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The Artificial Intelligence in Medical Field

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Abstract: **Background: The benefits of artificial intelligence have been extensively discussed in the medical literature. In the medical field, AI offers numerous advantages for fostering innovation.**

Methodology: AI requires the guidance of a model of reality, similar to those used in causal inference tasks, to achieve human-level intelligence.

Results: AI has emerged as a potentially changing innovation in the medical industry, promising positive patient outcomes. A. I. provides medical practitioners with accurate and timely information, allowing for early diagnosis and treatment.

Conclusions: Various technologies are being adopted and tested in the medical field to increase automation. AI is now being used in the medical field to keep a digital medical record and conduct patient checkups using smart technologies.

Keywords: **AI, artificial intelligence, artificial intelligence in medical field, AI in health care.**

1. INTRODUCTION

The invention of robots is widely regarded as the beginning of artificial intelligence (AI).

Today, AI is regarded as a branch of engineering that employs novel concepts and solutions to complex problems. Computers may one day be as intelligent as humans if advances in electronic speed, capacity, and software programming continue. The importance of contemporary cybernetics in the development of AI cannot be overstated.[1]

There are two types of AI applications in medicine: virtual and physical. Machine Learning (also known as Deep Learning) is the virtual component, which is represented by mathematical algorithms that improve learning through experience. Machine learning algorithms are classified into three types: unsupervised (ability to find patterns), supervised (classification and prediction algorithms based on previous examples), and reinforcement learning. [2]

Physical objects, medical devices, and increasingly sophisticated robots participating in care delivery (carebots) are examples of AI applications in medicine. The use of robots as helpers is perhaps the most promising approach; for example, a robot companion for the ageing population with cognitive decline or limited mobility. The most advanced forms of this technology are Japanese carebots. [3]

The benefits of artificial intelligence have been extensively discussed in the medical literature. AI can use sophisticated algorithms to 'learn' features from large amounts of healthcare data and then apply the resulting insights to improve clinical practice. It can also be outfitted with learning and self-correcting capabilities to improve its accuracy in response to

feedback. To inform proper patient care, an AI system can provide up-to-date medical information from journals, textbooks, and clinical practices.6 Furthermore, an AI system can aid in the reduction of diagnostic and therapeutic errors that are unavoidable in human clinical practice. In addition, an AI system extracts useful information from a large patient population to help make real-time inferences for health risk alert and health outcome prediction.[4]

2. LITERATURE REVIEW

Before AI systems can be used in healthcare applications, they must be 'trained' using data generated by clinical activities such as screening, diagnosis, treatment assignment, and so on, in order to learn similar groups of subjects, associations between subject features, and outcomes of interest. These clinical data can take the form of demographics, medical notes, electronic recordings from medical devices, physical examinations, clinical laboratory results, and images.[5]

Machine learning (ML) techniques that analyse structured data such as imaging, genetic, and EP data fall into the first category. ML procedures in medical applications attempt to cluster patients' traits or infer the probability of disease outcomes. Natural language processing (NLP) methods, which extract information from unstructured data such as clinical notes/medical journals to supplement and enrich structured medical data, fall into the second category. The NLP procedures aim to convert text into machine-readable structured data that can then be analysed using ML techniques.[6]

2.1 Applications of artificial intelligence in medicine:

In our daily lives, there is a need for new innovative technologies that improve people's lives. In the medical field, AI offers numerous advantages for fostering innovation. A doctor can use this technology to examine patients without having to visit a clinic or hospital. As a result, this technology is now available for providing online patient service. Any question from the patient about a variety of health issues can be quickly addressed.[7[

AI can help with a variety of medical challenges, such as determining a different level of difficulty while performing complex surgery with higher quality and outcomes. The patient can now enjoy the benefits of a timely and accurate decision. The following are the various benefits of AI in the medical field:

- Examine anomalies and recommend medical intervention
- To forecast upcoming diseases
- Accurate and efficient diagnosis
- Beneficial for complex and novel treatments
- Balance the patient's blood/glucose levels
- Patient monitoring is essential.
- Provide solace to doctors and patients
- Medical students should receive proper training.
- Improve hospital safety.
- Gather data during surgery to help improve future procedures.

