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Applications of Machine Learning Algorithms in Healthcare Industries

Manju Payal¹, Dr. T. Ananth kumar², P. Divya³

Software Developer, Academic Hub Ajmer, India¹

Department of Computer Science and Engineering, IFET College of Engineering, Tamilnadu, India²

Department of Computer Science and Engineering, IFET College of Engineering, Tamilnadu, India³

ABSTRACT: The healthcare industry is data-driven and generates approximately one trillion gigabytes of data annually, which is difficult for humans to analyze due to the volume of data. Applications of machine learning are rapidly gaining traction in the health care industry, and they have the potential to make a significant impact. This research looks at the benefits of using machine learning in the medical field and how machine learning can be used to revolutionize the healthcare industry. In the field of medicine, machine learning algorithms have led to significant advancements in recent years. This research aims to investigate the potential applications of machine learning in the medical field. In just a few years, machine learning will completely change the way health care is delivered.

KEYWORDS: SVM; Machine learning; healthcare; Artificial intelligence.

I. INTRODUCTION

The health industry places a significant emphasis on new technological developments in order to broaden and optimise its capabilities[1]. As people live longer on average, the healthcare industry is a multi-trillion dollar industry that continues to grow each year around the world[2]. While conventional methods of diagnosis and treatment are still in use, new technologies offer more accurate diagnoses, transform how medical professionals practise their craft, help save lives, and reduce patient suffering[3]. Learning algorithms such as machine learning and deep learning are two examples of the kinds of technologies that can be implemented at any stage of the healthcare delivery process to produce tools that both patients and medical professionals can use. The following is a condensed version of the method, which can be utilised in forecasting either the patient or the physician segments[4].

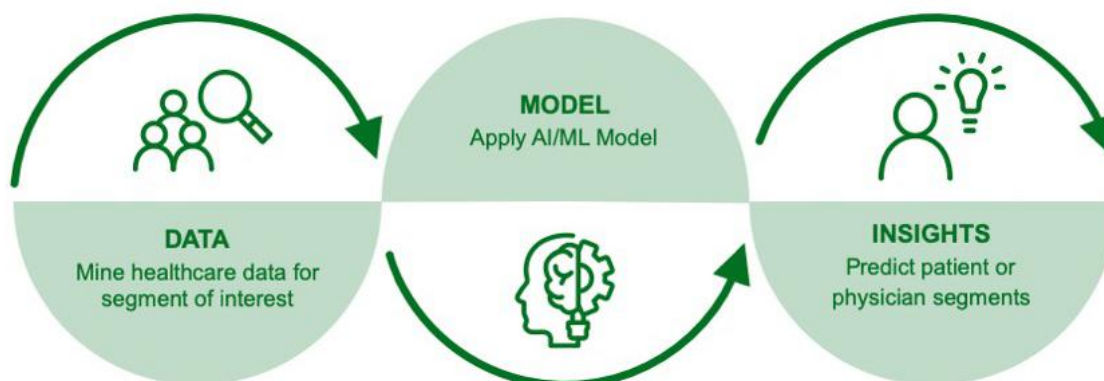


Fig. 1. Model diagram of Machine learning

The fields of artificial intelligence (AI) and machine learning are inextricably linked. AI, or artificial intelligence, is a technology that enables computers to imitate human intelligence and carry out tasks in an intelligent manner[5]. The purpose of machine learning is to generate as many positive results as possible while simultaneously improving the accuracy of its predictions. In particular, the field of healthcare has been significantly impacted by



machine learning, which has led to a revolution in medical diagnostics, reduced idle time, and improved quality of automated, individualized health recommendations[6]. For instance, the field of artificial intelligence known as machine learning teaches computers to think in the same way that humans do by teaching them to recognise patterns, learn from their actions, and form opinions based on their previous experiences. In the field of medicine, machine learning algorithms are utilized to eliminate the need for continuous programming in order to extract valuable information and learning points from large data sets[7].

II. LITERATURE SURVEY

Both children and adults are diagnosed with the most dangerous form of blood cancer simultaneously and in equal numbers. This form of leukaemia is known as acute lymphoblastic leukaemia (ALL)[8]. Using the microscope image processing software, you can improve the image quality, segment the photographs, and extract characteristics from the images. These and other image processing procedures can be performed on microscopic photographs[9]. Image processing tasks on microscopic images can only be carried out with the assistance of software developed specifically for image processing. Because it does not require the purchase of expensive laboratory equipment, image-based detection is not only a quick and cost-effective method of identifying infections, but it is also one that does not require such equipment. Image-based detection can be used to diagnose a wide variety of infectious diseases[10-12].

