USE OF IOT ENABLED SOFT COMPUTING FRAMEWORK FOR PREDICTING HEART ATTACK

Abstract

According to the WHO, cardiovascular disease is still one of the top ten leading causes of death. Due to the prevalence of cardiovascular disease in India and around the world, this paper investigates how data mining and prediction models apply to this problem. The emphasis is on grasping the numerous studies that employ data mining and model construction to forecast heart disease risk variables. Before going into great detail on telemedicine and e-health, let's take a moment to grasp the fundamentals of what we are about to discover. Electronic health records (EHRs), health information systems, remote monitoring and consultation services (such as tele-health, telemedicine, and tele-care), tools for self-management, and health data analytics are just a few examples of the many health and care services that can be provided through information and communication technologies (ICTs). M-Health, a part of e-Health, is connected to mobile applications and telephones. In a broad sense, multi-morbidity refers to having many chronic ailments concurrently and complex demands requiring the assistance of multiple carers. However, the reliability and accuracy of the diagnosis findings from these terminals remains a challenge. The examination is carried out without going directly to a doctor, therefore in addition to being a straightforward measurement, a high-performance automated electrocardiographic waveform classification technique is necessary. The performance of automatic categorization methods for electrocardiographic waveforms has started to be improved with the advent of machine learning techniques in recent years. By using machine learning and deep learning algorithms, this work suggests a solution to the issue of automatically classifying

Authors

Dr. Mrs Fatima M Inamdar
Assistant Professor
VIIT Pune
Maharashtra, India.
fatima.inamdar@vii

Dr. Yogesh Deshpande
Professor VIIT Pune.
Maharashtra, India.
yogesh.deshpande@viit.ac.in

electrocardiographic waveforms and patients' personal data.

Keywords: e-Health, Heart Attack, Artificial Intelligence, Machine Learning, Cognitive Technology, Risk Factor.

I. INTRODUCTION

Discuss further the idea of whether multimorbidity and e-health are related. Here are a few of its benefits.

1. By enhancing communication and information sharing between professionals and with patients using message systems or electronic EHRs, the coordination and integration between various parts of care can be improved. Track and assess risk to spot the most complicated situations and enable prompt responses.

2. Through telehealth services or m-Health applications, provide access to health care services for people with multimorbidity in rural and underdeveloped areas.

3. To encourage people to become aware of, adopt, and standardize information systems for classifying populations' risks at the regional and national levels. To give thorough studies and trials that aim to validate the effectiveness, efficiency, and impact of e-Health solutions for persons with multiple morbidities priority when allocating research money. Medical staffs are under more pressure due to the increased frequency of primary care consultations, hospital outpatient visits, and hospital hospitalizations associated with multimorbidity. Those with several morbidities run the risk of not receiving the right care, which might be detrimental to their health and quality of life. Patient-centeredness and care integration, which are both essential components of multimorbidity care, could be significantly improved by new opportunities made possible by the application and exploitation of ICTs in the health care sector. Furthermore, in terms of social inclusion and equality, people with lower socioeconomic status may have more difficulty accessing health care services due to a variety of factors, such as affordability issues and living in underdeveloped areas, which are frequently linked to the presence of multiple chronic conditions. ICTs can increase accessibility by implementing tele-health services for remote consultations and monitoring, for instance.

4. New opportunities made available by the application and exploitation of ICTs in the health care industry could considerably improve patient-centeredness and care integration, both of which are fundamental components of multimorbidity care.

5. Furthermore, in terms of social inclusion and equality, people with lower socioeconomic status may have more difficulty accessing health care services due to a variety of factors, such as affordability issues and living in underdeveloped areas, which are frequently linked to the presence of multiple chronic conditions. ICTs can increase accessibility by implementing tele-health services for remote consultations and monitoring, for instance.

6. Supporting multimorbidity sufferers who live at home involves tools that teach and give them control over their own care. Self-management tools can give patients feedback and support them in monitoring their coping mechanisms and treatment compliance.

   On the specific topic of e-Health for multi-morbidity care, there are incredibly few studies and data available, and their small sample sizes severely impair the generalizability of the results—a limitation that impacts all e-Health programmes more broadly.

How to adequately address the complex care needs of individuals with multimorbidity continues to be a topic of discussion due to changing demographics and the rising prevalence of chronic diseases. The necessity for multi-morbidity policies to evolve has lately been acknowledged at the EU level, but the function of e-Health for this target group was not made clear.

Sharing in this area is also necessary for the development and adaptation of new services utilizing the existing e-Health infrastructure, as well as for facilitating the transfer of e-Health solutions to various settings and nations. Multimorbidity patients have complicated requirements that cannot be met by just using healthcare services. To target, plan, and execute complete services, there has to be greater collaboration between health and social care. By investing in e-Health solutions, you may maintain patients' social inclusion, strengthen the link between health and social care (beyond the silos that are frequently present in local contexts), and remove access hurdles that disadvantaged groups with accumulative health and social disadvantages encounter.

