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Review Article

Artificial Intelligence in Healthcare – A Review

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Abstract

Artificial intelligence (AI) is defined as a field of science and engineering concerned about the computational comprehension of what is commonly called intelligent behavior, and with the creation of artifacts that exhibit such behavior. It is the subfield of computer science. 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. Major disease areas that use AI tool include cancer, neurology, cardiology and diabetes. Review contains 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 review will also explore how AI and machine learning can save lives by helping individual patients.

Keywords: Artificial Intelligence; Computer; Data; Diseases; Healthcare; Robots.

Introduction

In Artificial Intelligence, "Artificial" means objects that are made or produced by human beings rather than taking place naturally, and "Intelligence" is the capability to form tactics to achieve goals by interacting with an information-rich surroundings therefore Artificial Intelligence simply represent the intelligence of machines and the separation of computer science that targets to generate it[1]. Artificial Intelligence (AI) could organize patient routes or treatment tactics better, and also provide physicians with literally all the information they need to make a excellent decision in health care and medicine [2]. AI already established some areas in healthcare and it is only the beginning to alter dramatically starting from the design of treatment tactics through the bolster in repetitive jobs towards medication management or drug development [3].

Doctors don't have to learn by heart almost as much more data as they did 50 years before. Digital technology has liberated medical doctors, nurses and researchers to focus further mental energy on higher-level cognitive tasks and patient concern[4]. AI is ready to obtain this to the next stage. 'Thinking' time was spent getting into a position to think, to build a decision, to study something [5]. Much more time went into discovering or acquiring information than into digesting it. More than a few hours of calculating were required to obtain the data into comparable form. When they were in comparable form, it took only a only some seconds to decide [6].

As AI keep on progress, it has the capability to expand the energy of a person thinking in three crucial regions: highly developed computation, statistical analysis and hypothesis generation. These three regions correspond to three unique waves within AI

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progression [7]. Specialists roughly observe in excess of 50 patients for every day, which can be to a great degree debilitating thinking about the individual amount of notice and information per individual requires [8]. Unlike a medical doctor, AI is un-phased by numbers of patients, stretch work hour, and task redundancy [2]. AI helps doctors to evaluate the health endanger of a patient and then uses the intelligence to not only develop the quality of care, but also observe and advice patients on the side effects of certain medications [7]. The impact of AI athwart the globe is troublesome, with technologically highly developed tools allowing improved decision-making, discovery of disease, and management of ailments such as chronic and acute [9].

Doctors and other medical professionals utilize AI to make more accurate and faster diagnosis [10]. In medicine, AI uses arithmetical algorithms along with data-science from the human body to make diagnosis, better than doctors can do[11]. This gives specialists the potential to take instantaneous actions for diseases that may otherwise become severe [6]. Healthcare systems have to be understood in terms of a broad variety of heterogeneous, distributed and ubiquitous systems, speaking dissimilar languages, integrating medical appliances and being personalized by dissimilar entities, which in turn were set by people living in dissimilar contexts and aiming at dissimilar goals [8].

Hence, architecture has been envisaged toward support the medical uses in conditions of an organization for integration, dispersal and archiving of medical data and the electronic medical record, a shape of a web spider of intelligent information processing system, its foremost subsystems, their functional roles and the stream of information and control among them, with modifiable autonomy. With such web-based simulated systems, quality of service will be enhanced [9].

Applications of Artificial Intelligence in health care

Managing medical records and data

The most apparent use of artificial intelligence in healthcare is data management. Gathering it, storing it, normalizing it, and tracing its ancestry. It is the primary step in revolutionizing the obtainable healthcare systems [12]. quite recently, the AI research branch of the search giant, Google, propelled its Google Deep mind Health project, used to mine the information of medical statistics a good way to offer extremely good and expeditious health services [13]. Since the essential step in health care is compiling and investigating data, data management is the most broadly utilized application of artificial intelligence and digital automation. Robots collect, store, re-layout, and trace data to offer faster, more consistent access [14].

The past decade has seen an emission in the measure of health information that is currently obtainable[15]. In healthcare industry, data (patient information, diagnosis information, new research findings, and more) is generated in massive volumes every day [16]. The combination of huge data analytical tools have helped organizations achieve the insights essential to collaborate much more efficiently with patients and take excellent decisions, and this dependence on large data and storing it to reducing wastage; from cutting coast to streamlining hospital staff timings; from empowering remote patient monitoring to anticipating epidemics, the utilization of bog data has been growing notably [14].

AI is a branch of computer science and technology adapting with the simulation of smart behavior in computer system. Coordinating the experience, information, and human contact of clinicians with the power of AI will enhance the high quality of patient care and also lower its cost. Data from whole patient populations can be analyzed using AI to discover new evidence and determine high-quality healthcare practices [17].

