

AI in Medical Field

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Abstract: *In Artificial Intelligence, “Artificial” means objects that are produced by human beings, and “Intelligence” is the capability to form tactics to achieve goals by interacting with an huge information. Artificial Intelligence (AI) could organize better treatment for patients and it also provide information with literally to the physicians. Artificial Intelligence(AI), the ability of a digital computer or computer controlled robot to perform tasks commonly associated with intelligent beings. The advancement in computer technology has encouraged the researchers to develop software for assisting doctors in making decision without consulting the specialists directly. The software development exploits the potential of human intelligence such as reasoning, decision making, learning and many others. AI has been applied in many areas such as education, business, medical, agriculture and manufacturing. AI turning into a well-known field in computer science as it has enhanced the human life in many areas. AI has recently surpassed human performance in several domains, and there is great hope that in healthcare. AI may allow for better prevention, detection, diagnosis, and treatment of disease. Various automated systems and tools like Brain-computer interfaces (BCIs), biomarkers, Natural language processing (NLP) and various algorithms helps to minimize errors and control disease progression.*

This paper studies various technologies used to detect cancer and Stroke.

Keywords: Artificial Intelligence, Medical AI, Health Diagnostics

1. Introduction

In Artificial Intelligence, “Artificial” means objects that are produced by human beings, and “Intelligence” is the capability to form tactics to achieve goals by interacting with an huge information. Artificial Intelligence (AI) could organize better treatment for patients and it also provide information with literally to the physicians, to make an excellent decision in healthcare and medicine. AI already established some areas in healthcare and it is just starting from the design of treatment tactics through the bolster in repetitive jobs towards drug development.

AI has a well-known field in computer science as it has enhanced the human life in many areas. AI has a great hope in healthcare, and it may allow for better prevention, detection, diagnosis, and treatment of disease. Various automated systems and tools like Brain-computer interfaces (BCIs), biomarkers, Natural language processing (NLP) and various algorithms helps to minimize errors and to control the disease progression.

2. Medical AI

Medical AI stands for “Medical Artificial Intelligence”. It uses computer techniques to clinical diagnoses and suggest treatments. AI has the capability to detecting the relationships in a dataset and has been widely used to diagnose, treat, and predict the results. In the research and studies of medical AI, we primarily focus on the viability and feasibility to incorporate various computer AI techniques in medical information modeling. The state-of-the-art AI methods have shown great capabilities in recognition of meaningful data patterns and thus been widely experimented as tools for clinical trials, especially, to aid the decision making in each phase for diagnoses and subsequent treatments.

The main focus of this special issue for medical artificial intelligence, data mining, machine learning, and image processing. This special issue summarizes the most recent developments in the field, and give improvements and obtained the better results within the last several years.

3. Applications of Artificial Intelligence in medical field

3.1 Diagnose diseases

To diagnose diseases correctly, it may takes years of medical training. So, diagnostics is often an time-consuming process. In many fields, the demand for experts far exceeds the available supply. This puts doctors under strain and delays saving the patient’s life.

Machine Learning – particularly Deep Learning algorithms – made huge advances in automatically diagnosing diseases, making diagnostics cheaper and more accessible.

How machines learn to diagnose

Machine Learning algorithms can learn to see patterns similarly to the way doctors see them. But the difference is that algorithms need a lot of concrete examples in order to learn. Machines can’t read between the lines in textbooks, so these examples must be neatly digitized.

Hence, Machine Learning helpful in areas where the diagnostic information a doctor examines is already digitized. Such as:

- Detecting lung cancer or strokes based on CT scans
- Assessing cardiac death or other heart diseases based on electrocardiograms and cardiac MRI images

- Classifying skin lesions from images of the skin.
- Identify retinopathy from eye images

Since there is various data available in these cases, algorithms are becoming just as good at diagnostics as the experts. But the difference is that the algorithm can draw conclusions in a fraction of a second, and it can also be reproduced inexpensively all over the world. Everywhere it could have access to the same quality of top expert in radiology diagnostics for a low price.

3.2 Treatment design

In healthcare treatments, AI upgrading the organization of treatment tactics, analyzing data to provide superior treatment strategy, and monitoring treatments. AI has the ability to recognize signs and symptoms of disease in medical images like, MRI, CT scans, ultrasound and x-rays. Therefore it allows faster diagnostics by reducing the time of patients from weeks to hours, and also the introduction of treatment choices.

