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Virtual Healthcare System

Amruta Mankawade, Ruchita Chaudhari, Kshitij Bisen, Aditya Bhosale, Ashish Biradar, Chetan Chaudhari

Vishwakarma Institute of Technology, Pune, Maharashtra, India

Abstract *— Virtual care goes beyond the confines of healthcare facilities to offer remote treatment. Although virtual care cannot be considered a panacea for all medical issues, it offers another way to look at a medical problem and provide a much easy and affordable nursing to the patients. To define virtual care, and to contrast how it is when compared with the regular healthcare and how it impacts, a scoping survey was undertaken. As per the review, virtual healthcare means not only using virtual reality to monitor setting related to healthcare but also sophisticated tech like video conferencing to allow patients to be diagnosed from the doctors. There are a lot of potential uses of virtual care in healthcare, to name a few are consultations in a virtual way, managing pain and anxiety, follow ups, therapies, rehabs, clinics and even emergency services. The results were actually positive, both the doctors and patients liked the virtual care system by considering all the advantages it had and how it avoided all the difficulties majorly the technological ones.*

Keywords *— (Disease prediction, human health, Precision, Accuracy, F1-Score)*

I. INTRODUCTION

We have designed a Virtual Healthcare System which will be a one stop destination for all your fitness related activities. We have designed a website which will integrate all the above-mentioned things. It will include a proper Machine Learning based disease prediction system. It will allow the user to predict the disease based on the symptoms and a certain set of Y/N questions. Next up, we have a yoga section which will facilitate the users with improved strength, balance and flexibility. Yoga section will show the users various asanas and the right way to do it included with their advantages. We have also added a meditation section for those keen in it. It will help them with reducing strength and anxiety, improved focus and patience. It will exhibit the users with various meditation techniques again included with their pros. Furthermore, we have a nutrition section, it will help the users to take care of their food habits. It has been developed completely keeping in mind the Indian diet style. We have made separate sections for veg and non-veg and also for weight loss and weight gain. We also have a section for balance diet. To sum it up, we have also added an individual body part-based exercise tracker, which will help the user to strengthen and solidify a particular body part of the body. For instance, if a user wants to develop their biceps, it will show them all the exercises and sets to strengthen their biceps. This all is put together in a website built by us from scratch with a very intuitive GUI for the users. All put together, it will form a complete healthcare solution to the fitness freaks allowing them to develop individual muscles, yoga for flexibility, proper nutrition to gain/loss/balance weight, meditation for peace of mind and disease prediction models for predicting illnesses.

II. LITERATURE REVIEW

The most challenging task in the medical sciences is the prediction of heart disease. For the purpose of predicting cardiac disease, this research suggests an effective hybrid genetic algorithm and back propagation technique approach [1]. The question of how to extract valuable information from the data is crucial since there is a significant amount of hidden information in this data that has not yet been investigated. To figure out and source unknown knowledge (patterns and relations) about various heart diseases from the databases records was the primary goal to create a prototype.

Finding cardiac illness early on is currently one of the most crucial parts. Different methods have been used by researchers on the UCI ML heart disease dataset. The k-means approach is typically used to cluster the data. Reason being, this method is heuristic, this kind of clustering may become trapped in the local optimum. To overcome this major problem, we tend to use (HGA) Hybrid Genetic Algorithm for clustering of data. We got a fairly good accuracy of 94.06 %.

We need to set up a system that can identify heart stroke symptoms early on and prevent them, given the sharp rise in heart stroke rates among young people. A common man cannot afford tests like ECG frequently and hence there must be a system in first place that is practical and trust worth. We are intending to make a system such that it can predict the

vulnerability of cardiac illness on the basic symptoms of age, sex, pulse rate, etc[3].

In this essay, handling a sizable amount of data in the healthcare field is largely accomplished through data analysis. Instead of making predictions, past medical research relied on processing and assimilating vast amounts of hospital data[]. To solve the issue of missing medical data, we have done data cleaning and imputation to remove incomplete data. We are aiming to predict the heart diseases with higher accuracy using Naïve Bayes Classifier and KNN. We see sickness prediction using structured data as extension of this study. The authors' technique for predicting the risk of a single disease is based on convolutional neural networks.

Data mining is a branch of the discipline of software engineering, according to the paper. It is a intersection point of artificial intelligence, machine learning, and database systems. The major target here is to generate a diabetes detection system in an intelligent way that can predict the disease with higher accuracy.

Diabetes is a chronic medical illness brought on by incorrect control of the body's glucose levels. It is the most common cause of death and a chronic condition that develops when blood glucose levels are too high. In this study, we introduce a multilayer perceptron neural network-based diabetes incidence prediction system that makes prediction capabilities more convenient and approachable by allowing users to input basic data. The proposed approach performed well in terms of forecasting diabetes incidences when it was tested on Pima Indians[6].

