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An Approach for Heart Disease Prediction Using IOT and Machine Learning

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ABSTRACT: The heart is the key component that follows the heart and connects to it, and the heart has a greater historical precedent in human history. It raises the blood or accumulations to all body parts' gadgets. The ability to predict cardiac problem scenarios is crucial for the medical profession to function. Data analytics helps the medical center forecast different problems and is useful for gaining more information. Each month, a vast amount of patient-related data is produced. The gathered information may be used as a source for foretelling the onset of future weaknesses. Unusual computer learning and data mining techniques have been applied to detect cardiac problems. This study suggested utilizing several mRNN deep learning methods to detect cardiac disease. To get crucial characteristics and gather data utilizing specially created IoT settings, a variety of feature extraction & selection techniques have been deployed. The system efficiently and accurately calculates cardiac risk ratings in a runtime setting.

KEYWORDS: Monitoring System, Performance evaluation, Machine learning, heart diseases

I.INTRODUCTION

One of the most fundamental demands of each human is health. According to WHO figures, heart disorders account for 24% of all fatalities in India and one-third of all deaths worldwide. Every year, around 17 million individuals die from cardiovascular disease. One of the most effective illnesses in the world today is heart disease. Predicting chronic illness at the correct moment is difficult for physical consultants. In many ways, the diagnosis of illness based on conventional medical history has been deemed unreliable. Non-invasive technologies based on machine learning algorithms are reliable and effective for illness prediction. A safe and secure IoT-based healthcare system (Body Sensor Network). IoT and BSN components have the capacity to gather and transport data across a network without the need for any help. BSN-Care addresses the security issues that come with sending sensitive (life-critical) data over the internet. This study also includes patient data analysis and illness recommendations. We use various sensors to measure patient parameters (ECG, temperature, heart rate, pulse, blood pressure, etc.) in our system. According to the latest report, heart disease is causing a significant increase in death rates. As a result, an intelligent heart disease prediction system is necessary to reduce death rates. A range of variables, such as a change in lifestyle, more stress, and other things, might contribute to heart disease. The prognosis of cardiac disease is thus an important component of life. As we have seen in the literature, several data mining techniques have been used to the prediction of heart disease. There will be tests for cholesterol, blood pressure, pulse rate, or other variables. Massive volumes of medical data are produced every day, making it challenging to extract insights from this huge data. Its heart is the most crucial component of human life; when it is in good working order, human health is wonderful.

II.LITERATURE SURVEY

In Senthil kumar Mohan et. al. [1] proposed Effective prediction of cardiac disease using a mixed machine learning method. They used machine learning methods to build a novel strategy that discovers important characteristics to increase the accuracy of cardiovascular prediction. Different feature combinations and many well-known classification approaches are used to introduce the prediction model. In this study, machine learning methods were applied to analyze raw data and produce a fresh and original diagnosis for heart disease.

In Li Yang et. al.[2] create the prediction model, multiple strategies were applied. The electronic health record system was used to ensure consistent follow-up. They developed a three-year risk assessment prediction model based on a large population at high risk of cardiovascular disease in eastern China (Cardio Vascular Disease).

In Youness Khourdifi et. al. [3] the Fast Correlation- Based Feature Selection method was used to enhance the heart disease classifier by removing redundant information (FCBF). After that, they classified the data using several classification techniques.

In Fahd Saleh Alotaibi [4] Researchers used the Rapid miner tool & multiple machine learning algorithms to improve the previous accuracy score and anticipate heart illness. The cardiac disease dataset from UC Irvine was examined. The suggested approach enhanced the accuracy score previously obtained.

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In Lewlyn L. R. Rodrigues [5] proposed for data analysis, use the Structural Equation Modeling approach using the Partial Least Square method. They used machine learning to investigate the effects of BMI, age, systolic and diastolic blood pressure, cigarettes smoked per day, and alcohol drunk per week on hypertension and coronary heart disease. Except for age, SBP, and BMI, the researchers observed that the rest of the characteristics were linked to CHD (coronary heart disease) and hypertension. These findings aided academics and medical practitioners in ML who are attempting to find correlations between these factors.

In Mohd Ashraf et. al. [6] Researchers suggested using the Deep Neural Network technology to develop an automated system for predicting heart attacks. Multiple datasets were used to evaluate ML algorithms for accuracy. The proposed solution used an automated data preparation strategy to eliminate abnormalities from the system.

Sumit Sharma and Mahesh Parmar [7] presented a framework for Talos Hyper-parameter Optimization for the prediction of cardiac and heart illness. Deep Neural Networks may contribute to an improvement in the consistency of overall heart classification in the key field of heart sickness. SVM, Nave Bayes, and Random Forest all fared differently regarding classification. The Talos High energy Optimization outperformed the other classification algorithms in the UCI heart attack Dataset.

