REVIEW ARTICLE

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Use of Artificial Machines in Medical Sciences

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ABSTRACT: The application of artificial intelligence (AI) has grown across numerous industries, including healthcare. Health care providers of all shapes, sizes, and specializations are increasingly very interested in how artificial intelligence has developed and is assisting with patient requirements and care, as well as lowering costs and boosting efficiency. Radiology represents one of the most significant fields in artificial intelligence, with numerous opportunities for advancement. With the implementation of Machine Learning methods, the precision of cancer diagnosis findings has grown by 15-20% in recent years. The purpose of this research is to assist shape public perception of the use of artificial intelligence in many fields of medicine such as cancer, radiography, surgery, emergency care and the future of such machines in medical field.

Keywords: Artificial intelligence, cancer, efficiency, radiology, surgery.

INTRODUCTION

Artificial intelligence (AI), intelligent retrieval (IR), and robotics intelligence (RI) is a phrase used to represent a discipline of research that tries to give computers the capacity to execute operations such as logic, reasoning, organizing, learning, and concept recognition (Abernethy et al., 2014).

The latest advancements in artificial intelligence technology in healthcare have led us to worry whether RI tools would likely overtake human doctors. As stated in a study conducted by The Business Research Company (Busines Research Company, 2020), the Global Medical Device (MD) marketplace is expanding because of a rise in infectious and chronic diseases, an increase in the number of healthcare facilities, an increase in healthcare expenditure, technological advancements, and the rapid growth of the elderly population. Since the development of COVID-19, the global need for MDs utilized in diagnosis, prognosis, and therapy has expanded dramatically (Badnjevic, 2020). Users increasingly demand more than just a device. Despite the huge demand for healthcare, governments all over the world are concentrating on cutting costs, including MDs, but they also want to improve patient outcomes. In other words, patients now want greater functionality from their doctors, as seen by advances in categorization, clinical prognosis, and other tasks that call for intelligence (Catic, 2018).

A group of technologies make up artificial intelligence, which is more than simply one technology. Certain of such technologies, like machine learning, are frequently employed in healthcare. It has been used in a variety of medical fields, particularly to help with illness identification and prevention (Badnjevic, 2018; Gurbeta, 2018; Long, 2020; Saric, 2020). AI programming differs from conventional computer programming in that it imitates human decision-making (Deo, 2015).

Today, the use of AI in healthcare is one of the critical foundations for more breakthroughs in the area, with the potential to increase performance while cutting costs. Administrators around the globe have acknowledged the significance of these novel instruments to enhance healthcare and shift away from care facility systems toward care coordination whereas bolstering improving health and prevention of disease and trying to implement personalized medicine (European Council, 2017; FDA, 2020). To encourage the study, creation, and acceptance of these techniques and technologies, several nations have established or are establishing national AI plans and policies (LeCun, 2015; Ravi, 2017). AI has been integrated with medicine to create a range of medical devices (MDs) for regular use in daily life, including electronic health records (EHR), wearable medical technology, and remote patient monitoring devices. Since decisions in medicine are dependent on expert knowledge, clinical records, and the physicians' experience, it is a significant cognitive process but also mostly an information management effort. Therefore, the aim of this article is to discuss the importance and the key role of artificial intelligence in medical science. This work also tries to develop a viewpoint on artificial intelligence in several medical fields and their future prospective.

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Artificial Intelligence in Stroke

Stroke is a long-term condition that ranks highly among the mortality causes. Once the blood supply is cut off, it happens. A stroke is a serious condition that calls for immediate medical care. Management and judgment are challenging and complex tasks in the clinic. Artificial intelligence could be applied to neurology in this mixed circumstance. Clinical trials are often created to address these complex problems (Jiang et al., 2017). AI is anticipated to aid in more complicated investigations as well as clinical trials which are more similar to actual settings. Scientists have just started working in this manner and have seen encouraging results (Ye et al., 2017).

