iJRASET
International Journal For Research in Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 **Issue:** VII **Month of publication:** July 2022

DOI: https://doi.org/10.22214/ijraset.2022.45581

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International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.538
Volume 10 Issue VII July 2022- Available at www.ijraset.com

Medical Diagnostic Systems Using Artificial Intelligence Algorithms: Principles and Perspectives

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Abstract: ***The identification of a health issue, disease, illness, or other condition that a person may have is known as a disease diagnosis.Sometimes it may be extremely simple to diagnose a disease,but other times it may be more difficult. Large data sets are accessible,but the number of tools that can reliably identify patterns and forecast outcomes is constrained. Traditional methods for diagnosing diseases are labour-intensive and prone to inaccuracy.When compared to solely human competence, the use of AI prediction approaches enables auto diagnosis and reduces detection mistakes. For the past ten years, from January 2009 to December 2019, we have examined the recent literature in this publication. A total of 105 article were discovered in the eight most popular databases that were taken into consideration by the investigation. The most popular AI techniques for medical diagnostic systems were categorised after a thorough review of those papers. We also go over numerous diseases and the relevant AI methods, such as Fuzzy Logic, Machine Learning, and Deep Learning. The goal of this study article is to provide some key insights about the various AI technique now being applied in the medical industry, particularly in the areas of heart disease prediction, brain disease, prostate, liver and kidney illness.Last but not least, the report resolved issues.***

Keywords: Analytics of large amounts of data ,artificial intelligence, machine learning, deep learning, diagnosis of chronic diseases, and forecasting of healthcare costs..

I. INTRODUCTION

The investigation of sickness in the realm of healthcare A diagnosis is essential. A disease is defined as any factor or set of events that produce suffering, ailment, dysfunction, or even death in humans. Both the physical and emotional well-being of a person can be damaged by diseases, which also significantly alter the affected individual's way of life. Pathological process is the name for the study of disease's causes. Clinical professionals must interpret any indications or symptoms to determine the presence of a disease. The process of distinguishing a disease from its symptoms and indicators in order to determine its pathophysiology is known as diagnosis. The process of determining which disease an individual has based on their symptoms and physical signs is known as diagnosis. The information gleaned from medical history The knowledge needed for diagnosis is obtained by physical examination of the patient with a medical pathology. During this treatment, at least one diagnostic procedure, such as a medical test, is frequently carried out.

A medical professional will go through a procedure with numerous phases to accurately diagnose a patient, allowing them to gather as much data as they can. The hardest part of treating a patient is determining their diagnosis, but it's also crucial for a doctor to get it right before moving forward with treatment The diagnosis procedure could be quite time-consuming and difficult. The healthcare professionals gather empirical data to determine a patient's ailment in order to reduce the uncertainty in medical diagnosis. Due to errors in the diagnosis process, the patient may not receive the proper treatment for major health concerns orit may be delayed. Unfortunately, not all doctors are experts in every area of medicine.

As a result, an automated diagnostic system was required that combines the accuracy of the machine with the benefits of human expertise. For the diagnosis process to produce correct results at a lower cost, a proper decision support system is required. For human experts, categorizing diseases based on multiple factors is a challenging undertaking, but AI could help identify and manage these types of situations. Currently, a variety of AI methods are being applied in the field of medicine to precisely diagnose illnesses.

AI is a key component of computer science that helps make computers smarter. Learning is a must for all intelligent systems. AI uses a variety of learning-based methodologies, such as deep learning ,machine learning, etc.

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A rule-based intelligent system, which is one particular AI technique that is important in the medical profession, offers a set of if-then rules that serve as a decision support system in the field of healthcare. Intelligent systems are being gradually supplanted in the medical industry by AI-based autonomous approaches where human interaction is very little. Biological neurons connected in the brain serve as the basis for the creation of the neural network, also known as an artificial neural network(ANN). It mimics the functioning of the human brain exactly. Each neuronal unit is connected to numerous other neurons in a network that resembles a bipartite graph. These systems receive automatic learning and training.

