A Survey on Automating the Process of Medical History in Health-Care Systems

Maleeha Fathima[1] and Moulana Mohammed[2]
[1]Research Scholar, Department of Computer Science and Engineering, KoneruLakshmaiah Education Foundation, Guntur,Andhra Pradesh, India
[2]Professor, Department of Computer Science and Engineering, KoneruLakshmaiah Education Foundation, Guntur, Andhra Pradesh, India

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Abstract
The field of Medical Sciences is advancing swiftly; as the number of diseases rises, the number of patients is also increasing. Several AI-Models are available to predict the disease and its conditions, such as medical diagnosis and prognosis. Since the patient's history is also essential, taking the patient's entire medicalhistory every time is a time consuming and redundant process for a doctor. The main objective is to design the automation process of taking the medical history that can be achieved based on the patient's symptoms which acts as input to the AI Model. In this paper, the survey of various AI techniques is being used for the medical diagnosis of diseases. Different AI techniques include Support Vector Machines (SVM), Fuzzy Logic, Artificial Neural Network (ANN) etc. The paper focuses on critical insights into various types of AI techniques in terms of medical research, focusing on Breast Cancer, Brain Tumour and Appendicitis.

Key Words: Medical History, Disease Diagnosis, Artificial Intelligent based approach.

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1. INTRODUCTION

Covid-19 has left us to continue our lives with several rules. The need to continue with minimum interaction between people, i.e., social distancing, affects the relationship between the doctor and the patient. The number of duty doctors and the senior doctors is mainly affected as the contact is more with the patients. Also, taking the medical history of a patient is a time consuming and redundant process for a doctor.

There are several medical diagnosis and prognosis models available for many diseases.Since the patient's history is also essential, this causes the doctor to spend more time asking all the basic questions, the present and previous past, then concluding the treatment plan;this increases the time spent per patient taking the history rather than the actual treatment of illness.

2. CLASSIFICATION

This literature survey which is carried out, focuses on data about intelligent automating tools for the Medical History process in the health care domain. Even though there is a massive demand for the disease getting predicted, diagnosed, and finding the prognosis, the focus is minimal when taking the Medical history. Taking the patient medical record is an essential piece of the treatment process. The objective is to design and automate the process of taking the medical history, which is achieved based on the patient's symptoms, which acts as input to the AI Model. Previous studies with a detailed and more precise view of medical history are considered. The diseases were classified based on Intelligent models.

Common diseases with detailed history are:

1. Breast Cancer
2. Brain Tumor
3. Appendicitis

2.1 Classifying and Diagnosing Various Diseases using AI-Models

Simarjeet et al. [1] propose various models such as Decision Trees, SVM, Multilayer Perception, Bayes Classifier, KNN, Logic, Genetic Algorithm, and Genetic Swarm Optimization. It enforces different AI methods in health care to provide the results by improvising the performance of the diagnosis process, which leads to early detection of the disease. This allows for choosing the most suitable treatment plan.

Hosam et al. [2]introduce the application and provides research on the "Heath Care-as-a-Service" (HC-AAS) model. Identification of various system inputs, outputs, andtheir rulesis taken care of by Fuzzy Logic. The main aim of using HC-AAS is to treat every patient separately, specified to his medical situation. The paper introduces a novel method to improve the healthcare systems in different countries like Egypt and KSA by creating a diagnostic Model in the field of Medicine.

Sayan et al. [3]propose various models such as Sensor-based Signal Monitoring, Non-invasive Rapid blood tests, and a Secure Hash Algorithm. The research focuses on evaluating how quick and efficient the programming system is designed and checking on any interference that may occur within the system. If implemented correctly, this can help patients with a more clever and customised means to get therapeutic input and spare time, fulfil the desire for each individual to have control over their health, and reduce the long-term cost of restorative care. As the doctor's identity remains confidential, there is a similar arrangement of patients towards each doctor. This helps to improve the conventional system in which good doctors are deprived of their earnings due to a lack of reputation.

Dou et al.[4] propose the subcarrier selection method, which is in accordance with a scoring mechanism. It includes a filtering method for the moving average filter and wavelet filter and also uses the respiration rate by using the STFT technique, which uses the extraction method.Thetoolis used to compare the correlation between the respiratory contact sensor method and the C-band sensing method.