Artificial Intelligence in Diabetes

Retinopathy is among the most serious problems for diabetics. When compared to 54 ophthalmologist professionals, deep learning algorithms trained to diagnose and cure diabetic retinopathy and macular defect were able to detect moderate retinopathy and macular edema with high specificities and sensitivity utilizing 128,000 retinal images from 5871 patients (Gulshan et al., 2016). Validation is required for this approach's applicability, potential to advance diabetic treatment, and effectiveness (Miller and Brown, 2018). Diabetic retinopathy is one of the leading causes of blindness worldwide. There are 29 million Americans who have diabetes, or around 9% of the population. By 2030, this number is predicted to reach 44 billion. Several patients underwent retina photography and ocular scanning using a technology called the Intelligent Retinal Imaging System (IRIS). IRIS was a screening program powered by computer algorithms. The manual examination and the pictures produced by the IRIS software were contrasted. Population statistics are computed using the IRIS method. The IRIS program had excellent sensitivity. The percentage of negative cases was likewise minimal. The created IRIS software was envisioned as a potential replacement for traditional exams (Walton et al., 2016).

Artificial Intelligence in Surgery

The use of AI-based technology in the surgical branches is significantly influenced by surgeons. They should be prepared to work with data scientists to use a new data form and assist with the meaningful interpretation of the data (Hashimoto et al., 2016). In the future, surgeons will probably witness AI analysis of patient- and population-specific data. For instance, a patient having a bariatric surgery assessment will monitor their weight, blood sugar levels, food intake, and exercise levels using mobile applications and fitness trackers. Artificial intelligence has the capability to really be taught by surgeons and utilized with the prospect of a future for care delivery at the greatest quality if properly developed and deployed (Hashimoto et al., 2016).

Artificial Intelligence in Pathology and Dermatology

Nearly 1500 skin samples were examined for their histology and pathology using baseline pattern analysis of deep learning architecture to define basal cell cancer and differentiate malignant lesions from benign lesions. This method outperformed previously automated analyses and had a diagnostic accuracy of 90% when compared to specialists (Miller and Brown, 2018).. With diagnostic accuracy for neoplasm discovery and limitation comparable to that of specialists, deep learning histology and pathology detected metastatic breast cancer in sentinel lymph node biopsies (Wang et al., 2016).

Artificial Intelligence in Radiology

Technology is advancing at a breakneck speed in the medical field of radiology. This fast transformation requires radiologists to respond. While analyzing graphs, radiologists have profited from digital systems, but there are concerns about computers that treat humans as if they were human, raising the possibility if not likelihood that AI adoption in radiology may have a negative cultural impact (Thrall et al., 2018). Radiology was a pioneer in the creation of digital medicine, and it continues to be a leader in the use of artificial intelligence to medical practice. For the study to be done in this area, radiological pictures from certain national and international institutes can be gathered through a sharing network.

Artificial Intelligence in Neurosurgery

Artificial intelligence demonstrates that physicians may be able to increase their ability for decision-making in terms of neurosurgical diagnosis, preoperative planning, and result estimation; however, it is also crucial to note that barriers to the adoption and establishment of machine learning techniques in clinical settings have been erected (Senders et al., 2017) Sendler et al. looked at twenty-three trials that used ML algorithms for diagnosis, pre-surgical planning, or prediction of outcomes in neurosurgical patients. In contrast to clinical professionals, 50 results with a P value resulted in 29 (58%) ML models outperforming the clinical specialists.

Artificial Intelligence in Oncology

Cancer is a serious chronic illness with several subtypes that can result in death. Early detection of cancer is critical. Timely screening has a significant impact on life expectancy. Early detection of cancer is critical. Life is more likely if you are diagnosed early. As a result, cancer researchers are working to create novel screening tools for early cancer detection. Cancer data may also be collected from several sites and shared over a network to form a huge dataset. As a result, emerging technologies such as big data and artificial intelligence can be employed to treat cancer. The precise diagnosis of cancer is a critical duty that doctors desire. Researchers in the right environment have recently expressed interest in machine learning technologies. While these approaches cannot properly forecast the outcome of cancer treatment, they may find and describe patterns and correlations across complicated data sets (Kourou et al., 2015).