Doctors and surgical specialists must spend a lot of time researching the potential outcomes and forecasts for health conditions .In some circumstances, ANN offers quick healthcare judgments where the systems can gather data, comprehend it, and identify element that will be crucial to prediction. In the medical area, deep learning—a branch of machine learning that is likewise based on algorithms—is used to support specialists in the assessment of any ailment. better medical decisions as a result. Deep learning has applications in a variety of sectors, including drug discovery, medical imaging, genome analysis, and Alzheimer's disease detection. In this essay, our main areas of interest are fuzzy logic, machine learning, and deep learning—the three fundamental branches of artificial intelligence. Deep learning is widely used in healthcare to diagnose breast cancer, which is the main trend. It is evident from a recent study by a cancer institute that the accuracy of Automatic breast cancer is comparable to or higher than a human radiologist. Additionally, since AI is constantly learning, it has a better possibility than before of producing results that are more accurate. The Internet of Medical Things, which enables the collection of healthcare data through IOT devices, is another key application of AI. AI-based software senses the disease's signs to identify it even before it manifests. In comparison to a skilled radiologist, neural networks can be trained to detect lung, breast, and stroke tumours in less time. By analysing medical pictures like MRIs ,CT scans, and x-rays, various AI algorithms assist clinicians in making quick diagnoses of particular diseases. Since some diseases have remarkably similar symptoms, diagnosing a disease and giving the proper therapy are invariably challenging and difficult processes. Doctors may diagnose patients more precisely and recommend the best course of treatment when they use medical expert systems. Doctors can use AI techniques to not only identify the sickness but also categorise the various sorts of fatal diseases. Modern AI algorithms already assist physicians in setting up a thorough plan for managing sickness. They are also frequently utilised to enhance surgical robots that do extremely complex procedures. This work makes three contributions in total.

1) We start by outlining the current factors that have an impact on the earliest detection of disease outbreaks.
2) In the following section, we go through how AI techniques have changed for initial disease diagnosis.
3) We present a comprehensive analysis for medical diagnostic systems using a systematic review. We employ the widely used PRISMA technique.
4) he diseases that were addressed, the AI approaches that were employed, the articles' study objectives, and their findings are then summarized for each of the articles that were chosen .Along with a thorough analysis of the publications under evaluation, we also provide future research directions.

II. IMPLEMENTATION

1) *Data Collection:* Gathering data is the initial stage. It is a highly important phase because quantity and quality have an impact on the system's overall performance. It basically entails a procedure of acquiring information on specific variables. The second step is data pre-processing which comes after data gathering. It involves transforming unusable raw data into information that can be used to make decisions. Data cleansing is another name for this technique.
2) *Select a Model:* To incorporate pre-processed data into a model, one must select the right algorithm for the job
3) *Train the Model:* ML uses supervised learning to train a model to improve the precision of predictions or decision-making.
4) *Assess the Model:* A few parameters are required to assess the model. The 5.2 specified objectives serve as a guide for the parameters. Additionally, one must record how the new model performs in comparison to the old one.
5) *Parameter Tuning:* This stage may involve adjusting the initialization settings, distribution, learning rate, performance and number of training steps.
6) *Make Predictions:* In order to compare the developed model to the real world, it is essential to make a prediction on the test dataset. The model can be utilised for additional predictions if the result agrees with domain experts or opinions that are close to it.

