Summarizing and Analyzing Research Papers

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DESCRIPTION: Disease diagnosis is the identification of a health issue, disease, disorder, or other condition that a person may have. Disease diagnoses could be sometimes very easy tasks, while others may be a bit trickier. There are large data sets available; however, there is a limitation of tools that can accurately determine the patterns and make predictions. The traditional methods which are used to diagnose a disease are manual and error-prone. Usage of Artificial Intelligence (AI) predictive techniques enable auto diagnosis and reduces detection errors compared to exclusive human expertise. In this paper, we have reviewed the current literature for the last 10 years, from January 2009 to December 2019.

SUMMARY: In the field of healthcare, the study of disease diagnosis plays a vital role. Any cause or circumstances that lead to pain, illness, dysfunction, or eventually, a human being's death is called a disease. Diseases may affect a person physically and mentally, and it considerably manipulates the living style of the affected person. The causal study of disease is called the pathological process [1]. A disease is made by signs or symptoms that are interpreted by clinical experts [2]–[4]. Diagnosis has been defined as the method of identifying a disease from its signs and symptoms to conclude its pathology. Diagnosis can also be defined as the method of figuring out which disease is based on an individual's symptoms and signs [5], as shown in Fig. 1. The data gathered from medical history physical examination of the individual having medical pathology constitutes the knowledge required for diagnosis. Often, at least one diagnostic procedure, such as medical tests, is done during this procedure. To form an honest diagnosis, a medical doctor will perform a process that involves several steps, allowing them to collect the maximum amount of information as possible [6]. Diagnosis of diseases is the most challenging process at the same time, a very pivotal phenomenon for a medical care professional as before reaching the

conclusion. The diagnostic process could be very tiresome and complex. To minimize the uncertainty in medical diagnosis health, the care experts collect empirical data to ascertain a patient's disease. The patient's correct treatment may be adjourned or missed with serious health issues due to making fault in the diagnosis process. Unfortunately, all doctors don't have expert knowledge in each domain of the medical field.

ITERATION [1]

- A suitable decision support system is needed to achieve accurate results from the diagnosis process with reduced costs. Classification of diseases depending upon various parameters is a complex task for human experts but AI would help to detect and handle such kinds of cases. Currently, various AI techniques have been used in the field of medicine to accurately diagnosis sicknesses. AI is an integral part of computer science by which computers become more intelligent.
- The vital need for any intelligent system is learning. There are various techniques in AI that are based on Learning like deep learning, machine learning, etc. Some specific AI methods that are significant in the medical field named as *a Rule-based intelligent system*, provides a set of if-then rules in healthcare, which act as a decision support system. Gradually, intelligent systems are being replaced in the medical field by AI-based automatic techniques where human intervention is very less
- The neural network or artificial neural network (ANN) is a large collection of neural units designed based on biological neurons connected in the brain. It is a simulation of the human brain and works exactly like it. Each neural unit is linked with many other neurons approximately similar to the bipartite graph. These kinds of systems learn and are trained automatically.

SUMMARY:

Deep learning provides benefits in different fields such as drug discovery, medical imaging, Genome, detecting Alzheimer's disease [13].

In this paper, we primarily focus on the three main branches of AI: Fuzzy logic, Machine learning, Deep Learning. The major trend in healthcare using deep learning is to detect breast cancer. In a recent study conducted by a cancer institute, it is clear that the accuracy of Automatic breast cancer is equal/high than a human radiologist. Moreover, AI trained itself continuously and have greater chances to produce more accurate results than before. Another significant

application of AI is the Internet of Medical Things that helps to collect healthcare data using IOT Devices. AI-based software detects the disease even before its occurrence by sensing its symptoms. Neural networks can be trained to detect lung cancer, breast cancer, Stroke in less time than a trained radiologist.

Various AI algorithms help doctors to medical images such as MRIs, x-rays, and CT scans and diagnose specific diseases by just spotting signs. Detection of disease and providing correct treatment is always a tricky and complex process since some diseases have very similar signs. Using medical expert systems, doctors can diagnose patients more accurately and prescribe the most suitable treatment. Using AI tools, doctors can not only detect the disease but can also classify the types of different fatal diseases.

Modern AI algorithms already help doctors in arranging a comprehensive approach to disease management. Moreover, they are often used to improve surgical robots that execute highly complex operations. The contributions of this paper are two folds

- We first describe the existing elements that affect the initial outbreak of disease detection.
- We latter discuss how AI techniques have been altered for initial disease diagnosis

ITERATION [2]

- Van Mourik *et al.* carried out a survey on automated surveillance techniques for healthcare-associated infections. In this review, authors have described how automatic surveillance systems based on machine learning algorithms bring enhanced performance and reliability compared to manual surveillance methods. Another finding of this review is that the use of regression models can improve the efficiency and sensitivity of surveillance programs. There are some challenges that need to be addressed in the near future such as post discharge surveillance, case-mix adjustment, quantification of device utilization. BRONCHIOLITIS is a lung infection that is commonly seen in younger children and infants.
- Luo *et al.* reviewed this disease along with respiratory syncytial virus (RSV), an infection that can be a root cause of bronchiolitis. The systematic review provides some insights into predictive modeling and also reported how machine learning can use to overcome limitations of predictive modeling. SEPSIS is a life-threatening condition that occurs due to your body's response

to infection, which causes inflammation that result in multiple organ failures at the same time.

