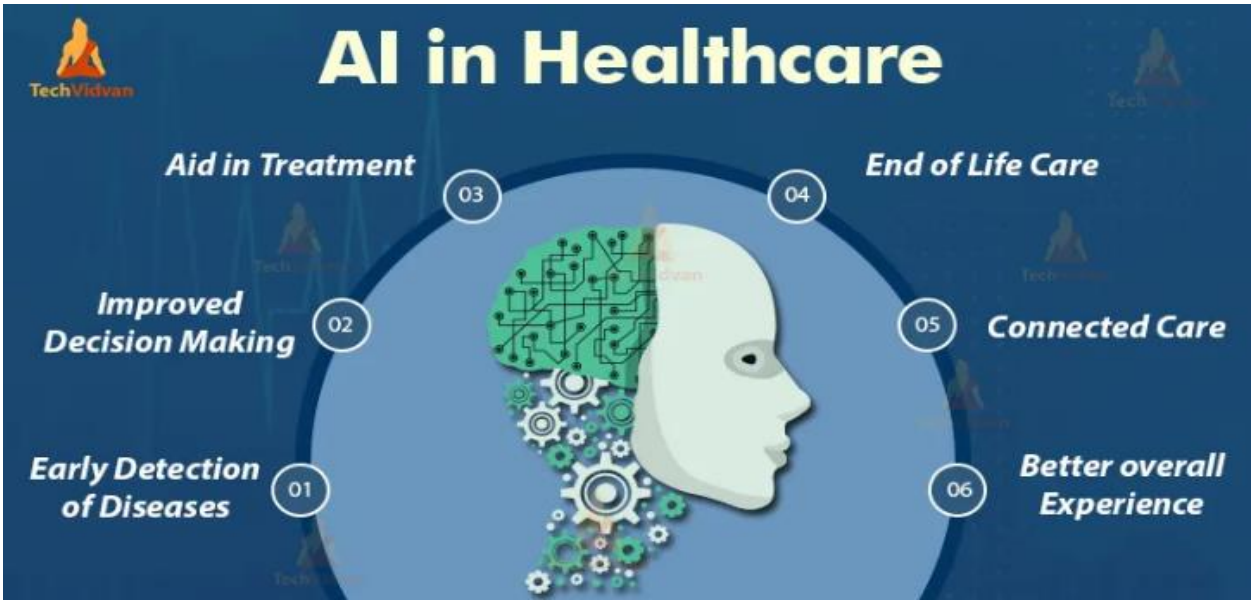

Figure 1: Diagrammatic Representation of AI in Health Care [TECHVIDVAN].

1.3 Threats of Artificial Intelligence in Healthcare

- *Mistakes and Injuries*: One of the most significant dangers of AI in healthcare is that the AI system may be incorrect at times, such as if it recommends the wrong medication to a patient or makes a mistake in identifying a tumor in a radiology scan, resulting in the patient's damage or serious health repercussions. For at least two reasons, AI mistakes are possibly distinct. While human medical experts may make mistakes as well, what makes this important is that an underlying fault, such as one in an AI system, might result in thousands of people being injured.
- *Data accessibility*: Another danger presented by AI systems is that training them requires enormous quantities of data from a variety of sources, such as pharmaceutical records, electronic health records, insurance claims records, and so on. Because data is fragmented and patients often visit various doctors or move insurance companies, data becomes more complex and difficult to understand, increasing the risk of mistake and increasing the cost of data gathering.
- *Concerns about privacy*: Many patients believe that the gathering of large datasets and the sharing of data between health institutions and AI developers to allow AI systems violates their privacy, leading to the filing of lawsuits. Another area where the use of AI systems raises this concern is that AI may anticipate private information about patients even if the patient has never provided the information. For example, an AI system might identify Parkinson's illness by detecting shaking on a computer mouse even if the individual hasn't told anybody else, which could be deemed a breach of privacy by the patient.
- *Inequality and bias*: AI systems may absorb the biases of the available data since they absorb and learn from the data with which they are taught. For example, if the data used in AI is mostly gathered in academic medical facilities, emerging AI systems will be less

Journal of The Gujarat Research Society

ISSN: 0374-8588
Volume 21 Issue 4, April 2019

aware of patients from communities who do not usually visit academic medical centers, and as a consequence, will treat them less successfully.It's possible that the profession may change. In the long term, the use of AI systems may lead to changes in the medical field. Especially in fields like radiology, where the majority of the job is mechanized.