Doing repetitive jobs

Analyzing tests, X-Rays, CT scans, data entry, and other usual tasks can all be done much faster and more accurately by robots[18]. Cardiology and radiology are two fields where the amount of data to examine can be overwhelming and time intense [19]. Cardiologists and radiologists in the future should only look at the foremost sophisticated cases where human supervision is helpful. IBM commenced another algorithm known as Medical Sieve [20]. It is an ambitious long-term investigative project to build the next generation

"cognitive assistant" with analytical, reasoning capabilities and a extensive range of clinical knowledge. Medical Sieve is eligible to help in clinical decision making in radiology and cardiology. The "cognitive health assistant" is able to examine radiology images to mark and identify complications faster and more reliably [21].

Treatment design

AI is resulting in advancements in healthcare treatments, such as upgrading the organization of treatment tactics, analyzing data to provide superior treatment strategy, and monitoring treatments [22]. AI has the ability to rapidly and more accurately recognize signs and symptoms of disease in medical images, such as MRI, CT scans, ultrasound and x-rays, and therefore permits faster diagnostics reducing the time of patients wait for a diagnosis from weeks to mere hours and expeditiously the introduction of treatment choices [23].

Doctors can now search information, such as Modernizing Medicine, a medical assistant used to gather patient information, record diagnoses, mandate tests and prescriptions and arrange billing information[2]. Furthermore, the aptitude to explore public databases with information from thousands of doctors and patient cases can assist physicians manage better personalized treatments or discover similar cases [20]. AI will encourage clinicians adopt a more extensive strategy for malady administration, better facilitate care designs and help patients to all the more likely oversee and satisfy with their long haul treatment programs [21].

Digital consultation

Bots for healthcare exist first and foremost for patient engagement. Healthcare bots, which are found in mobile messaging apps, that can facilitate patients quickly and in actual time simply by sending a message for example Babylon and uMotif's[24]. Health conversation bots can reply to health-associated questions and even support patients manage medications by providing data on variety of medications and suggested doses [25].

Healthcare Monitoring gadgets that use AI techniques are currently in extensive use. They can be utilized as remote patient monitoring for health indicators, such as post-operation heart action, patient height and weight, and so on. Wearable gadgets, similar to wristwatches, such as those of Fit BIT commercial fitness trackers, are now frequently used. AI can be utilized to remotely decide persistent treatment designs, or alarms to give the client with any issues. Wearable gadgets can monitor information associated to health and comfort, such as the number of steps walked, or else the number of calories burned. This might be significant to patients seeking to drop weight. AI can then interpret this information to provide people better access to knowledge regarding their physical state and thus, give confidence to patient lifestyle changes [26].

Drug creation

Machine learning algorithms are now being used with numerous achievements to decrease drug discovery times. Developing pharmaceuticals by means of clinical tests is exceptionally tedious, as often as possible taking considerably more than 10 years, and cost billions of U.S dollars. Using AI to restore parts of the drug discovery process can be much quicker, cheaper, and safer. At the same time AI cannot completely remove all the stages concerned in drug creation, it can assist with stages like, discovering new compounds that could be possible drugs. It can also assist to find new applications for previously tested compounds[27]. Between the West Africa Ebola in 2014 virus outbreak, a program powered by AI was used to scan accessible medicines that might be redesigned to fight against the disease. Two drugs were discovered to reduce infectivity in one day, when analysis of this kind generally takes months to years, a difference that might signify saving thousands of lives [28]. Not long from now, AI platforms united with in-memory computing technology will have the capacity to offer accelerated drug discovery and development and delivery and also help scientists find new uses for drugs[27].

Detecting malignant diseases and assessing the effectiveness of chemotherapy in cancer patients

Some kind of skin markings, similar to lesions, can be symptomatic of medical conditions. Recognizing them can assist medical practitioners distinguish malignant conditions

like skin cancer earlier. Certain treatment systems are now applying AI algorithms for this. Derma Compare is a main example that applies AI algorithms to compare and contrast images of melanoma moles with images of 50 million known moles uploaded by patients and doctors in the entire world [29].

Through the application of AI, special features can be extracted from images that gives much more information than the human eye could determine[30]. Imaging, for instance, can capture macro differences among tumors, such as dimension, shape, and exterior features (smooth versus rough and infiltrating cancers.) If these physical features can be connected to specific mutations, for instance, the data might be utilized to determine diagnosis or predict results [29]. The revolution in digital computer technology that has made feasible new and complicated imaging techniques may subsequently have an impact on the interpretation of radiologic images. In mammography, computer image and AI techniques have been used effectively to distinguish or to portray abnormalities in digital images[31].

Detecting mental conditions

That demeanor or psychological condition has to be taken into account when scheming eLearning solutions for them, for instance. To identify these psychological conditions in children earlier several medical technologies are revolving to AI [32]. Contemplate on the eye-tracking technology Right Eye LLC. The technology innovator in recent times established an AI powered Autism experiment which permits providers to apply eye tracking technology to recognize early stage of ASD (Autism Spectrum Disorder) in kids ranging from 12 to 40 months [33]. During the analyses, an eye tracking device tests children by presenting various images on the screen. Based on this technology, health care provider decide which child has a healthy brain (they mainly concentrate on faces on screen) and which show autistic visual propensity (concentrating much more on other objects on screen) [34].