Artificial Intelligence in Emergency Medicine

In emergency departments (ED) of hospitals, identifying patients, making predictions, and swiftly evaluating clinical results are crucial for the patient as well as for cost and efficiency. For this reason, the emergency department has to deploy artificial intelligence. First assessment, risk categorization, and speedy patient evaluation are necessary in emergency rooms. These protocols must be thoroughly followed in congested EDs in particular. Current triage techniques will be developed, according to several ML models. It is the duty of emergency physicians to identify life-threatening disorders as soon as feasible. For instance, cardiac issues are crucial in a patient with chest discomfort if they have an acute disease. They need to realize that as soon as possible.

Future of artificial intelligence in medical equipment

The promise of AI applications in medicine may be seen in the unification of standards and legislation that expressly control AI usage in medical devices. The use of "locked algorithms" was detected in previously authorized medical devices that used AI processes. Major manufacturers are switching from traditional production systems to data-driven intelligent models as regulators take on the industry. For instance, Medtronic is dedicated to incorporating artificial intelligence into its current surgical sector, including improved imaging, robotics, and guidance, as well as expanding recruiting for remote health monitoring. On the other side, Philips made the decision to concentrate on several industry developments, namely AI diagnostics and workflow calculations with improved accuracy. Phillips and BioTelemetry entered into a merger agreement in December 2020 with a purchase price of US$2.8 billion.

The potential of AI applications may be seen in preventing injuries and fatalities brought on by medical equipment in addition to improving treatment accuracy. The potential of AI applications may be seen in preventing injuries and fatalities brought on by medical equipment in addition to improving treatment accuracy. For example, using intelligent infusion pump devices is now the go-to strategy for guaranteeing the security of intravenous medications. The majority of these systems are based on AI expert systems rather than ML, however because to their robustness and dependability, more extensive ML-based applications, such implantable insulin pumps and developing closed-loop artificial pancreas devices, have been developed. The aforementioned examples all pertain to healthcare, and as a result of cloud computing resources, ubiquitous memory, and apps, applications in healthcare are growing quickly. A considerable risk of deviations from accuracy and safety of performance will result from inadequate and incorrect monitoring of medical devices (MD), that will impair clinical precision and the effectiveness of patients undergoing treatment.

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CONCLUSION

Several areas of medicine have started to employ artificial intelligence. It is currently implemented in several systems, varying from video analysis to databases. It now in turn is connected to doctors' growing understanding of technology's capabilities. Taking selections will also be difficult for doctors. However, things will be made simpler and more productive with the aid of technology. It is particularly true for healthcare and medical services, where a wealth of information is available from both the medical archive and the report provided by wearable health detectors.

Oncology is entering a new age, and the doctors of today should be ready to approach this field with the same curiosity that it has always attracted. Obviously, we do not believe that doctors will be substituted by machines, but we do think that artificial intelligence will aid doctors in making more decisions in the future when it comes to diagnosing, particularly in fields like radiology and pathology. Healthcare services are expanding, and big data analysis techniques are advancing quickly, making it possible for AI to succeed in the healthcare industry.

Although with acknowledged barriers, it is possible to draw the conclusion that AI has already fundamentally altered the way traditional medicine is practiced, greatly raised the caliber of medical care, and assured universal health. It remains to be seen how the potential for medical AI to advance will affect how the human population responds to escalating problems like infectious pandemics, chronic illnesses, and aging populations.

CONFLICT OF INTEREST

No conflict of interest was declared by the authors.

REFERENCES

Abernethy, A. P., Etheredge, L. M., Ganz, P. A., Wallace, P., German, R. R., Neti, C., Murphy, S. B. (2010). Rapid-learning system for cancer care. J Clin Oncol, 28(27), 4268-4278.

Badnjevic, A., Gurbeta, L., Custovic, E. (2018). An expert diagnostic system to automatically identify asthma and chronic obstructive pulmonary disease in clinical settings. Scientific Reports, 8(1), 1-9.

Badnjević, A., Pokvić, L. G., Džemić, Z., Bečić, F. (2020). Risks of emergency use authorizations for medical products during outbreak situations: a COVID-19 case study. Biomed Eng Online, 19(1), 1-14.