Another area where e-Health for multi-morbidity care intersects with social and economic debates currently taking place in Europe is the use of ICT to deliver multilingual and culturally sensitive care services, draw in new funding for the digitalization of healthcare, develop a more qualified workforce capable of using eHealth tools, and contribute cost-effective ICT and eHealth solutions to the sustainability and quality of healthcare.

II. WHAT IS TELEMEDICINE?

Telemedicine is a technique that improves patient participation, reduces costs, and enhances access to healthcare. Due to a lack of doctors and clinics in rural areas of the country, telemedicine arrangements have emerged as an alluring solution to provide high-quality medical services everywhere. Telemedicine is the use of rehabilitative data traded from one site to the next by way of electronic interchanges to improve patients. The system allows for direct communication between patients in remote locations and a doctor who is located elsewhere, as well as access to test results and therapeutic data online.

Telemedicine Benefits

1. Patient's Perspective
- Less time away formwork
- No travel expenses or time
- Less interference with child or elder care responsibilities
- Privacy
- No exposure to other potentially contagious patients

2. Provider's Perspective
- Increased revenue
- Improved office efficiency
- An answer to the competitive threat of retail health clinics and on-line only providers.
- Better patient follows through and improved health outcomes

- Fewer missed appointments and cancellations
- Private payer reimbursement

The application of information and communication technologies (ICT) for health is known as e-health. The e-Health unit collaborates with partners at the national, regional, and international levels to enhance and advance ICT use in health development, from field applications to global governance. The section is housed in the Cluster of Health Systems and Innovation's Department of Service Delivery and Safety.

Many technologies have been investigated in the development and improvement of the contemporary healthcare facilities. The application of information and communication technology (ICT) to the healthcare sector in particular looked at ways to improve the flow of all available medical resources. Additionally, it can offer dependable, effective medical treatment to elderly individuals, persons with physical limitations, and people who are ill with chronic conditions. The goal of the proposed project is to create and implement an Internet of Things-based healthcare system that uses the Neuron Fuzzy self-learning approach. The suggested method keeps track of the physiological parameters of the patients and helps the medical staff make the earliest possible diagnoses of diseases.

In the event of any anomaly, the device will sound an alarm and send tweets to warn both the carers and the doctors. The system's results give medical staff the ability to monitor patients for the least amount of money possible while also making the best use of the available resources. The proposed system's capacity to adapt to learning enhances decision-making in disease diagnosis and increases forecasting accuracy.

In the most delicate fields of healthcare and medicine, IoT infrastructure is crucial. Smart examination of a variety of hospitalized patients using wearable technology and monitoring sensors. IoT assists in giving prompt services and promptly diagnoses the patient.

It offers telemedicine, computer-assisted smart transportation, and real-time study of medical conditions. The primary goals of medical and healthcare are ongoing assessment, prompt intervention, and remote consultation with medical professionals. It is closely related to Safety-critical, which is defined as substantial harm or loss of life caused by any breakdown or trouble, and Mission-critical, which is defined as a vital component of business operation or an organization, and which the breakdown or trouble may directly influence. Recent developments in medical imaging techniques like multi detector computed tomography (MDCT) and magnetic resonance imaging (MR imaging) allow us to quickly gather high-dimensional, sectional, thin-sliced, and enormous numbers of pictures.

The immense quantity of data creates significant difficulties for radiologists when interpreting images. To analyze such complicated data, image processing becomes crucial. The introduction of soft computing into medical image processing is due to the fact that it is a successful method for addressing the uncertainties included in obtained image data. Fuzzy connectedness approaches image segmentation, fuzzy clustering techniques, particularly for human brain MR image segmentation, statistical atlases, and fuzzy models for object detection and delineation are a few examples from the past 20 years. Fuzzy logic, neural networks, support vector machines, evolutionary computation, probabilistic methods, and chaos theory are examples of soft computing methodologies.

III. RESEARCHMETHODOLOGY

Predictive analytics is the main area of study for locating risk factors for cardiovascular illnesses. One of the main causes of disease burden in India is heart disease. Heart disease is one of the leading causes of death in India, and this is due in part to a combination of factors including poor access to treatment, ignorance, and poverty. The clinical causes of cardiovascular disorders are numerous. To comprehend the root causes and contributing components of an illness, a human diagnostic is made. This diagnosis reveals vague heart attack signs and symptoms at an early stage, making it difficult to forecast or prevent the attack. Using fused information gathered from many sources and in real time, the study aims to create a typical allowing prediction model for anticipating heart attacks in patients [6]. A framework employing NoSQL-based storage is suggested which saves all the types of data in order to achieve this fused dataset. A predictive model is constructed over this archetype using the knowledge gained from examining existing analytical techniques and machine learning techniques for cardiovascular disease prediction. Technique for extracting key risk indicators is crucial. In order to do this, pattern-finding algorithms were applied to the dataset in order to anticipate the risk factors and causes. By providing insights, our prediction model aids in further heart attack prevention.