Artificial intelligence (AI) is used extensively in scanning technologies such as X-rays, computed tomography, magnetic resonance imaging, and three-dimensional scanners. These are useful in making a better decision about the patient. For better health, AI recommends a proper diet and eating habits. It effectively manages patient scheduling and reminds patients of doctor's appointments. This technology is also useful for virtual interactions with doctors, and its implementation makes the medical field more efficient in addressing various challenges. [8]

2.2 Prediction and diagnosis of disease:

Despite the increasing use of artificial intelligence in healthcare, research is primarily focused on cancer, nervous system, and cardiovascular diseases, which are the leading causes of disability and mortality. Infectious and chronic diseases, on the other hand

AI is expected to revolutionise healthcare in areas such as surgery, radiology, and cancer detection, as well as improve healthcare delivery and patient experience.[9]

2.3 Treatment efficacy and prediction of outcome:

Treatment efficacy and outcome prediction are also critical areas with clinical implications in disease management strategies and personalised care plans. Only a decade ago, molecular and clinical data were used to predict cancer outcomes. New types of input parameters have been collected and used for prediction as a result of the development of high-throughput technologies such as genomic, proteomic, and imaging technologies. With a large sample size and integrated multi-modal data types, such as histological or pathological assessments,30 these methods could improve cancer susceptibility, outcome prediction, and prognosis significantly (15-25%).[10]

2.4 Drug development and repurposing:

Approximately 25% of all drugs discovered were the result of a chance meeting of different domains.40 When compared to traditional blind screening, targeted drug discovery is preferred in pharmaceuticals due to the explicit mechanism, higher success rate, and lower cost. Because of the following factors: 1) high drug development costs; 2) increasing availability of three-dimensional structural information that can guide the characterization of drug targets; and 3) extremely low clinical trial success rates, machine learning is now used in the drug discovery process.[11]

2.5 Prediction of an epidemic outbreak:

The infectious disease distribution pattern between population groups with known probabilities is based on prior knowledge of the environment's ecological and biological features. If model parameters are known in part, early prediction of the epidemic (such as peak and duration of infection) is possible.[12]

2.6 Precision Medicine:

Genetic and biomedical research has continued with the goal of revealing links between genes and human traits or diseases. Regularised logistic regression is a useful tool for a variety of related applications. [13]

In terms of end users, the hospitals and providers segment is expected to have the largest share of the AI in healthcare market. A large number of applications of Al solutions across provider settings, the ability of AI systems to improve care delivery, patient experience while lowering costs, and the growing adoption of electronic health records by healthcare providers are a few of the major factors responsible for the high share of the hospitals and providers segment. Furthermore, AI-based tools, such as voice recognition software and clinical decision support systems, help hospitals streamline workflow processes at a lower cost while improving care delivery and patient satisfaction.[14]

3. METHODOLOGY

AI requires the guidance of a model of reality, similar to those used in causal inference tasks, to achieve human-level intelligence. As a result, in such a model we will: (1) develop new visualisation techniques that can be trained by medical experts in order to investigate the underlying explanatory factors of the data; and (2) formalise a structural causal model of human decision making and map features in these to DL approaches. Such mechanistic models can be used in digital pathology to analyse and predict the response of a functional network behaviour to features in histology slides, molecular data, and family history.[15]

Develop causability as a new scientific field The human-computer interaction community has established a range of usability methods. Similar to these usability methodologies, methods and tests, we need the development of causability methodologies, methods and tests, which are based on clear scientific principles and theories of causality in order to establish causability as a scientific field which will become necessary with increased use of AI. The same as usability measures ensures the “quality of use”. causability measures must ensure the “quality of explanations”.[16]

4. RESULTS

AI has emerged as a potentially changing innovation in the medical industry, promising positive patient outcomes.