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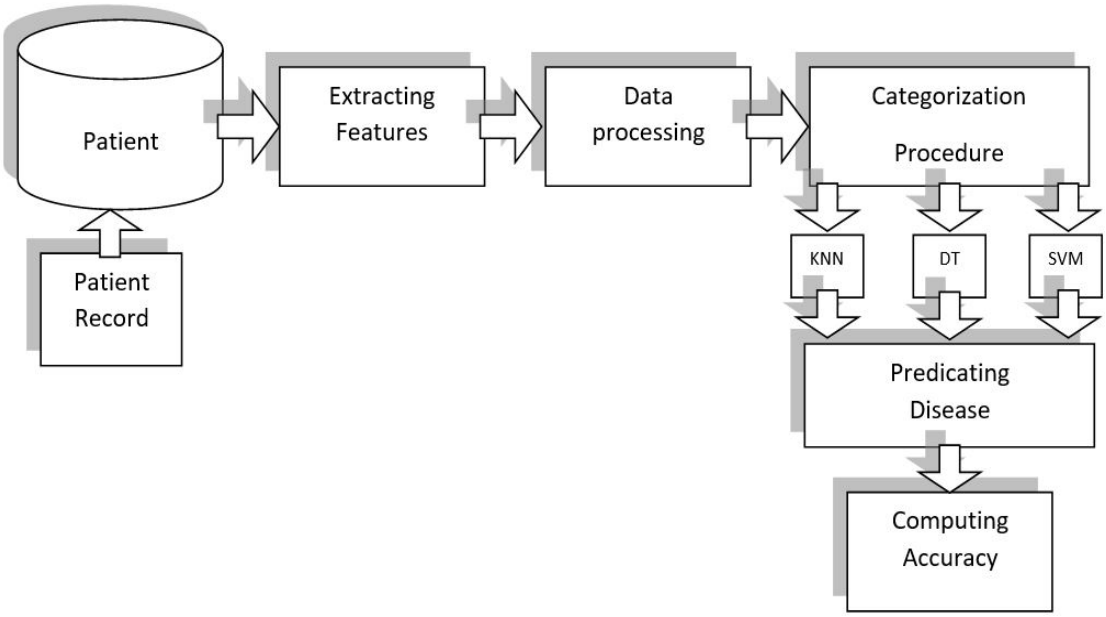


FIGURE 1. Machine Learning System.

The following is a description of the fundamental procedures for disease detection using ML.

a) Gather test results and patient information.
b) The feature extraction procedure selects characteristics that are helpful for predicting disease.
c) After choosing the attributes, choose and process the dataset.
d) A pre-processed dataset can be used to assess the precision of disease prediction using the various categorization methods shown in the diagram.
e) Evaluation of the performance of various classifiers in order to choose the one with the highest accuracy.

In machine learning, all features are extracted by a domain expert to reduce the complexity of the data and to generate patterns that would be obvious to ML algorithms. The sole requirement is to make exact selections so that the testing data can be correct. However, deep learning-based techniques can extract features manually without human interaction. A domain expert is not necessary with this method for feature extraction. The use of deep learning for illness diagnosis systems is discussed in the section that follows.

III. RESULT

The graph compares the accuracy of the automated efficient illness detection system we intend to create using ML algorithms. Successful uses of AI in healthcare are the result of recent developments in AI technology. Even the question of whether AI expert systems will someday replace human doctors has become a prominent issue of discussion. We nevertheless take into account the reality that the AI expert system may help the human doctor to a better decision or, in some circumstances, may even take the place of human judgement. Numerous clinical data sets can be used to extract pertinent information using various AI algorithms. Additionally, AI techniques are educated in a way that allows them to be self-learning, error-correcting, and provide outcomes with a high degree of accuracy. The three AI methods used in disease diagnosis are the subject of this survey. With the PRISMA technique, we evaluate the effect of AI methods and their consistency on disease diagnosis in this review to reduce misdiagnosis errors. Our team came up with a search strategy to achieve the main objective.