The healthcare industry heavily relies on predictive modelling. These methods and models support the human observer's efforts to identify and measure relationships between different characteristics, patterns, colour graphs, etc. These models might also point out a brand-new collection of characteristics or traits that weren't previously taken into account when determining a disease's aetiology or how to treat it. When coronary arteries contract or become blocked, it results in heart disease. This is brought on by the buildup of cholesterol as well as the deposition of fat on the inner walls of the arteries. The healthcare industry depends substantially on predictive modeling. These methods and models support the human observer's efforts to identify and measure relationships between different characteristics, patterns, colour graphs, etc. These models might also point out a brand-new collection of characteristics or traits that weren't previously taken into account when determining a disease's aetiology or how to treat it. When coronary arteries contract or become blocked, it results in heart disease. This is brought on by the buildup of cholesterol as well as the deposition of fat on the inner walls of the arteries. The information gathered to assess cardio vascular disease is frequently the same for all individuals, but the mix of these variables affects how accurately heart attack risks are predicted. When some facts are unavailable, the diagnosis may be delayed or fall short of expectations. For example, lifestyle factors like drinking, smoking, and diet, patient demographics like age and gender, diabetes, lipid profiles and cholesterol levels, body weight, and body mass index are used to assess the risk of cardiovascular illnesses. Collecting these variable values and diagnosing it becomes a very tiresome operation.

When some of the variable values are missing, determining the risk of suffering a heart attack becomes considerably more challenging. Again, in order to forecast a heart attack, the combination of the variables must be taken into account. It becomes difficult to choose the variables accurately and combine them to analyze. The numerous variables utilized for the assessment of the risk of cardio vascular illnesses can be identified and predicted using data mining and machine learning [17]. Many scientists have made contributions in this area. The methodology and dataset employed by these various methods for predicting risk factors of cardiovascular illnesses are also reviewed in more detail. In order to understand how to increase the effectiveness and performance of the approaches, it is helpful to evaluate the many existing data mining models for predicting the risk factors that identify cardiovascular diseases from the various datasets. Artificial intelligence (AI) systems may automatically learn from their experiences and get better over time thanks to a technique called machine learning. The creation of computer programmers that can access data and use it to learn for themselves is the focus of machine learning. In order to find patterns in the data and base future judgments on the instances, the learning process starts with observations or data, such as examples, firsthand experience, or instruction. The main goal is to let computers learn autonomously without any help from humans and adapt their behavior accordingly.

Algorithms for machine learning are frequently divided into supervised and unsupervised categories.

- In order to anticipate future events, supervised machine learning algorithms can use labelled examples to apply what they have learnt in the past to fresh data.
- When the data used to train is neither categorized nor are labeled, unsupervised machine learning algorithms utilized.
- Since they train on both labeled and unlabeled data, semi-supervised machine learning methods fall midway between supervised and unsupervised learning.
- A learning method known as reinforcement machine learning algorithms interacts with its environment by taking actions and identifying successes or failures.

IV. STEPS TO INVOLVE IN METHODOLOGY

The first stage involves reading real-time patient parameters and ECG data. The application reads these input data. The second phase involves categorizing patient medical data (lipid profile). In the third step, we will use confidence and support to construct associative rule mining to assess the risk associated with each risk factor and provide the framework for understanding how the risk factors are interconnected.

The application of a wavelet transform on the supplied ECG will be used to create in the fourth phase. The next stage is to use the deep learning model to categories. In Step 7, the medical data is categorized using the deep learning model. Integrating the two deep learning algorithms at step eight produces the final forecast.

V. SUMMARY/CONCLUSION

It can analyse vast amounts of information much more efficiently when combined with AI and cognitive technologies. The relationship between different Influencing variables and cardiovascular diseases has been extensively studied, opening the door to the implementation of heart attack diagnosis and prediction systems employing data mining and analytics. The entire digital ecosystem has been disrupted and thrived thanks to IoT devices.

IoT devices that track and monitor people's health utilising a variety of sensors have advanced recently. These gadgets and sensors generate a tonne of real-time health-related data. A heart attack's risk factors, causes, and potential recurrence can all be predicted using the selective data from these real-time data.

The potential for developing a practical model that integrates both conventional and real-time data processing is great. As a result, it is suggested that a framework be created that can store and process the combined data in real time. The traditional database or file system was used to run all of the predictive models that were already in use. Due to the requirement for real-time processing, the same execution pattern may not allow the prediction or anticipation of heart attacks utilizing real-time data and historical data. In order to adapt to real-time processing, a new prediction model built on existing analytical and mining algorithms is developed.

The goal of this research is to develop a method for storing, processing, and performing predictive analysis on the fused real-time data stream and historical data in order to foresee heart attacks. Creating a new framework and prediction model as a result.