On January 30, 2020, the very first case of covid-19 was discovered and recorded in the medical literature. After March of 2020, the total number of incidents kept rising to ever-higher levels throughout the rest of the year[13]. (SARS-CoV-2) The acronym SARS, which stands for severe acute respiratory syndrome, refers to a particular manifestation of the acute respiratory syndrome[14]. The name COVID-2019 has been given to a Coronavirus case that is so severe that it has never been seen before. It posed a risk to the continued existence of any global society at the time[15]. This pandemic is being evaluated worldwide as COVID-2019, and to estimate the pandemic, several different tests, and numerical models are being used. The pandemic is expected to last until at least 2019. The development of these numerical models is guided by a wide range of criteria, including a focus on research and the years to come[16]. A model that has recently been presented has the potential to be useful in predicting COVID-2019. This model uses machine learning models and time series forecasting techniques such as Support Vector Regression[17], linear regression[18], and DST learning forecasting models such as Support Vector Regression and linear regression. In addition, DST learning forecasting models are also utilized (LSTM)[19-21].

1. Applications Of Machine Learning in Healthcare Industry

a. Timely Diagnosis with Machine Learning

The entirety of the medical community is currently engaged in a battle to accurately and promptly diagnose life-threatening diseases such as cancer as well as degenerative mental disorders such as Parkinson's disease and depression. This war is being waged in an effort to improve patient outcomes[22-23]. Together, some of the largest technology companies in the world are collaborating on a project to advance medical research. The development of diagnoses and treatments combining the capabilities of machine learning computers with the requirements of the healthcare industry.

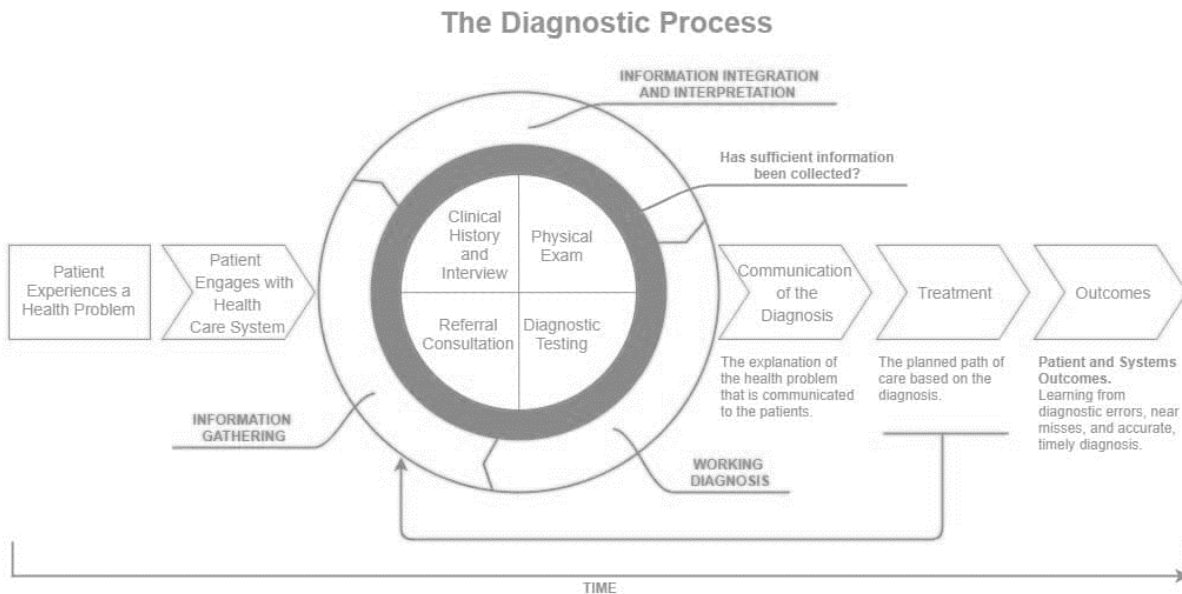


Fig. 2. Machine learning based Diagnostic process

Detection of problems or health concerns can be made in significantly less time and with far greater accuracy by using this technology. According to researchers, machine learning algorithms can be used to make a variety of healthcare predictions, such as the likelihood that a patient will develop a specific illness or that they will be re-hospitalized within a certain amount of time, or that a patient will respond favorably to a new treatment. Machine learning algorithms can be used to analyze healthcare data to make all of these predictions[24-27].