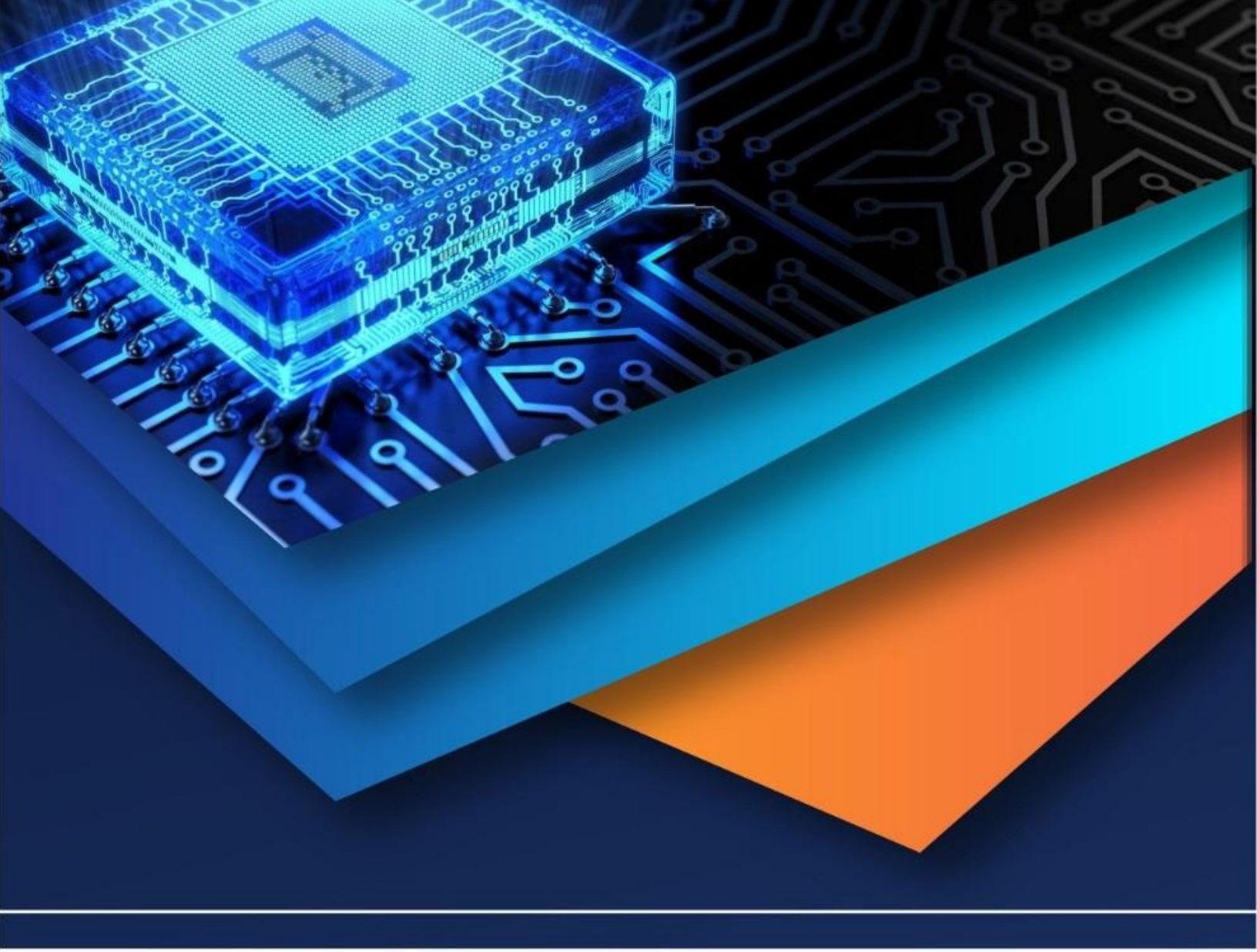
IV. CONCLUSION

By improving diagnosis procedures and detecting diseases in their early stages, AI in healthcare helps choose the best treatment strategy. Another important point to remember is that we looked into two AI techniques that are frequently utilized in healthcare, namely machine learning and deep learning, and we employed these two techniques to produce our results. Additionally, the impact of each AI technique was evaluated based on the frequency with which it was mentioned in papers. Using AI diagnostic criteria, the main medical fields that we looked at were cardiology, brain tumors, renal illness, diabetes, and liver disease.

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