Chitra et al. [5]propose various models such as Hadoop, MapReduce, and K Means as their modelling techniques. This system investigates the possibility of making use of the Big data techniques for health care support which is an evidence-based approach. This improves the accuracy of required medical treatment. The system analyses the symptoms and diagnoses

them to the exact disease, finding the most appropriate drug for the diagnosed condition. Finding out the diagnosis of the disease correctly and using the proper medications for a patient will eventually help the attending physician in the implementation, analysis and decision making about what type of treatment and medication is required for patients who have unique health conditions. The physician will be able to get the necessary information in terms of a second opinion before starting the actual treatment. Hence, the accuracy of health care being carried out is assured.

Fuyuan et al. [6] propose a Fuzzy soft set, Decision Making, as its modelling technique. This paper presents a mixed based approach for using fuzzy logic- soft sets in the process of making any new decision. This is done by integrating the fuzzy analysis based on entropy by using the theory of evidence from Dempster–Shafer. The proposed method is regarded as the unpredictability measure of various parameters and its effect on the relative reliability of parameters. This concludes that the model is more efficient as multiple degrees of uncertainty can occur due to human subjective awareness, which is now reduced. The model helped in various levels of decision-making was improvised, which resulted in better performance.

Chunxueet al. [7] propose the "Greedy Deep Weighted Dictionary Learning" modelling technique. The paper presents a deep learning technique called GDWDL-Greedy Deep Weighted Dictionary Learning, a novel technique applied to the entire group of mobile multimedia that can account for and be used for medical diseases. By using this technology and the continuous follow-up by observing the patients, the inter changing of the collected data into detailed data information.

Xiaoliet al. [8]propose a lazy learning algorithm. A novel modelling technique is used to represent the medical information and use it as a sequence of evolving graphs. The model that has been proposed can achieve a better representation of the medical data. A novel technique is developed, i.e., a lazy learning algorithm to support the automatic diagnosis of the present medical data and perform a similarity search on graphs. A multi-layered inverted index is established to fast-forward the similarity search and support the automated medical disease diagnosis prediction analysis.

Vishnu et al. [9] propose modelling techniques, including Medical Diagnosis, Information Retrieval, Machine Learning, Text Mining, Vector Space Model, TF-IDF, Cluster Analysis, and K-means. Currently using the bag of words approach, but there can be better ways for achieving improved accuracy.

Weijing et al. [10] propose a Recurrent Neural Network as its modelling technique. It presents Patient2vec, which is a combination of bi dimensional Recurrent Neural Network-RNN. This collects various interactions and relationships between the patients' medical treatments and physical symptoms.

Arushi et al. [20] propose artificial intelligence AI, clustering, fuzzy logic, backpropagation and expert systems as their modelling technique. The implementation reduces the obstacles of time and ensures that the overall effectiveness of the diagnosis system is improved.

Omer et al. [19] propose Support Vector Machines, Tree-Seed Algorithm, and SVM-TSA for Medical Diagnosis as their modelling technique. This study introduced a hybrid system of Support Vector Machines (SVM) and Tree-Seed Algorithm (TSA) for obtaining an intelligent medical diagnosis system. Thanks to optimising the sigma (σ) parameter of the Gaussian-RBF kernel function of the SVM model, it aimed to diagnose target diseases with high

accuracy rates. The applications over the dataset of diseases of four variants from UCI databanks showed that the SVM-TSA system could diagnose the target disease well. Further comparisons with alternative methods also showed that the solution approach by SVM-TSA has success rates around top places.

Omer et al. [17] propose gradient boosting tree and random forest algorithms as modelling techniques. In this paper, the Machine learning/ML algorithms used for the sufferer data that suspect appendicitis and the correctness of the above-stated algorithms were contrasted and interpreted. After analysis, it was found that the algorithm gradient boosting tree has gained the remarkable success with a prognosis value of 95.31%, followed by the random algorithm forest with a value of 92.96%

Pranav et al. [16] propose an Artificial Neural Network as its modelling technique. In this conclusion, a 3-D model is developed to diagnose acute appendix using a video-based CT scan. It emphasizes a unique model implementation technique that then utilizes the existing video to compensate for a small-scale dataset. It can be taken for upcoming research that employs images related to the medical field.

