



ARTIFICIAL INTELLIGENCE ON EMERGING TRENDS OF HEALTHCARE AND MEDICINE

A.Kavitha

Head & Assistant Professor of Computer Science,
Aditanar College of Arts and Science, Tiruchendur, Tamilnadu, India

Abstract:

Artificial intelligence has made significant advancements and tremendous performance in numerous applications in the history of human civilization. It has been used since last two decades as a development tool in various fields like medicine, forecasting, healthcare, image processing, security and manufacturing. This technology is one of the increasing efficiency and capacity of health-care provision across the region. It enables faster and better service in medicine and health care. Nowadays Artificial Intelligence, Machine learning, Deep learning, Artificial Neural Network, Natural language Processing, Internet of Things, Robotics, Big data analytics have transformed the field of healthcare and medicine in many ways. This paper is focusing on how the AI is used in healthcare and Medicine. This will helps tounderstand the emerging development of Artificial intelligence and its sub fields in healthcare and medicine.

Keywords: Artificial intelligence, AI, artificial neural network, deep learning, healthcare, machine learning, medicine, natural language processing

INTRODUCTION

Artificial intelligence (AI) is based on the disciplines such as Computer Science, Biology, Mathematics, Engineering, Psychology, Linguistics and many more. The goal of AI is the development of intelligent machines that can learn, analyze, communicate, predict, manipulate the objects and solve the problems. Nowadays Artificial Intelligence has revolutionized many fields such as education, agriculture, military, business, manufacturing, engineering, research, healthcare and medicine.

Over the past decades recent advancement of Artificial Intelligence is used in many areas such as Natural Language Processing, Object Recognition, Speech Recognition, Computer Vision, Robotics and Sensory Systems, Computer Vision, Fuzzy Logic, Expert Systems, Neural Networks, Cognitive Computing, Biometrics and many more. In recent year healthcare and medicine fields are significantly changed because of the latest technologies like AI, Internet of Things (IoT), Cloud Computing, Big Data, Robotics, Machine Learning and Deep learning. At present the above said advancement technologies has supported tremendously to the doctors to treat the patients in their earlier stage [1].

Over the past 3 years Corona virus disease-19 (COVID-19) has changed the world completely. It affects mostly all the sectors such as education, transportation, politics, business etc. Recently the advanced technologies such as AI and deep learning techniques are used to monitor and control the spread of corona virus by identify the high risk patients and cure them from infection in the real world [2].

LITERATURE REVIEW

Artificial Intelligence is the combination of science and engineering field that can build smart machines which has the ability to copy the functions of human brain. Machine Learning is a sub discipline of an exciting technology Artificial Intelligence that can learn automatically from experience. The sub discipline of the latest buzzword Machine Learning is Deep Learning that is concerned with algorithms inspired by the function of the brain called Artificial Neural Networks. At present, AI is making our daily life more comfortable. Moreover it could significantly improve efficiency in healthcare and medicine field. Medical Decision Support System supports health professionals to take best medical decision. Patients use AI chatbots to identify symptoms and they can follow further actions easily.

ANNs (Artificial Neural Network) can perform parallel computations for data processing and knowledge representation. Their ability to learn from past examples, analyse non-linear data, handle imprecise information and generalise enabling application of the model to independent data has made them a very attractive analytical tool in the field of medicine. Dilsizian et al discussed the application of the Artificial Intelligence system to diagnose the heart disease via cardiac images. Stamey et al., proposed a neural network classification algorithm which can classify prostates as benign or malignant. This model has the accuracy of 90% with a sensitivity of 81% and specificity of 92%. [3].

ARTIFICIAL INTELLIGENCE IN HEALTHCARE AND MEDICINE

Recently cardiovascular failure, lung failure, kidney failure and cardiovascular diseases are increasing day by day. It requires a lot of health monitoring from time to time. Nowadays doctor can constantly monitor the patient health without physically interact so it reduces the number of the patient's presence in the hospital. Generally diseases are spread among the people by various new viruses. In medical field there are so many research is going for variety of diseases. Artificial intelligence is an advanced science technology has been widely used in medical fields to promote medical development, disease diagnoses, determination of disease severity, drug development and management. The following diagram Figure 1 illustrates about the uses of Artificial intelligence in Healthcare and Medicine.