Business Research Company. [Online resource] Last accessed: 03.05.2021. https://www.globenewswire.com/ news-release/2020/10/27/2114984/0/en/Global-MedicalDevice-Market-2020-Size-To-Increase-Due-To-Rising-Infectious-And-Chronic-Disease-Cases-As-Per-The-BusinessResearch-Company-s-Medical-Devices-Global-Market-Opportuni.html

Catic, A., Gurbeta, L., Kurtovic-Kozaric, A., Mehmedbasic, S., Badnjevic, A. (2018). Application of Neural Networks for classification of Patau, Edwards, Down, Turner and Klinefelter Syndrome based on first trimester maternal serum screening data, ultrasonographic findings and patient demographics. BMC Medical Genetics, 11(1), 1-12.

Deo, R. C. (2015). Machine learning in medicine. Circulation, 132(20), 1920-1930.

European Council’s Conclusions on Health in the Digital Society. Specifically, Council of The European Union, 2017

Food and Drug Administration. Software as medical device SaMD. https://www.fda.gov/medical-devices/software-medical-device-samd/artificial-intelligence-and-machine-learning-software-medical-device

Gulshan, V., Peng, L., Coram, M., Stumpe, M. C., Wu, D., Narayanaswamy, A., Webster, D. R. (2016). Development and validation of a deep learning algorithm for detection of diabetic retinopathy in retinal fundus photographs. Jama, 316(22), 2402-2410.

Gurbeta, L., Badnjevic, A., Maksimovic, M., Omanovic-Miklicanin, E., Sejdic, E. (2018). A telehealth system for automated diagnosis of asthma and chronical obstructive pulmonary disease. J Am Med Inform Assoc, 25(9), 1213-1217.

Hashimoto, D. A., Rosman, G., Rus, D., Meireles, O. R. (2018). Artificial intelligence in surgery: promises and perils. Ann Surg, 268(1), 70.

Jiang F., Jiang Y., Zhi, H. (2017). Artificial intelligence in healthcare: past, present, and future. Stroke Vasc Neurol, 2, 230-243

Kourou, K., Exarchos, T. P., Exarchos, K. P., Karamouzis, M. V., Fotiadis, D. I. (2015). Machine learning applications in cancer prognosis and prediction. Comput Struct Biotechnol J, 13, 8-17.

LeCun, Y., Bengio, Y., Hinton, G. (2015). Deep learning. Nature, 521(7553), 436-444.

Long, J. B., Ehrenfeld, J. M. (2020). The role of augmented intelligence (AI) in detecting and preventing the spread of novel coronavirus. J Med Syst, 44(3), 1-2.

Miller, D. D., Brown, E. W. (2018). Artificial intelligence in medical practice: the question to the answer?. Am J Med, 131(2), 129-133.

Ravì, D., Wong, C., Deligianni, F., Berthelot, M., Andreu-Perez, J., Lo, B., Yang, G. Z. (2016). Deep learning for health informatics. J Biomed Health Inform, 21(1), 4-21.

Sarić, R., Jokić, D., Beganović, N., Pokvić, L. G., Badnjević, A. (2020). FPGA-based real-time epileptic seizure classification using Artificial Neural Network. Biomed Signal Process Control, 62, 102106.

Senders, J.T., Arnaout, O., Karhade, A.V. (2017). Natural and artificial intelligence inneurosurgery: a systemic review. Neurosurgery, 83, 181-192

Thrall, J. H., Li, X., Li, Q., Cruz, C., Do, S., Dreyer, K., Brink, J. (2018). Artificial intelligence and machine learning in radiology: opportunities, challenges, pitfalls, and criteria for success. J Am Coll Radiol, 15(3), 504-508.

Walton, O. B., Garoon, R. B., Weng, C. Y., Gross, J., Young, A. K., Camero, K. A., Chu, Y. I. (2016). Evaluation of automated teleretinal screening program for diabetic retinopathy. JAMA Ophthalmology, 134(2), 204-209.

Wang, D., Khosla, A., Gargeya, R., Irshad, H., Beck, A. H. (2016). Deep learning for identifying breast cancer. Proceedings of the International Society on Biomedical Imaging (ISBI), Quantitative Methods.

Ye, H., Shen, H., Dong, Y. (2017). Using Evidence-Based medicine through Advanced Data Analytics to work toward a National Standard for Hospital-based acute ischemic Stroke treatment. Mainland China, 65.