Subbhuraam et al. [12] propose that Breast cancer in women is the leading cause of death; it starts to expand out of proportion and then infects the neighbouring tissues to diffuse in the body. Various breast imaging modalities assist practitioners in the first stage of masking cancer, identifying and characterizing the lesion, assessing the degree of spread of cancer from the origin, deciding on a course of medication and observing the patient's progress, and checking the cancer's fresh outbreak. The potential of the different mammography techniques is used in health centres. Work is being taken to enhance the former methods and evolve advanced strategies established on cancerous breast tissue's physical, chemical, and biological properties that differentiate it from the regular and harmless, i.e., benign tissues.

Swathi et al. [11] propose a glimpse of the most common breast cancer variations, their degree of spread from the origin, and identification methods and modalities. They evaluated various diagnostic imaging methods and spectro-analysis methods that are medically present and are to be considered for the research work. The research paperwork also compares medically available imaging techniques' cost versus accuracy. Though medically used imaging modalities can reduce women's death rate due to cancer-related breast, they possess few drawbacks that canseverely destroy women's health. Hence, an effective technique is needed that is cost-efficient and radiation less, which can be used to identify cancer-related to the breast in females at early stages.

Francisco et al. [26] propose a technique which uses brain tumour classification, data augmentation, multi-scale processing, Convolutional Neural Network and Magnetic Resonance Imaging(MRI) as its modelling technique. A completely automated brain tumour segmentation and classification method using a Convolutional Neural Network (CNN) structure was developed for multi-scale serving. Data augmentationis done by the elastic transformation, which is then used to expand the training dataset and ward off the overfitting of data. Results were compared with the other related brain tumour classification approaches with the same dataset. The process gained the maximum tumour classification with a value of 0.973 as its accuracy. The multi-scale CNN method uses meningioma, glioma, and pituitary tumour processing pathways and efficiently segment and classify the three kinds of brain tumours.

2.2 Undertaking the Process of Medical History

Several Medical Journals are considered to understand the steps needed to take Medical History.

Friedemann et al. [24] propose the experience of empathy – two sides of the same coin". Collecting sufficient clinical data from a case history and presenting through compassion are different paths in the case history. Managing skills and demonstrating skills are gained during their training at medical colleges. Students must be prepared with add-on learning skills and opinions so that students can be noticed implementing both the skills wherever required intheir regular practise medically.

Hampton et al.[23] explain that physical examination was more required in patients who had diseases related to cardiovascular. Several methods are used in the paper, i.e., General Diagnosis, Diagnosing of disease after taking the entire history, Predicting after history is taken, Diagnosing after performing the examination, Predicting after conducting the examination, and ordering further Investigations.

John et al. [22] propose the significant difference between house officers' various groups was the lower frequency of case history and physical checkup errors. The interns were less skilled in obtaining an account to establish the site of origin of symptoms, onset and course of the symptom complex, and asking pertinent questions to follow leads discovered in the systems review. House officers are more proficient both in history taking and technique of physical examination.

Dr Roger et al. [21]propose the History Examination; the essential skills are Communication skills, Extracting the information, Staying focused, Common problems, Past Medical history, Drugs, Family History, and Social History. Physical Examination The First thing to be done in any checkup is to notice. The Stethoscope is not necessary at the start for checking the cardio-vascular system or respiratory system. Much important information can be gained by observing personal hygiene, handshake and Skin colour.

Yogesh et al. propose that A good history is an essential component in patient care and often leads to the diagnosis. It is one of the fastest ways to reach a diagnosis conclusion and the cheapest. All healthcare practitioners must acknowledge its importance. Good history is the quickest way to get a diagnosis.

2.3 Electronic Health Records and Telemedicine:

Ministry of Health and Family Welfare (GoI), eHealth Section introduces a uniform system for standard-based creation and maintenance of EHR by the health care providers. Electronic Health Records (EHR): The one or more depository of information integrated into computer process able format, related to the well being,i.e.the health of a person, competent of being safely stored and securely transferred and that can be accessed privately by other authorized health personals only, presented accordingly to a standardized logical information model. Its main aim is to provide entire life, efficient, best and safe combined healthcare.