3.3 Detecting mental conditions

When scheming eLearning solutions, the psychological conditions has to be taken into an account for instance. To identify these psychological conditions in children earlier several medical technologies are related to AI, for example, the eye-tracking technology Right Eye LLC. In recent times AI powered Autism experiment that permits providers to apply eye tracking technology to recognize early stage of ASD (Autism Spectrum Disorder) in children between age 12 to 40 months. Eye tracking device tests children by visualizing various images on the screen. Based on eye tracking technology, healthcare provider analyse and decide which child has a healthy brain and which one is autistic.

3.4 Recognition of facial symptoms

Technology that permits AI systems to identify faces in digital photographs. Facial emotion recognition (FER) is an important area in computer vision and artificial intelligence. FER can be carried out by using several sensors. To demonstrate, consider Face2Gene phenotyping purposes that use face detection and machine learning to assist healthcare providers in recognizing uncommon genetic disorders. These technology draw data points from a image and analyse it to images of patients from a database, who have also been treated with these disorders. Utilizing facial recognition is conceivable to perceive a person from a digital photo or a video. It is by detecting a face in the image or video and comparing it with a database. Our face, similar to our fingerprints, is a biometric identifier, So very unique characteristics are extracted for face identification.

3.5 Robot assisted surgery

Robotic surgery, computer-assisted surgery, and also robotically-assisted surgery are the robotic systems used in surgical procedures. Robotically-assisted surgery minimally-invasive surgical improve the capacity of surgeons performing open surgery.

In the case of robotically-assisted minimally-invasive surgery, the surgeon uses either a direct telemanipulator or

through computer control. A telemanipulator is a remote controller that allows the surgeon to execute the ordinary activities related with the surgery in the meantime the robotic arms complete those movements using end-effectors and manipulators to do the real surgery on the patient. In computer-controlled systems the surgeon utilizes a computer to deal with the robotic arms and its end-effectors. One of the important use of the computerized technique is that the surgeon does not need to be available during the surgery, but rather can be anywhere in the world, top to the likelihood for remote surgery.

The most familiar surgical robot is the da Vinci Surgical System. Recently, Google has reported that it commenced working with the pharmaceutical giant Johnson& Johnson in designing a new surgical robot system. They are not the only revivals, though. With their AXSIS robot, Cambridge advisers aspire to conquer the limitations of the da Vinci, such as its big size and incapability to work with extremely detailed and delicate tissues. Their robot somewhat relies on flexible components and small, worm-like arms. The programmer consider it can be applied later in ophthalmology, e.g. in cataract surgery .

4. Study of AI Applications In The Medical Field

4.1 AI in Cancer detection

A CNS (Central Nervous System) tumor begins when healthy cells with in the brain or the spinal cord change and grow out of control, forming a mass. A CNS tumor can be either cancerous or benign. A cancerous tumor is spread to other parts of the body. A benign tumor means the tumor can grow but will not spread.

Machine learning algorithms are widely used to identify Central Nervous System Tumors. Artificial intelligence algorithms can also be used to grade gliomas, identify glioma recurrence and post-treatment necrosis, prognosis prediction of gliomas, and predict the prognosis of gliomas.

Lung cancer is the uncontrolled growth of abnormal cells in or both lungs. These abnormal cells do not carry out functions of normal lung cells and do not develop into healthy lung tissue.

AI has make a potential role to detect the lung cancer. The LDCT is the most important technology to detect the lung cancer. In the last decade, lung cancer screening programs using low-dose computer tomography (LDCT) in high-risk individuals have been implemented in some clinical settings. AI has the potential to aid clinicians in the interpretation of LDCT images obtained in the setting of lung cancer screening.

4.2 AI in Stroke

A stroke occurs when the blood supply to part of your brain is interrupted or reduced, preventing brain tissue from getting oxygen and nutrients. Brain cells begin to die in minutes. A stroke is a medical emergency, and prompt treatment is crucial. Early action can reduce brain damage and other complications.

The early detection and diagnosis of stroke are neuroimages obtained from computerized tomography (CT) and magnetic

resonance imaging (MRI) scans. Machine Learning algorithms such as SVM (Support Vector Machine) and CNN (Convolutional Neural Network) are suited for identifying and classifying possible stroke cases based on endophenotype responses of motor disability that the patients are likely to exhibit before the stroke.

Viz.ai is a stroke detection software, was developed by a company based in San Francisco and Tel Aviv. Using deep learning and an algorithm, Viz.ai analyzes brain scans, to detect signs of a stroke and suddenly notify the hospital's stroke team through their mobile phone.

5. Review Of Various Medical AI Related Papers

The authors N. Murali, N. Sivakumaran[1] says the current status of AI applications in healthcare. AI can also be used to automatically spot problems and threats to patient safety, such as patterns of sub-optimal care or outbreaks of hospital-acquired illness with high accuracy and speed. A few ongoing researches of AI applications in healthcare that provide a view of a future where healthcare delivery is more unified, human experiences. This paper will also explore how AI and machine learning can save lives by helping individual patients.