SUMMARY:

- Bhattacharjee *et al* performed a systematic review to investigate the current trends in sepsis detection in hospitals. Authors have investigated various sepsis detection scoring systems and screening tools along with their pros and cons in general hospital wards. Finally, they observed biomarkers and electronic health records can have a huge effect in predicting sepsis.
- They reported some drawbacks in routine blood culture testing for sepsis detection. To analyzed suitable automatic sepsis detection methods that they investigated seven molecular technologies that utilize blood samples. In this study, they have discussed the various present and future trends. In addition, they have also analyzed the impact of machine learning algorithms with electronic medical records in sepsis detection. They conclude that by merging various technologies can improve the detection process and minimize the risk of using the wrong antibiotic.

FINAL REPORT:

Fuzzy logic provides dynamic methods that deal with difficult problems. Fuzzy logic is assumed to be a solid tool for decision-making systems, such as expert systems or Pattern classification systems [18]–[21z. Fuzzy logic plays a vital role in the medical evaluation as it provides an exact examination report. These sorts of frameworks provide an instant and straightforward strategy for clinical assessment. They are also useful where an expert or clinical specialist is absent. These frameworks give an outcome depending on the knowledgebase incorporated within or from specialists or experts in the field. Various clinical diagnoses systems created depend on the fuzzy set model and applied in the medical field . The word fuzzy refers to things that are ambiguous. Sometimes we face a circumstance when we are uncertain about whether the state is valid or invalid, wherein fuzzy logic provides reasoning for such conditions as depicted It is a rule-based method. Fuzzy Rule-Based System (FRBS) is a frequently used technique in healthcare that drives from Fuzzy Inference Systems (FIS). FRBS applies *IF-THEN* rules for information portrayal. Besides this, clustering and classifying techniques are also used in the medical domain. Also, FIS and FDSS are determined as the most common techniques in the area of medicine. The main feature of fuzzy logic is that it can alleviate the inaccuracies and uncertainties of

any situation. There is no logic for the absolute valid and absolute invalid value, but partially true and partially false intermediate value exists in a fuzzy logic system. Let's take the following example to show how fuzzy logic works.

SUMMARY:

- KIDNEY DISEASE is a common word for diverse disorders affecting the kidney's structure and working. The definition of chronic kidney disease is centered on kidney damage or reduced kidney function for three months or more. Kidney failure is among the most serious outcomes of chronic renal disease, with complications of decreased kidney function being the primary reason [49]. Sinha and Sinha [50] proposed a decision support framework to diagnose kidney disease. They compared the performance of two classier, SVM, KNN. The comparison was based on accuracy, precision and execution time of both algorithms. From the investigation they observed that KNN works better than SVM. In another study, Charleonnan *et al.* classified his analysis on performing a comparative analysis based on four ML techniques KNN, SVM, logistic regression (LR), and decision tree classifiers to detect diagnosis kidney disease. In order to pick the best technique, they compared their performance with each other. It was observed that the SVM method is best than the rest of others and gives a maximum accuracy of 98.3 %.

- BREAST CANCER which is a chronic disease for females, is the most common cancer disease and a leading cause of death. In recent years, machine learning was used a helpful tool in the detection of breast cancer. Zheng *et al.* [52] focused on developing a model to diagnose breast cancer based on the extracted tumor features. To extract useful information and diagnose the tumor, the K-means algorithm was used to identify the hidden designs of benign and malignant tumors. Afterward, SVM was utilized to get the classifier to differentiate the incoming tumors. Their system improves accuracy up to 97% approximately. In another study, Asri *et al.* [53] classified their analysis on breast cancer using different methods of machine learning. The authors have done comparatively performance-based analysis between ML methods such as SVM, k Nearest Neighbours, Decision Tree using the Breast cancer dataset. The prime objective was to evaluate the accuracy in classifying data relating to each algorithm in terms of correctness, precision, sensitivity. Results produced by those algorithms showed that SVM provided the highest accuracy. Soreness of one or more joints, the reason for pain and

stiffness that can become worsen with age is referred as ARTHRITIS. Various sorts of arthritis exist such as osteoarthritis and rheumatoid arthritis. Each type has a different way of treatment. ARTHRITIS reduces the quality of life of a person. Hence, early detection of arthritis is necessary which can be achieved using ML.

Medical Diagnosis Process Using Ml

Machine learning has granted computer systems new abilities that we could have never thought of. Machine learning is a field of AI that gives machines to power to learn itself by examples in order to analyze how to different models perform in ML without using human judgment. The working of ML are explained step by step as follow

1. **Data Collection**: The very first step is to collect data. It is a very critical step as quality and quantity affect the overall performance of the system. Basically it is a process of gathering data on targeted variables.
2. **Data Preparation**: After the collection of data, the second step is data preprocessing. It is a process to change raw data to useful data, on which a decision could be made. This process is also called data cleaning.
3. **Choose a Model**: To represent pre processed data into a model, one chooses an appropriate algorithm according to the task.
4. **Train the Model**: ML use supervised learning to train a model to increase the accuracy of decision making or doing predictions.
5. **Evaluate the Model**: To evaluate the model, a number parameters is needed. The parameters are driven from the defined objectives. Also, one needs to capture the performance of the model with the previous one.
6. **Parameter Tuning**: This step may include: numbering of training steps, performance, outcome, learning rate, initialization values, and distribution, etc.
7. **Make Predictions**: To evaluate the developed model with the real world, it is indispensable to predict some outcome on the test dataset. If that outcome will match with domain expert or opinions nearer to it, then that model can be used for further predictions.