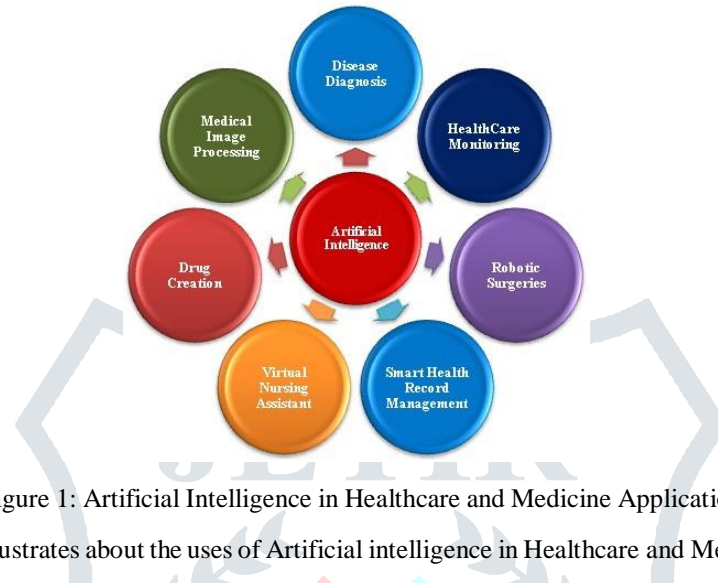


Figure 1: Artificial Intelligence in Healthcare and Medicine Applications

The following diagram Figure 2 illustrates about the uses of Artificial intelligence in Healthcare and Medicine.

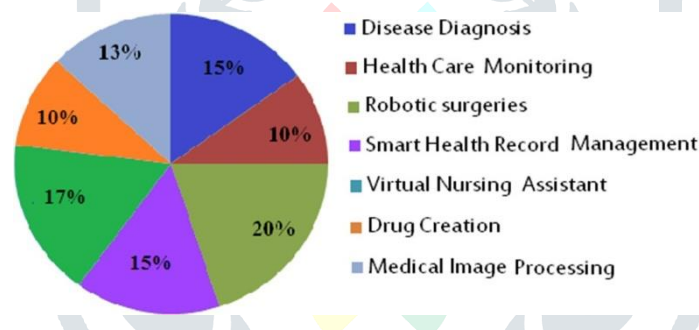


Figure 2: Uses of Artificial Intelligence in Healthcare and Medicine Applications

Artificial Intelligence is one of the promising technology for diagnose the disease of a patient at earlier stage. It provides best results in pneumonia, dengue, blood cancer, lungs cancer, brain tumor, COVID-19 disease diagnosis. Over the past two years many people are affected by Corona virus. During this period AI technologies helps in diagnosis and providing treatment at an early stage [4].

AI techniques have been applied to echocardiography, electrocardiography, vectorcardiography and electronic health records in the diagnosis and treatment of heart diseases. Nowadays telemedicine with wireless technologies has produced remarkable advancement in the field of cardiovascular imaging. With the implementation of remote echocardiography and AI robotics technology provides sufficient support to acquire, identify, and quantitatively analyze echocardiograms. ML has been applied in analyzing the performance of stroke treatment [5].

In today's modern digital world the tumor is one of the dangerous diseases which can be on any part of the body. The brain tumor is most dangerous and very complicated to cure it. The integration of AI, computer vision, and robotics play a vital role in brain tumor surgery with a high degree of precision. Sourabh Hanwat et al [6] proposed CNN algorithm used for classifying a brain tumor with the help of the MRI Images. The accuracy of this training model is 98% which is better than the result of the Random Forest and k-Nearest Neighbors classifier.

Healthcare Monitoring

During the pandemic Covid-19 period Artificial Intelligence, Robotics and deep learning algorithms are the latest and valuable technology to identify the corona patients in earlier stage and also helps in monitoring the condition of the infected patients. In many hospitals Patient Centred Health Information Systems assists to doctors and nurses to monitor and interpret patient's medical history. Recently smart watches, smart phones and wearable devices can be employed for diagnosis and efficient monitoring in COVID-19. Moreover, AI with IoT technologies watch is used to monitor the patient's heart rate at regular interval to prevent them from heart attacks. In addition it is used to observe their health records such as pulse rate, body temperature, blood sugar, blood pressure and oxygen levels. In addition, Virtual clinics would ensure that patients continue to obtain regular medical care while reducing the crowd of patients in the hospital. Patient remote monitoring systems monitor the patient's health condition regularly and make alerts during irregular situations of patient's health. We can see that more than 2 million patients are getting telemedicine treatments in the worldwide

per annum [7].

Internet of Medical Things (IoMTs) is one of the promising Telehealth monitoring systems. It is used to transfer and monitor medical information in patient centered systems to assist the doctor in analyzing and interpreting the life-threatening diseases efficiently [8]

Robotic Surgeries

Robotic surgery is one of the remarkable technologies in healthcare and medical field. AI Robots are very intelligent so it has become more collaborative with humans and are more easily trained to perform the desired task. Recently robots perform very critical surgery with improved precision in many hospitals. Surgical robots provide extra powers to surgeons, improving their skill to create precise and minimally invasive incisions, stitch wounds and so forth. Technological advances in robotics stimulate the development of new treatments for various complex surgeries relating to the brain, kidney, lungs, heart, head, neck and other sensitive areas. Minimally invasive cardiac surgery was one of the landmark applications of robot. Smart Tissue Autonomous Robot (STAR) works better than expert surgeon in soft tissue cutting precisely during the surgery. Similarly da Vinci Surgical System has magnified 3D high-definition computer vision system and tiny wristed instruments that bend and rotate more flexible than the Surgeon [9]. Robotic tele-surgery devices are applications where the surgeon remotely controls the robot performing the operation. The following diagram Figure 3. illustrates about the use of AI in robotic surgeries during the period from 2018 to 2022