The prediction of illness signs benefits greatly from data mining. Data mining techniques are being used to analyse diabetes individuals and forecast ailments like heart disease, breast cancer, and others. It aids in the diagnosis of diseases and the development of treatments. Using data models to categorize the dataset for illness persistence. In order to provide quicker and more varied answers, categorization is used. To arrive at the projected values of 32.20 and 27.73, two algorithmic trends—Deep learning and another—Gradient Boosted Trees—were used. Gradient Boosted Trees, which are used in the research, do not perform as well as Deep Learning[7].

A remote healthcare service system based on cloud computing is presented in this research. The three primary components of this system are the cloud services platform, mobile medical devices, and intelligent terminals (such as smartphones and tablets). Wirelessly (Bluetooth/WiFi), devices transfer signals to a smart agent. Smart terminal monitoring software provides data presentation, archiving, and pushes measurement findings to a cloud service platform. A unique website called a cloud services platform was created employing server, storage, and push technology all using cloud, which forms the basis of the entire system. Users only need an Internet-connected device to view and manage their health data records at any time and from any location[8]. The health status of patients can be seen by doctors in the same way.

The authors of this work created a model to generate compelling logics based on a approaches involving social psychology with the intention of enhancing persuasive technologies and smart contexts for avoidance[9]. This model comprised a mobile app that prompts users to write first and then score statements that support healthy sexual activity, producing compelling arguments in the process. The creation of a collection of persuasive arguments is important for upcoming health of public initiatives and intelligent context apps that encourage healthy behavior. This work also makes transdisciplinary suggestions for how technical traits and social psychology might be combined.

This project itself has a wide range of objectives and ambitions. As a result, the app stores are flooded with mHealth applications. It's interesting to note that one facet of the use of apps oriented to health by patients, consumers, and healthcare professionals has received less attention to date: There are mainly no systematic or regulated methods for evaluating an app's quality or its scientific support. The (MARS) Mobile App Rating Scale is a standardized tool that tries to categories the objectives and functions of mobile and health apps as well as evaluate their quality in a systematic and comparable manner. It consists of 23 components that are used to determine a rating system. A database named Mobile Health was designed with MARS in mind[10].

III. METHODOLOGY

A. Method

Four performance evaluation measures are utilized to assess the proposed disease prediction model. The true positives (TP), which are accurate predictions of the target as chronic disease patients, the true negatives (TN), which are accurate predictions of the target as healthy individuals, the false positives (FP), which are inaccurate predictions of the target as diseased individuals, and the false positives (FP), which are inaccurate predictions of the target as healthy individuals, make up the confusion matrix. The four performance evaluation criteria are:

1)Accuracy

The classification accuracy is expressed mathematically as the proportion of correctly predicted values to all predicted values:

$$\text{Accuracy} = \frac{TP + TN}{TP + TN + FP + FN} * 100$$

2)Precision

The ratio of a correct prediction to all correct values, including both true and false predictions, is called as positive predictive value (PPV) precision, and it is represented mathematically as follows:

$$\text{Precision} = \frac{TP}{TP + FP}.$$

3)F1-Score

The weighted average of the values derived from the computation of the precision and recall parameters is referred to as the F-measure. When there is an uneven distribution of students in a class, the f1-score value is far more significant than the accuracy value. Additionally, the value of is quite appropriate whenever false positives and false negatives have different values. The following equation represents the f1 score mathematically:

$$F_\beta = \frac{\left(1 + \beta^2\right)(\text{Precision} * \text{Recall})}{\left(\beta^2 * (\text{Precision} + \text{Recall})\right)}$$

Support Vector Machine Algorithm:

Classification and regression issues are resolved using SVM or Support Vector Machine, one of the most used supervised learning techniques. It is mostly used, nevertheless, in Machine Learning Classification problems.

In order to swiftly categorise new data points in the future, the SVM algorithm aims to determine the optimum line or decision boundary that can divide n-dimensional space into classes. To generate and categorize new data points swiftly, SVM tries to find a defining boundary that divides the n-dimensional plane into classes. The name of this best decision boundary is a hyperplane.

SVM doesn't choose the vectors or the points necessary for the hyperplane generation. The SVM approach is based on support vectors, which are utilized to represent these extreme situations.

SVM can be of two types:

Linear SVM: Data that can also be separated into two classes by a single straight line are used for linear SVM. The classifier used is referred to as a Linear SVM classifier, and this type of data is known as linearly divisible data.

Non-Linear SVM: For non-linearly separated data, Non-Linear SVM is utilized. A dataset is deemed non-linear only if it cannot be classified along a linear line, and the classifier used is called to as a Non-linear SVM classifier.

IV. RESULTS AND DISCUSSIONS

With the appropriate dataset, effective classifier model training that takes into account all relevant factors and incorporates a significant amount of prior experience learning, the prediction engine performs at its peak. In order to forecast illness symptoms, data mining is crucial. Using data mining techniques, a variety of diseases are involved, including the prediction of heart disease, breast cancer, and diabetic patient analysis. The spread of information technology and its continuous participation in the medical and health industries, as well as the symptoms of diabetes, are all widely known. It aids in the diagnosis of illnesses and their treatment. Classifying the dataset for the persistence of disease using data models. The installed Prediction Engine has a high degree of accuracy when predicting the existence of a specific ailment. We also offer a balanced diet plan in addition to a diet plan for weight gain and loss. We also have exercises for certain body parts on our website. The datasets were obtained from Kaggle, and the coding was done in Anaconda's Jupyter Notebook. Machine learning was coded using the Python language. A website was created using HTML, CSS, and JavaScript.