Recognition of facial symptoms

Technology that permits AI systems to identify faces in digital photographs is now presenting the similar potential in discovering physical identifiers in some medical conditions. Facial emotion recognition (FER) is a most important area in the fields of computer vision and artificial intelligence owing to its remarkable educational and commercial potential. even though FER can be carried out utilizing multiple sensors [35]. To demonstrate, consider Face2Gene phenotyping purposes that use face detection and machine learning to assist healthcare providers in recognizing uncommon genetic disorders. These applications draw data points from a image and evaluate it to images of patients from a database, who have also been treated with these disorders [36].

Utilizing facial recognition is conceivable to perceive a person from a digital photo or a video. This is reached by detecting a face in the image or video and comparing it with a database including both face pictures and metadata relating the picture with a person. Our face, similar to our fingerprints, is a biometric identifier, a very unique characteristics are extracted (minutiae), for face identification, the similar process is used [37].

Management of diabetes

Diabetes is a chronic progressing metabolic turmoil described by high blood glucose level. Increment in blood glucose level is distinguished due to either pulverization of pancreatic β-(Type I) or cells resistant to insulin (Type II). The disease development directs to severe micro vascular or macro vascular disorders such as neuropathy, nephropathy, retinopathy and cardiomyopathy [38].

The reason for AI in analysis or checking of diabetes and its inconvenience can build up the patient's magnificence of life [39]. The computer assisted diagnosis, decision support systems, specialist systems and execution of software may help physicians to reduce the intra and inter-observer variability. The application of AI enhances interpretation of outcomes with high precision and maximum speed c. For an instance, The Diabeter Clinic’s latest observational test applied a system built on top of a self-optimizing AI platform. The system, named as Rhythm, forecasts and manages blood glucose levels of people with diabetes, relied only on non-invasive biometric sensors and AI [41].

Robot assisted surgery

Robotic surgery, computer-assisted surgery, and also robotically-assisted surgery are terms for technological improvements that utilizes the robotic systems to aid in surgical procedures[42]. Robotically-assisted surgery was created to conquer the limitations of pre-existing minimally-invasive surgical procedures and to improve the capacity of surgeons performing open surgery [43].

In the case of robotically-assisted minimally-invasive surgery, instead of straightly moving the instruments, the surgeon uses one of two methods to control the instruments; either a direct telemanipulator or through computer control [44]. 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[45, 46]. In computer-controlled systems the surgeon utilizes a computer to deal with the robotic arms and its end-effectors, however these systems still utilize telemanipulators for their information [47]. One beneficial use of the 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 [48].

The most familiar surgical robot is the da Vinci Surgical System [49]. Recently, Google has reported that it commenced working with the pharmaceutical giant Johnson& Johnson in designing a new surgical robot system[50]. 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[51]. 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 [50].

Future of Artificial Intelligence

AI is in advance traction in many fields. AI has the likelihood to have an enormous and positive impact for doctors and patients in healthcare. Because of the capability to collect and analyze a huge amount of various data, AI could yield considerably quicker and much more accurate diagnoses for a broader section of the population. Individuals without access to extremely specialized healthcare might achieve the advantage of that experience through AI [52].

Healthcare expenses could potentially fall due to previous and more accurate diagnoses. AI also causes risks for the medical profession and patients. Until the data warehouse gets big enough and extremely well qualified, doctors will have to persist to use their training and experience to guarantee that artificial intelligence is yielding the proper diagnoses and course of medical treatment [53].

As AI technologies expand, they will change the way doctors look at their patients, broaden the possibilities to predict and treat diseases, save healthcare expenses and progress medical care in regions where access to healthcare is limited. Finally, picturing a future of medicine based on data and analytics gives explanation for hope but needs constant research to understand its full potential [54].

Limitations of Artificial Intelligence in healthcare

The term “artificial intelligence” could be deceptive in many cases as it involves a far more developed technology than it stands at the moment [27]. At finest, current technology – meaning a variety of machine learning methods is able to achieve artificial narrow intelligence (ANI) in various fields. Yet, that is developing at an implausible speed[24]. These narrowly intelligent programs beat humans in particular tasks. To avoid over-hyping the technology, the medical restrictions of present-day ANI also have to be acknowledged[4]. Streamlining and standardizing medical records in such a way that algorithms can make sense of them mean another huge limitation in introducing ANI to hospital departments for doing administrative task.

Conclusions

Artificial Intelligence is growing science which has applications in various fields as well as medicinal services framework. Studies demonstrate that AI is a fundamentally developing market in the field of healthcare. It has wide variety of applications in this field such as data management, drug discovery, diabetic management, digital consultation etc. There is

some proven evidence that medical AI can play an important role in helping the doctors and patients to deliver healthcare much more professionally in the 21st century.

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Conflicts of interest

Authors declare no conflict of interest.

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