Today, deep learning algorithms are very useful in our daily lives: autonomous driving, face recognition, speech understanding, recommendation systems, and so on. However, it is very difficult for people to understand how these algorithms make decisions; ultimately, these are so-called "black box" models. The problem is that, even if we understand the underlying mathematical principles and theories, such models lack an explicit declarative representation of knowledge.

A. I. provides medical practitioners with accurate and timely information, allowing for early diagnosis and treatment.

5. DISCUSSION

For the analysis of complex and large amounts of medical data, AI employs complex algorithms and specialised software. It produces correct and feasible results without the direct involvement of humans. Through smart machines, this technology can interpret and advance information. The primary goal of AI is to investigate the relationship between treatment/prevention methods and patient outcomes. [17]

AI will help doctors and physicians make better clinical decisions in all medical fields in the coming years. This technology can provide current information and knowledge for proper patient care. The proper implementation of AI will improve the future of health care. It focuses on converting unstructured text to machine language and then electronically recording data. Artificial intelligence will be used in financial management and innovation.[18]

Because of advances in machine learning techniques involving multiple layers of artificial neural networks trained on big data, i.e., deep learning, the use of artificial intelligence (AI) for medicine has recently received a lot of attention. AI is expected to have a significant impact on various fields of medicine and has the potential to improve many aspects of healthcare. On the other hand, AI has generated a lot of hype as well. It is not difficult to find stories on the Internet about how modern AI software programmes can analyse a patient's medical information and present diagnoses automatically, even more precisely than human experts, with the implication that AI will soon dominate medical practice. [19]

Medical professionals must also ensure that AI becomes a technology that benefits patient care. As a result, medical students must prioritise the acquisition of solid AI knowledge and experience. The goal of this article is to provide a concise summary of the current state of AI from a medical standpoint, as well as suggestions for what medical students should do to prepare for the era of AI in medicine.[20]

6. CONCLUSIONS

Various technologies are being adopted and tested in the medical field to increase automation. AI is now being used in the medical field to keep a digital medical record and conduct patient checkups using smart technologies. It offers solutions, particularly in targeted treatments, specially formulated drugs, and personalised therapies. AI is a cutting-edge technology that assists surgeons with medication, treatment, and surgery. The primary application of this technology is to improve decision-making in complex cases. It can also aid in the tracking, detection, investigation, and control of infections in hospitals. This technology creates and optimises online appointment platforms for patients. It will be useful in all medical fields in the future to serve humanity.[21]

REFERENCES

[1] Patel VL , Shortliffe EH , Stefanelli M , et al. The coming of age of artificial intelligence in medicine. Artif Intell Med 2009;46:5–17.

[2] Somashekhar SP , Kumarc R , Rauthan A , et al. Abstract S6-07: double blinded validation study to assess performance of IBM artificial intelligence platform, Watson for oncology in comparison with manipal multidisciplinary tumour board ? first study of 638 breast Cancer cases. Cancer Res 2017;77(4 Suppl):S6-07.

[3] Koprowski R F. K Machine learning and medicine: book review and commentary. Biomed. Eng. Online 17, 17 (2018).

[4] Krittanawong C, Zhang H, Wang Z, Aydar M, K. T Artificial Intelligence in Precision Cardiovascular Medicine. J. Am. Coll. Cardiol 69, 2657–2664 (2017).

[5] Jiang F, Jiang Y, Zhi H, Dong Y, Li H, Ma S, Wang Y, Dong Q, Shen H, W. Y Artificial intelligence in healthcare: past, present and future. Stroke Vasc. Neurol 2, 230–243 (2017)

[6] Gershman, S. J., Horvitz, E. J., & Tenenbaum, J. B. (2015). Computational rationality: A converging paradigm for intelligence in brains, minds, and machines. Science, 349, 273–278.