In Asma Baccouche et. al. [8] proposed an ensemble- learning framework based on unidirectional and bidirectional BiLSTM or BiGRU model with a CNN and achieved the accuracy of 91% for different types of heart disease. A data preprocessing with feature selection is implemented to improve the classifier performance.

Researchers in N. Sowri Raja Pillai et al. [9] employed a learning algorithm strategy for improvement goals outcome using patient diagnostic narratives using based on deep neural networks (RNNs), i.e. (PPRNN). Multiple RNNs are used in the hypothesized PP-RNN to learn from patient diagnostic code combinations in order to forecast the incidence of high-risk illnesses. Finally, the suggested strategy improved accuracy.

M. Ganesan and Dr. N. Sivakumar have developed a novel Cloud & IoT-based medical application [10] to monitor and identify serious illnesses. During the training phase, the svm classifier is trained using data from of the validation set. To identify sickness or the absence of disease during system testing, actual patient data were used.

III.PROPOSED METHODOLOGY

Essentially, the suggested system is split into two phases: training and testing. The use of machine learning methods to forecast illness is suggested in this study. The dataset plays an essential part throughoutthe whole execution to obtain classification accuracy. Several sensors have been installed and linked to the microcontroller. Each sensor gathers data from the user's real-time bodily events and saves it in a cloud database. A variety of efficient hybrid machine learning techniques will be used to create the graphical user interface.

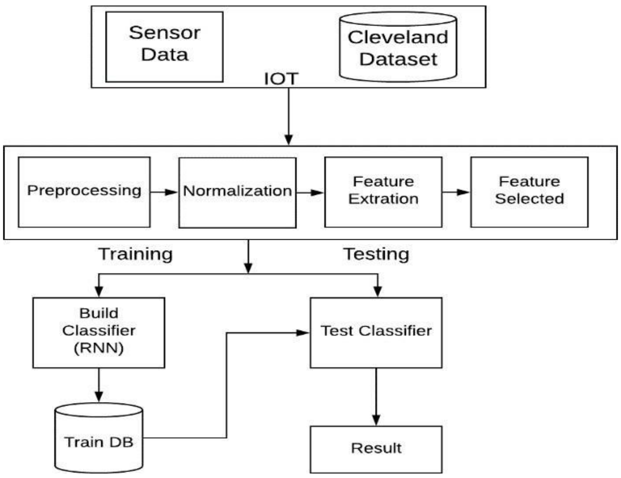

Figure1. System Architecture

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B. Algorithms

Algorithm 1: Proposed modified Recurrent Neural Network Algorithm (mRNN)

Input: Train_Feature set [], // Set of training dataset Test_Feature set [] //Set of test dataset Threshold denominator Th Collection List cL

Output: Create class labels based on categorization findings for all test examples.

Step 1: Utilize the following function to read all properties from the Testing dataset.

$$\text{Test\_Feature} = \sum_{j=1}(T[j])$$

Step 2: Utilize the following function to read all characteristics from the training dataset.

$$\text{Train\_Feature} = \sum_{k=1}(T[k])$$

Step 3: Use the method below to read the total characteristics from the train instances.

Step 4: Create weights for each feature sets and calculate the similarity index.

$$Weight = classifyInst(\text{Train\_Data\_Feature}, \text{Test\_Data\_Feature})$$

Step 5: Verify with Th

optimized_Instance_result = Weight > Th ? 1 : 0; Whenever instances = null, add each optimized instance to cL.

Step 6: Return cL

C. Objectives

- To design and developed Machine learning classification-based health care system for heart disease prediction.
- To evaluate to proposed system on synthetic as well as real time dataset to evaluate the proposed analysis.
- To develop a various privacy preservation technique during the health care data distribution
- To calculate the heart severity with Cardiac Index (CI) and vascular age of Heart (VAH) using proposed algorithms.
- To explore and validate the proposed system results with various existing systems and show the effectiveness of system

D. Problem Statement

The proposed research effort is to design & implement a system that can provide the user (patient) Heart by monitoring any disease prediction by using Hybrid Machine Learning classification approach.

E. Mathematical Model

Many users can obtain one result or multiple results.

Set Theory:

S= {s, e, X, Y}

Where

s = Start sensor and application of the program. Log in user.

Get the data from sensors or synthetic data e = End of the program.

Display the captured data on the monitor screen. Log out the user.

X = Input of the program.

Input should be synthetic data set. Y = Output of the program.

Finally, we display the captured data on the monitor screen.

Let S be the Set of System. S= {U, I, A, C, R}

Where U, I, A, M, R are the elements of the set. U=User

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I=Input synthetic data. A=Application monitor patient data

C=Classification (Training, Testing) data set R=Result.

Failures:

Hardware failure. Software failure.