1.4 Social and safety aspects of using AI in healthcare:

There are also unique challenges that we may encounter while using AI in healthcare. Because integrating AI into healthcare necessitates interaction between AI and a wide variety of humans, we may anticipate considerable skepticism from users of AI systems, owing to the popular image of "scary AI." Furthermore, the final choices regarding whether or not to integrate a technology are often made by individuals who aren't IT experts and have just a rudimentary understanding of AI. The answer to this issue will be to increase public knowledge of AI, breaking down widespread misconceptions about the technology, and to be able to communicate ideas simply and convincingly to governments, so that they realize the need of integrating the technology Another stumbling block for AI in healthcare is the issue of privacy and data security Data from medical records is utilized to train AI, and precautions must be made to ensure that this information does not get into the wrong hands. There must also be dependable security against cyber assaults; this is a significant problem in any area, but it is particularly essential in healthcare since the industry is directly linked to human lives, and a cyber attack may actually result in death. Remote hacking of a cardiostimulator and deliberate "retraining" of a diagnostic and recommendation system to suggest a lethal medication or treatment are the most common examples among alarmists. In a worst-case scenario, this may result in mass murder. As a result, wearable gadgets must be secured from outside threats. Then there are the issues of what protection is deemed trustworthy, who assesses dependability, and who would be held accountable in the event of an incident .We also have to consider how AI diagnostic tools will impact the job and lifestyles of all the people who are still working as experts in medicine. There are two ways to frame AI in medicine: the first is that technology is a tool for physicians and patients, and the second, more radical, is that AI will eventually replace doctors. The first method is treating a human doctor as an a priori irreplaceable element in medicine, since medicine is first and foremost a science about people, and humans are much too complex systems to be studied by any artificial system in all of its features and subtleties. As a consequence, AI acts as a supporter, with the doctor in charge of understanding and implementing the outcomes of its work.

2. DISCUSSION

Three global leaders, i.e. nations from the first cluster, were identified throughout our study. Nonetheless, this conclusion is fairly typical, and the significance of the nations from the remainder of the clusters should not be overlooked: they have startups in the top ten, while a large number of countries were not represented at all. Furthermore, the study was conducted based only on startup financing, without taking into account other significant variables. The study focused on just financially funded AI companies in healthcare in various nations, therefore we can't track the number of significant ideas that perished due to a lack of funding. There's also the context of the nation: we can only evaluate the advancement of AI in healthcare in any country by looking at its overall development, economic situation, and other factors.

3. CONCLUSION

ISSN: 0374-8588
Volume 21 Issue 4, April 2019

In conclusion, AI in healthcare is most frequently utilized to accomplish the following tasks: diagnostic aid, healthcare enterprise management and maintaining a healthy lifestyle. The following are the major obstacles to using AI in healthcare: the need for specialized business architecture, public perceptions of AI, the need for privacy and information security; and the need for high dependability and high quality services. Artificial intelligence has been used in the healthcare field. These are just a few of the areas of healthcare that Artificially Intelligent technologies may revolutionize. Complex operations would be performed with a high degree of accuracy by artificially intelligent robots. Wearable gadgets, such as watches and wristbands, would be created with AI to monitor the human body and anticipate illnesses.

REFERENCES

[1] C. Domshlak, E. Hüllermeier, S. Kaci, and H. Prade, "Preferences in AI: An overview," *Artificial Intelligence*. 2011, doi: 10.1016/j.artint.2011.03.004.

[2] M. Salman, A. W. Ahmed, A. Khan, B. Raza, and K. Latif, "Artificial Intelligence in Bio-Medical Domain An Overview of AI Based Innovations in Medical," *IJACSA) Int. J. Adv. Comput. Sci. Appl.*, 2017.

[3] M. Kolanovic and R. T. Krishnamachari, "Big Data and AI Strategies," *J.P.Morgan*, 2017.

[4] R. Bogue, "The role of artificial intelligence in robotics," *Ind. Rob.*, 2014, doi: 10.1108/IR-01-2014-0300.

[5] V. Sze, Y. H. Chen, T. J. Yang, and J. S. Emer, "Efficient Processing of Deep Neural Networks: A Tutorial and Survey," *Proceedings of the IEEE*. 2017, doi: 10.1109/JPROC.2017.2761740.

[6] E. Hovy, R. Navigli, and S. P. Ponzetto, "Collaboratively built semi-structured content and Artificial Intelligence: The story so far," *Artif. Intell.*, 2013, doi: 10.1016/j.artint.2012.10.002.

[7] S. Nasiri, M. R. Khosravani, and K. Weinberg, "Fracture mechanics and mechanical fault detection by artificial intelligence methods: A review," *Engineering Failure Analysis*. 2017, doi: 10.1016/j.engfailanal.2017.07.011.

[8] B. S. C. Uzochukwu, M. D. Ughasoro, E. Etiaba, C. Okwuosa, E. Envuladu, and O. E. Onwujekwe, "Health care financing in Nigeria: Implications for achieving universal health coverage," *Nigerian Journal of Clinical Practice*. 2015, doi: 10.4103/1119-3077.154196.

[9] K. Fiscella and M. R. Sanders, "Racial and Ethnic Disparities in the Quality of Health Care," *Annual Review of Public Health*. 2016, doi: 10.1146/annurev-publhealth-032315-021439.

[10] S. M. R. Islam, D. Kwak, M. H. Kabir, M. Hossain, and K. S. Kwak, "The internet of things for health care: A comprehensive survey," *IEEE Access*, 2015, doi: 10.1109/ACCESS.2015.2437951.