The paper Artificial Intelligence In Medical Application: An Exploration is written by Wan Hussain Wan Ishak, Fadzilah Siraj[2]. According to these authors will explore the potential of artificial intelligence techniques particularly for web-based medical applications. In addition, a model for web-based medical diagnosis and prediction is proposed.

According to AbhimanyuS.Ahuja[3] suggest that, role of AI-based systems in performing medical work in specializations including radiology, pathology, ophthalmology, and cardiology. It concludes that AI-based systems will augment physicians and are unlikely to replace the traditional physician-patient relationship.

Tong Li, YiXie, Jingxiong Chen[4] says that AI has many algorithms, there are many applications in central nervous system tumors, lung cancer, breast cancer, prostate cancer, orthopaedic tumors, etc., with the norms and support of national policies, AI technology in tumor medical imaging will be used broadly. In this paper they include the classic AI algorithm and its applications in medical imaging, Application of AI technology in medical imaging, the application of AI technology in tumor imaging.

According to Mohamed Alloghani1, Dhiya Al-Jumeily, Ahmed J. Aljaaf1, Mohammed Khalaf, Jamila Mustafina, and Sin Y. Tan[5] says that AI in medical research have machine learning component and as such relies on algorithms such as support vector machine, neural network, deep learning, and convolution neural networks. Of these algorithms, support vector machine is the most commonly used, and it has been applied in medical imaging, diagnosis and treatment of stroke as well as early detection of cancer and neurology conditions. In this Paper says that, AI results in higher accuracy of diagnosis and risk prediction compared to human approaches. Despite such success and promising future, AI faces regulatory and data related challenges.

6. Advantages of Artificial Intelligence in healthcare

6.1 AI-driven tools help reveal early disease risks

AI can store the people's data in a single place, it can utilize this information to see into the previous and current health problems. Such a comparison of disease details helpful to the physicians to make a more accurate diagnosis. The database of health apps has compiled millions of symptoms, diagnosis and particular cases that allow for predicting potential health problems a person can have in the future.

6.2 AI algorithms can save time and costs

The other main advantage of AI application in the healthcare system is related to saving the time and making easy efforts that would be needed for examining and diagnosing the patients. Biomarkers technologies that can help to detect certain illnesses in the human body. The algorithms ensure the possibility of automating the bigger part of the manual work in specifying these biomarkers. This way they save time that can cost a person life.

6.3 AI as unique and unrivalled assistance in surgery

AI technologies are used for performing the robot assisted surgeries. AI Surgical System allows for performing the most accurate movements. The complex operations are conducted with minimal pain, blood loss, and low risks of side effects. Furthermore, after such surgical procedures patients recover with in a short time period.

The Antibacterial Nanorobots helps to clear the patient's blood from infections before or after being operated. AI ensure surgeons with real-time information concerning the patient's current condition. Such AI tools made trust in patients when they have some doubts about surgery under general anesthesia.

7. Limitations of Artificial Intelligence in healthcare

7.1 Possibility of a Defective Diagnosis

Machine Learning algorithms can learn to see patterns similarly to the way doctors see them. But the difference is that algorithms need a lot of concrete examples in order to learn, depends on various data collected from millions of people who have experienced similar symptoms and conditions. To enable the proper comparison, the AI database should contain sufficient information about the patients of the particular group. Hence, if there is a lack of information about a person from a certain background, AI can provide an inaccurate diagnosis. As a result the doctor provide wrong treatment and care to the patients.

7.2 A rise in unemployment rates among healthcare workers

Since, AI has been implemented throughout the of healthcare system on a larger scale, many activities that were

traditionally performed by humans can be done by machines nowadays. Chatbots and robots can provide mental health help, analyze the condition of patient's health etc.

Therefore, many people can lose their work and it may replace doctors in the future. The AI software detect diseases from the X-rays with higher accuracy than radiologists can.

8. Conclusion

Artificial Intelligence is growing science. There are many applications related to AI in various fields rather than healthcare, such as data management, drug discovery, diabetic management, digital consultation etc. Studies demonstrate that AI is a fundamentally developing market in the field of healthcare There are many evidences proved that medical AI can play an important role in helping the doctors and patients to deliver healthcare much more professionally in the 21st century.

AI has a significant role in medical field. Diagnose diseases, treatment design, detect mental conditions etc. are the main applications of AI in medical field. There are various AI technologies are available for detecting cancer, stroke etc.

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