Success:

Search the required information from available in

Datasets or Database.

User gets result very fast according to their needs

IV.RESULT AND DISCUSSIONS

The relationship between clinical ratings and quantitative assessments makes sense and has the ability to solve a variety of decision-making issues. Six machine learning methods were used with the created training library to identify patterns of frequent, dubious, and risky behaviors. Utilizing the behavior categorization, training-database, the 3-fold, 5-fold, & 10-fold cross-validation method was used to predict and evaluate the machine learning methodologies. Figure 2 below illustrates the three-fold categorization method applied to all parameters and demonstrates the consistency of all implementations.

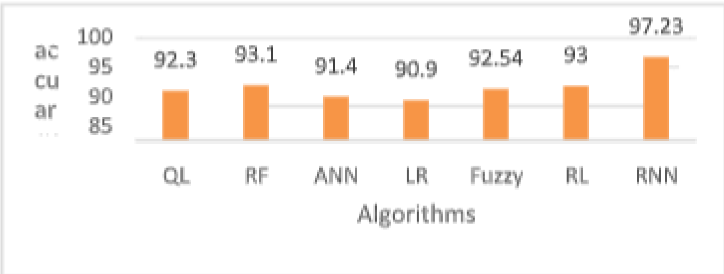

Figure 2: Evaluation of different ML and RNN classifications' accuracy

The total accuracy of each method, including the proposed RNN, is shown in Figure 2. It has a 97.23 % accuracy rate. Linear Regression (LR) has a minimum accuracy of 90%, which is higher than other methods.

Figure 3: Evaluation of multiple ML and RNN classifications that are True Positive

Figure 3 displays a True Positive (TP) of every algorithm, including the suggested RNN. Its TP ratio is around 97.40 %. When compared to other techniques, the algorithms Linear Regression (LR) has a minimal accuracy of 93.000%.

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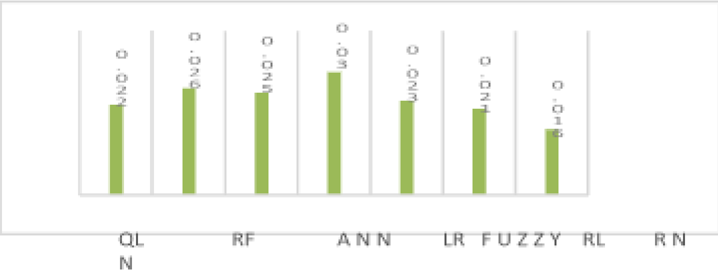

Figure 4: False Positive evaluation of various ML and RNN classification

Figure 4 displays the overall accuracy of all methods, including the suggested RNN. Its accuracy percentage is 97.23%. Compared to other techniques, linear regression (LR) has a minimal accuracy of 90.90 %.

Figure 5: True Negative evaluation of various ML and RNN classification

The True Negative for each method, including the proposed RNN, is shown in Figure 5. A 98.41 % accuracy rate is achieved. The lowest TN of all the methods is achieved by the fuzzy logic algorithm, which has a value of 90.40 %.

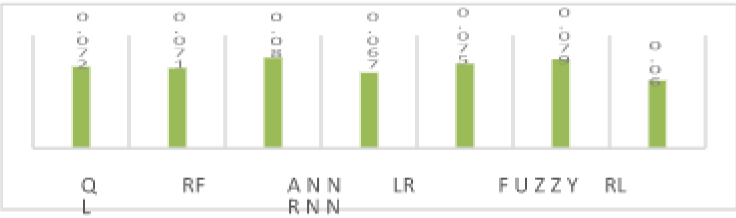

Figure 6: Evaluation of multiple ML and RNN classifications that is falsely negative

Figure 6 depicts the erroneous percentage of a system using many algorithms; LR and RNN constantly provide the lowest negative outcome ratio.

The above figure 2 to 6 highlights the significance of several experimental studies concentrating on different statistical tests using seven unique algorithms: Q-Learning, RF, Fuzzy logic, Nave Bayes, Linear Regression, RL, & Random Forest using Recommended Perceptron Algorithm. The classifier used the mRNN classification method for data management. For each model, the neural network was displayed and discussed. The system accuracy for correctly identifying, incorrectly classifying, recession, & device recall is shown by both uncertainty metrics.

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V.CONCLUSIONS

The system offers online illness prediction and real-time health monitoring. It can function using both fake and live training data. Prediction accuracy is superior than other learning strategies. Additionally, the system is capable of sending out alerts 24 hours a day in case of emergencies. Future research will use cloud environments to construct these systems using parallel processing of high-dimensional data. This project seeks to provide them a platform where any indigent patient may get their vital signs using a recommended non-invasive method. In this case, patients may get in touch with the doctor using internet technology whenever they choose, day or night, seven days a week.

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