A. Figures

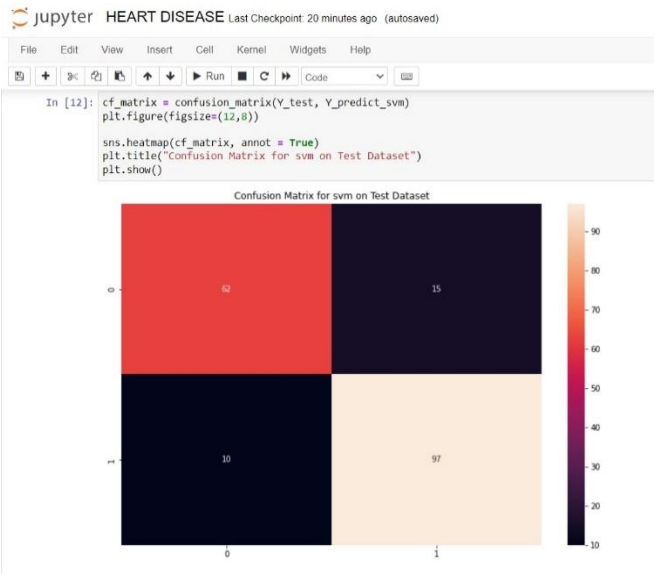

Fig 1. Confusion matrix

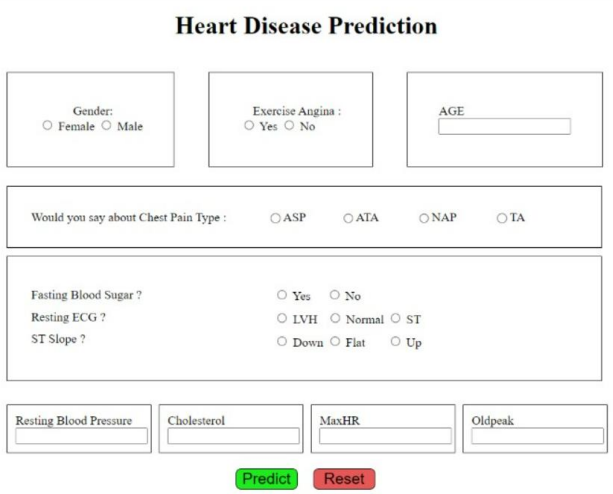

Fig 2. Form display

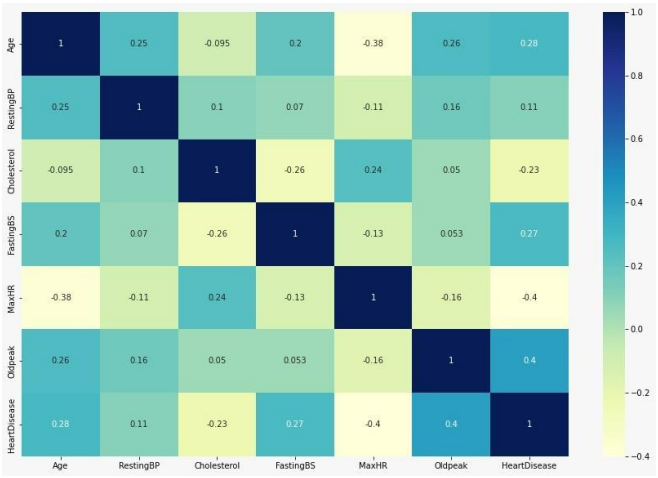

Fig 3. Correlation Matrix

V. LIMITATIONS

Our project is based on diseases that can be anticipated using historical data or on symptoms associated with that specific disease; new symptoms or new diseases cannot be recognized by our model, and occasionally a different set of symptoms results in incorrect decision-making.

VI. FUTURE SCOPE

The user account feature allows the user to keep track of their medical test data and receive suggestions or support to meet the right specialists or take the tests that need to be taken. It also provides admin controls to upload and delete the dataset that will be used to train the model, which improves the functionality of the prediction engine.

Automate the process of building the model and extracting the pickle files of the trained models that the APIs will use to predict the disease, and mail the detailed report of the identification engine results along with the information of the five closest medical facilities with location and contact details.

VII. CONCLUSION

Human Health is mostly dependent on his/her mental health. Our whole health also includes our social, psychological, and emotional wellbeing. It affects our attitudes, feelings, and actions. It also tells us how do we respond to stress, have an interaction with other people around us and eventually make good decisions for them. A healthy lifestyle can aid in the prevention of chronic diseases and debilitating conditions. Your self-esteem and self-image depend on how you feel about yourself and how well you take care of your physical and mental well-being. Our project will assist people in getting the health care they need in less time and without spending any money in the busy world they live in today.

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