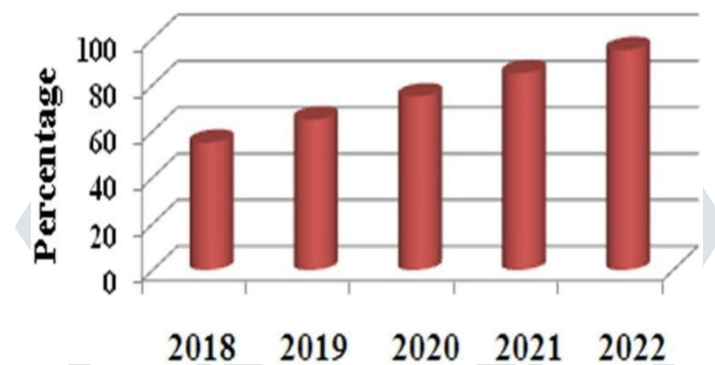


Figure 3: Use of AI in Robotic SurgeriesSmart Health

Record Management

Nowadays EHR (Electronic Health Records) store and maintain the huge data of patient's information including patient's history, laboratory test results, prescribed medications and clinical notes. Data were based on traditional machine learning and statistical techniques such as logistic regression, support vector machines (SVM), and random forests are used to analyze the patient data and produce the patient health conditions result quickly. At present, sensor equipments with AI technology are used in smart hospitals to promote automation and reduce human intervention in many tasks, thus it reduce the costs and increase efficiency and save time. [7]

Moreover the rapid adoption of EHRs in recent decades has generated large volumes of medical data for the early detection of diseases such as heart failure and to improve risk assessment in patients with suspected coronary artery disease. At present in ophthalmology, machine learning classifiers with EHR data have been used to predict risks of cataract surgery complications, improve diagnosis of glaucoma and age-related macular degeneration and perform risk assessment of diabetic retinopathy [13].

Drug Creation

Drug development is one of the important applications of Artificial Intelligence. Nowadays AI has been widely used in many stages of the drug development process such as identification and validation of drug targets, designing of new drugs, drug repurposing, aggregating and analyzing biomedicine information and so on. Moreover, AI, Deep Learning and Big Data provide better decision-making in various stages of drug discovery. It is really long, costly and challenging process. [12].

Over the past five years numerous computational methods have been newly introduced to reduce drug discovery times and costs. In addition it improves the quality of development process and its successrate [14].

Virtual Nursing Assistant

In many hospitals virtual nursing assistant assists doctors to monitor the patient's health condition, recognize their sickness based on their symptoms and schedule doctor appointments. For example RONA (Robotic Nursing Assistant) system used in hospitals to assist nurse personnel for moving patients from one bed to other bed or bed to Wheelchair [11].

In COVID-19 pandemic robots play a vital role in logistic tasks of hospitals. The robotic nursing assistants are designed to assist for nurses in hospitals. It helps to nurses by performing tasks such as food and medication delivery, patient movement, caring for patients and assists with daily hygiene. Moreover, ARNA (Adaptive Robotic Nursing Assistant) is a novel robotic system used to sanitize commonly touched surfaces such as work desks, doorknob and so on.

Medical Image Processing

Rapid advancements of Artificial Intelligence and Computer Vision help to radiologists to treat the patients more efficiently. Recently Convolutional Neural Network algorithms are used in examining medical images obtained from Ultrasound scan, CT scan, MRI Scan, X-ray to classify and discover the diseases from these images [12]. AI applications improving image quality and decreasing MRI scanner time and radiation dose, optimizing CT or MRI scanner utilization. Also it will simplify and accelerate technicians' work and reduce

cost [15].

Robots in medical field needs appropriate feedback for accurate and secure operations due to the dynamic and unstructured part of human body. This feedback is used to generate a quick response for controlling the robot motions. It helps to surgeons to monitor the patient's condition during the operations.

CONCLUSION

Over the past decade, AI has reached exponential growth in most applications of healthcare and medicine field such as detection of disease, complex surgery, management of chronic conditions, Telemedicine and drug discovery. As a result, the integrations of AI, Robotics, IoT, Big data analytics, Machine learning and Deep learning algorithms helps to improve the treatments of patients in earlier stages. Moreover these technologies play an important role in the global battle against the COVID-19 pandemic. In future, it will become an important and powerful technology to fight against various novel diseases. In this study, we provide the role and progress of Artificial intelligence in Medicine and healthcare field.

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