Manohara et al. [15] propose digitalising health files for the public sector healthcare site and the immediate presence of those files in electronic documents. The established electronic health record EHR system based on cloud architect has been verified with data obtained

from the patients from Primary Health Care(PHC), i.e. 60 and Community Health Care(CHC), i.e. 40. Error-free results were captured, and patient data was shared across various healthcare system levels. The error-free quality of the EHR system allows managers at all public health system levels to plan and conduct multiple medical-related events and aid in reaching the goals set by the healthcare system.

Vinoth et al. [14] present that Telemedicine is the way to proceed with the remote disease diagnoses and come up with treatment plans for patients through telecommunication technology. Thus providing meaningful healthcare to the poor section people or low-income individuals. Several Services like telehealth, tele-home, and tele‑ education demonstrate and show us that they can bring wonders to healthcare. The significance of satellite-based communications is focusing on disaster management at points where all the terrestrial modes of communication are affected.

Geetanjali et al. [13] propose that elemedicine's emergence and utilization is one of the most productive methods to broaden our outlook to reduce the impacts. Telemedicine is a way to overcome and have control over the shortage of several goods and services, starting from masks and sanitisers to tele-ICU. Today, India is levelling the playing field on par with the developed nations, both as a country and economy. The policymakers now need to create a new evolved framework that can allow the embracing of a holistic approach to all stakeholdersand underscore the execution.

2.4 Diseases and Their Classification:

Diseases are classified and used based on the symptoms and their rich data. Below is the table of content used and ranked based on symptoms, algorithms, research goals and results, Medical Area under which it comes.

	Breast Cancer	*Brain Tumor*	*Appendicitis*
SYMPTOMS	Lump in breast or armpit, sore nipple or pain in areas around the breast, enlarged lymph nodes in the neck or armpit	Headaches, Seizures, Difficulty thinking, Weakness, numbness or paralysis, loss of balance, dizziness	Sudden and sharp pain which starts at the right side of the lower abdomen, which is then followed by Nausea and vomiting, Pain which worsens when you cough, walk or make other jarring movements
ALGORITHM	Fuzzy Inference System, Fuzzy Omega Algorithm, K-Means and SVM, WEKA Data Mining Tool	clustering algorithm, fuzzy Logic, K-Means used along with Genetic Algorithms, Particle Swarm Optimization	Gradient Boosted Tree Algorithm, Random Forest Algorithm, Convolutional Neural Network, Artificial Neural Network

RESEARCH GOALS	Comparative study of performance among various machine learning algorithms done,i.e., KNN, SVM, Naïve Bayes, Decision Trees,on the Wisconsin Breast Cancer dataset	To improve the segmentation process	Develop an accurate and precise estimation procedure for early diagnosis of acute appendicitis
RESULTS	SVM performs better with amaximum accuracy of 97.13%, with the minimum uncertainty	The results provided have considerable evidence that for the brain tumour segmentation,performance accuracy found out is 0.95, changeof error has been reduced to 13%, the rate at which tumour is diagnosed has reached to high rate of 98%	Gradient Boosted Tree Algorithm - 95.31%, Random Forest Algorithm - 92.96%, CNN - 95%, ANN > 97%
MEDICAL AREA	Surgery	General Medicine	Surgery

Table 1: Table showing classification of Diseases

3. CONCLUSION AND FUTURE WORKS

In this paper classification of various types of diseases and their diagnosis is done. The results show the most commonly used models for predicting diseases. The Algorithms which give us more accuracy are Support Vector Machine (SVM), various Fuzzy Logic techniques and Artificial Neural Network (ANN). The other used methods included in the research include Decision Trees, K-Means, Dictionary Learning, Text Mining etc.

Based on these results, we will proceed with furtherresearch using these algorithms that give us more accuracy on diseases such as Breast Cancer, brain tumour, and Appendicitis to get the rich data and move further to Automate the history-taking process.

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