Improving the accuracy of diagnoses by using various applications of machine learning and pattern recognition[28-30].

An algorithm developed by Google has the potential to diagnose breast cancer based on malignant cell patterns found on tissue slides. This diagnosis would be based on the patterns of cells found on the slides. The accuracy rate of a human pathologist is only 73 percent, whereas the accuracy rate of an algorithm is 89 percent[31]. It is possible to get a better idea of how likely a disease will strike again in the future by looking at the data collected from previous outbreaks of the disease. The location of Purdue University's campus is Indianapolis. Because of a model for machine learning that was developed in Indianapolis, it is now possible to make an accurate prediction of whether or not a patient will go into remission from leukaemia. In addition, it was possible to make accurate predictions regarding relapses at a rate of 90 percent of all cases. The diagnostic algorithm for AML was trained with data obtained from the blood of healthy people and bone marrow samples and patient medical histories of people who had AML[32-35]. This allowed for a more accurate diagnosis of the disease. In an effort to diagnose and treat cancer, a biopharmaceutical company named Berg is applying the principles of machine learning and artificial intelligence in their research. In the case of IBM's Watson Genomics, machine learning has the additional capability of identifying diseases in the preliminary stages of their progression. DeepMindHealth, a Google subsidiary, is devoting its attention to improving eye care at present. On the other hand, these advancements in artificial intelligence (AI) are still trying to figure out which strategies have been successful in the past[36].

b. Imaging with MRI by Utilizing Machine Learning Applications

The Microsoft Inner Eye is an image diagnosis tool that aims to detect malignancies early in order to revolutionise MRI imaging. This can be accomplished through the early detection of cancerous tumors. As a result of a game-changing development in technology, diagnostic imaging in medicine is now a component that is driven by

machine learning. This is an important step forward in the field. The Oxford P1Vital PReDict project's primary concentration is on the clinical management of mental illness patients[37-39].

Deep learning systems can diagnose problems, but they are unable to explain how they arrived at their findings. This is the case even though these systems can diagnose problems. As a result of this, medical professionals are reluctant to make decisions that could have a consequence of life or death in the absence of scientific evidence regarding how the computer diagnosed the illness.

c. Implementation of Machine Learning in Treatments

The development of personalized medications tailored to an individual patient's specific requirements is an active area of research. Medications are tailored to the individual based on their medical history, genetic heritage, previous illnesses, allergies, and other relevant factors. Machine learning will assist in determining which medications a person is sensitive or reactive to, which will help select the most appropriate treatment plan for the individual[40].

It is possible to adjust the dosage of any medication, from the most common to the most specialized, to meet a specific patient's requirements. In addition to making an accurate diagnosis, precision medicine is an absolute necessity for stopping the progression of diseases. The Knight Cancer Institute and Project Hanover, which Microsoft runs, are working together to develop a cancer precision therapy.

d. Machine Learning and Drug Discovery

One of the most fruitful applications of machine learning can be found in the field of pharmaceutical research and development. It can help with the preliminary screening of medicinal compounds and then predict success rates based on the biological parameters that are available[41-43]. If machine learning is successful in developing ground-breaking improvements to existing medications, it has the potential to eliminate major players in the pharmaceutical industry by significantly lowering the cost of medications that save lives. This would be a significant boon for the healthcare industry. In this particular industry, both Google and IBM are concentrating their efforts on achieving their goals by applying next-generation sequencing technology.

The MIT Clinical Machine Learning Group is attempting to develop medications that will be able to treat type 2 diabetes.

e. Modifications to Behaviour Made Possible by Machine Learning

Machine learning has the ability to monitor both voluntary and involuntary motions, which is just one of its many applications[44]. Somatix is able to understand human behavior, which is a fantastic example of a machine understanding human behavior. It does this by following the movements of the user's hands as they get closer and closer to their mouths, which helps them kick the habit of smoking. Machines may one day be able to interpret the behavioral patterns of an individual in a more precise manner, which will aid in the process of prescribing preventative medicines. Through the application of machine learning, it is possible to make effective use of preventative medications in the treatment of patients and the prevention and detection of cancer and other areas.

f. The Importance of Machine Learning and Other Forms of Artificial Intelligence in Record Management

Documenting medical history manually and ensuring that it is always up to date is a task that presents a significant challenge. Even though technological advancements such as data entry have made their way into the realm of maintaining medical records, the process is still highly time-consuming. The meticulous upkeep of electronic medical data is one way that machine learning can reduce the amount of time, money, and labour expended in the medical industry[45].