[7] Miller, T. (2019). Explanation in artificial intelligence: Insights from the social sciences. Artificial Intelligence, 267, 1–38.

[8] Turkay, C., Jeanquartier, F., Holzinger, A., & Hauser, H. (2014). On computationally-enhanced visual analysis of heterogeneous data and its application in biomedical informatics. In A. Holzinger & I. Jurisica (Eds.), Interactive knowledge discovery and data mining: State-of-the-art and future challenges in biomedical informatics. Lecture notes in computer science LNCS 8401 (pp. 117–140).

[9] Zhou, B., Khosla, A., Lapedriza, A., Oliva, A., & Torralba, A. (2016). Learning deep features for discriminative localization. Paper presented at Proceedings of the IEEE conference on computer vision and pattern recognition (2921–2929).

[10] Su, H., Wu, H. and Kao, H. (2021) Artificial Intelligence in Precision Medicine in Hepatology. Journal of Gastroenterology and Hepatology, 36, 569-580.

[11] Rompianesi, G., Pegoraro, F., Ceresa, C.D., Montalti, R. and Troisi, R.I. (2022) Ar- tificial Intelligence in the Diagnosis and Management of Colorectal Cancer Liver Metastases. World Journal of Gastroenterology, 28, 108-122.

[12] avenport, T. and Kalakota, R. (2019) The Potential for Artificial Intelligence in Healthcare. Future Healthcare Journal, 6, 94-98.

[13] Aung, Y.Y., Wong, D.C. and Ting, D.S. (2021) The Promise of Artificial Intelli- gence: A Review of the Opportunities and Challenges of Artificial Intelligence in Healthcare. British Medical Bulletin, 139, 4-15.

[14] Yan, Y.S., Thilo, F.J., Felzmann, H., Dowding, D. and Lee, J.J. (2023) Artificial Intel- ligence in Nursing and Midwifery: A Systematic Review. Journal of Clinical Nurs- 32, 2951-2968.

[15] Lysaght, T., Lim, H.Y., Xafis, V. and Ngiam, K.Y. (2019) A.L.-Assisted Deci- sion-Making in Healthcare: The Application of an Ethics Framework for Big Data in Health and Research. Asian Bioethics Review, 11, 299-314.

[16] O'Connor, S., Yan, Y., Thilo, F.J.S., Felzmann, H., Dowding, D. and Lee, J.J. (2023) Artificial Intelligence in Nursing and Midwifery: A Systematic Review. Journal of Clinical Nursing, 32, 2951-2968.

[17] Kulkarni, S., Seneviratne, N., Baig, M.S. and Khan, A.H.A. (2020) Artificial Intelli- gence in Medicine: Where Are We Now? Academic Radiology, 27, 62-70.

[18] Durán, J.M. and Jongsma, K.R. (2021) Who Is Afraid of Black Box Algorithms? On the Epistemological and Ethical Basis of Trust in Medical A.I. Journal of Medical Ethics, 47, 329-335.

[19] Kelly, C.J., Karthikesalingam, A., Suleyman, M., Corrado, G. and King, D. (2019) Key Challenges for Delivering Clinical Impact with Artificial Intelligence. BMC Medi- cine, 17, Article No. 195.

[20] Hernandez-Boussard, T., Bozkurt, S., Ioannidis, J.P. and Shah, N.H. (2020) MINIMAR (MINimum Information for Medical A.I. Reporting): Developing Reporting Stan- dards for Artificial Intelligence in Health Care, Journal of the American Medical Informatics Association, 27, 2011-2015.

[21] Kocaballi, A.B., Ijaz, K., Laranjo, L.., Quiroz, J.C., Rezazadegan, D., Tong, H.L., Willcock, S., Berkovsky, S. and Coiera, E. (2020) Envisioning an Artificial Intelligence Documentation Assistant for Future Primary Care Consultations: A Co-Design Study with General Practitioners. Journal of the American Medical Informatics Association, 27, 1695-1704.