In an effort to make sense of real health data, more information is constantly being combined from mobile devices. The treatment of Parkinson's disease and Asperger's syndrome can benefit from the use of Machine Learning, which Apple's Research Kit supports. Machine learning is utilised in order to maintain and keep this information up to date successfully. Radiology and Radiotherapy are Separate but Related Fields get the most out of machine learning. The diagnosis of cancer, which is frequently delayed, presents a significant barrier to progress in the war against the disease. In the vast majority of cases, treatment is initiated very late in the course of the disease's progression, which

significantly lessens the treatment's overall effectiveness. One of the Machine Learning-based algorithms that is in the highest demand is one that can differentiate between healthy tissues and diseased tissues, as well as typical lesion growths and pathological lesion growths. Another algorithm that is in high demand is one that can differentiate between typical lesion growths and pathological lesion growths. DeepMindHealth, a Google subsidiary, and the University of California, Los Angeles (UCLA) have collaborated on the development of a machine learning system. This system is able to differentiate between healthy cells and cancerous cells, which makes it possible for radiation therapy to be improved and more precisely targeted. The process of tissue segmentation, which is necessary for accurate radiation therapy planning, is going to be sped up due to this technology.

g. Surgeries Performed by Robots

Machine learning has the potential to assist in the performance of surgical procedures with greater attention to detail, fewer tremors, and within more constrained spaces when it is applied to the surgical aspect of medicine. The commands that human controllers issue are what enable robotic limbs to move deftly and keep them moving in a steady motion. As a result of the da Vinci Robot's capabilities as a robot surgeon, there has been a significant uptick in interest in the device all over the world[46]

A number of surgical procedures, such as suturing, the evaluation of surgical abilities, the development of robotic surgical materials, and surgical workflow modelling in pre- and post-operative experiences, can all benefit from the involvement of robots in surgery. In hair transplantation, for instance, machine learning is not required but rather computer vision is essential.

h. An Enhancement in the Already High Standard of Medical Data Obtained Via the Implementation of Machine Learning

The review of expanded medical information that individuals have voluntarily provided can be beneficial to both the investigation of unusual occurrences and the treatment of acute diseases. This information gathered from the general public could be used to make adjustments to the treatment that will be used in the future in real-time if it is put to good use[47]. IBM and Medtronic are collaborating on a study of diabetes and insulin data in the hope of discovering a treatment for diabetes as well as a cure for the condition. OCR methods such as Google's VisionAPI and MATLAB's Machine Learning-based handwriting recognition technology are being used to read the uploaded medical prescriptions as they are being uploaded. This enables doctors and nurses from all over the world to provide feedback on the medications and treatments that are being administered.

i. Investigational and Clinical Trials Conducted on Human Subjects

When combined with real-time monitoring and access to patients' medical information, machine learning has the potential to assist in the predictive examination of diseases, the selection of the best prospective sample set of clinical trial candidates, and the determination of the best prospective sample set of clinical trial candidates[48]. This is because machine learning has the ability to determine the best prospective sample set of clinical trial candidates. The use of electronic records makes it possible to significantly reduce the number of mistakes that are made concerning data.

j. Making Predictions Regarding Disease Outbreaks Through the Application of Machine Learning

As a result of the proliferation of satellites and websites, our scientists now have instant access to many data. Artificial neural networks utilise this information in order to generate forecasts regarding a wide variety of diseases, ranging from malaria to widespread epidemics. The monitoring and forecasting of disease outbreaks in different regions of the world is currently being assisted by machine learning and artificial intelligence working together. This stream of knowledge is especially helpful in third-world nations, which suffer from inadequate medical and educational infrastructure and have few treatment options. These nations also have fewer options available to them regarding medical care.

IV. CONCLUSION

The application of machine learning (ML) methods enables the automated processing and analysis of large amounts of data and the discovery of hidden or non-obvious patterns and the extraction of new information. In addition, ML methods can be used to automate the discovery of hidden or non-obvious patterns. These capabilities are made possible by the application of machine learning methods, which are the fundamental instrument of artificial intelligence (AI). An analysis of the academic literature on applying machine learning (ML) algorithms for disease detection and prediction is carried out as part of this research project. Deep learning is one of the most promising applications of machine learning, and it is carried out with the assistance of artificial neural networks that have multiple layers. This type of learning is known as "deep learning." It is expected that the development of models based on machine learning methods and their use in clinical practice will assist in making medical decisions, increase the effectiveness of treatment, and reduce the costs of medical care. These benefits will be realized as a result of the convergence of these two fields.

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