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Healthcare Proctoring System Using Chatbot Based on Machine Learning

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Abstract

This presentation describes the implementation of a healthcare portal which will include features like interoperability, symptom-based disease prediction with the help of a chatbot and remote patient health proctoring services.[1] As it is common knowledge, health and medicine are gaining a lot of significance in today's advancing world, where evolving technology is being used to combat almost all the known diseases.[2]

Technology is constantly developing everywhere forevery new ailment that us humans come across. We have new counter-measures ready for these diseases.[3]However, according to reports, more than 200 thousand people in China, 100 thousand in the USA,and nearly 70 thousand people in India die each yeardue to medication errors. Technologies such as data mining and other recommended technologies provide possibilities to explore potential knowledge from diagnosis history records and help doctors to diagnose the disease and prescribe medicines correctly to decrease medication error effectively.[4] This project proposes a system which will aim to negate any miscommunication between the medical professional and patient by acting as a medium whichwill be accessible by both entities with every record of the patient available for the professionals.[5] This system consists of a database system module, data preparation module, disease prediction module,medicine recommendation module, model evaluation and API which will be used for a centralized database for the patient's data.[6] A decisiontree map and random forest algorithm are used to achieve the objective.

This paper also mentions the additional features of the proposed system like the dual function of prediction of diseases and the recommendation of medicines, which adds to the capabilities of the existing systems, and has a portal through which a patient can have appointments, get reports for every medical check-up which will be virtually available.

The patient's data will be globally available for both medical professionals as well as the patient to see.[7] The proposed system will be designed in such a waythat every user's data will be regularly updated in case it is being monitored by other attending medicalprofessionals.[8]

Keywords

healthcare portal, recommendation system, chatbot,data mining, centralized database

I. Introduction

It is estimated that more than 70% of people in Indiaare inclined to general body maladies like viral, flu, cough, cold etc, in every 2 months.[9] Since numerous individuals don't understand that the general body illnesses could be side effects to something increasingly hurtful, 25% of the populace surrendersto death because of ignoring the early general body symptoms. This could be a dangerous situation for the population and can be frightening.[10] As a result, diagnosing or predicting the disease as soon as possible is critical to keeping a strategic distance from any unfavorab0le losses. The currently available systems are either specialized to a specific ailment or are in the research phase for algorithms when it comes to generalized disease.[11]

This situation is not only limited to India, but similar observations are seen across the world, even in countries with robust healthcare systems.[12] According to reports, more than 200 thousand people in China, even 100 thousand in the USA, die each year due to medication errors. Furthermore, many research suggest that the prescription kills about lakhs of people.[13] These mistakes might be traced to doctors, who prescribe medications based on their previous experiences.[14]

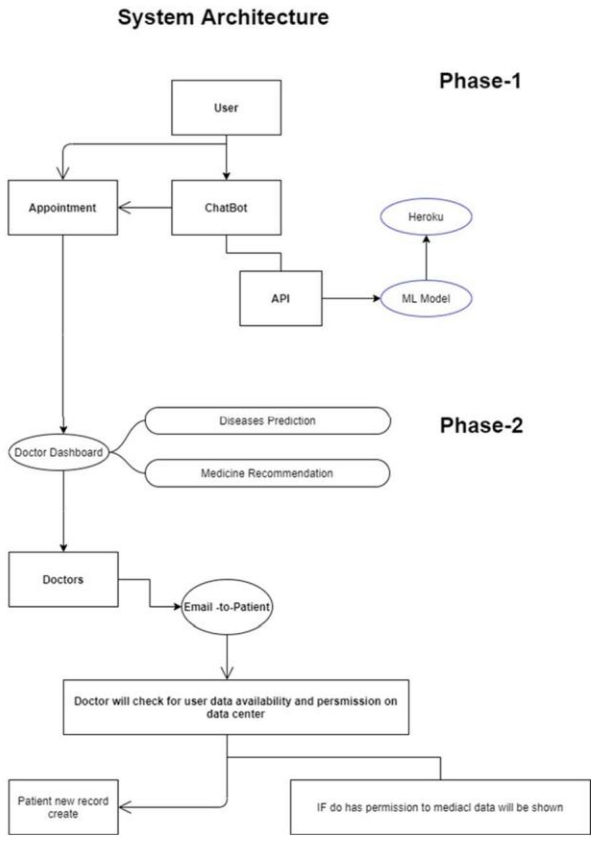

Fig. 1 – System Architecture

A system architecture is the conceptual model that defines the structure, behavior, and more views of a system. An architecture description is a formal description and representation of a system, organized in a way that supports reasoning about the structuresand behaviors of the system.[15]

Technologies such as data mining and recommender systems give prospects to investigate, provide opportunities to inspect potential knowledge from historical records pertaining to diagnosis and help specialists to analyses the clinical malady and endorse prescription accurately to decrease medication error effectively.[16]

II. Related Work

The traditional way consists of doctors performing a patient's diagnosis and prescribing medication by the doctor's experience. This may sometimes lead to the doctors prescribing wrong medicines or an overdoseto patients, which causes more health issues to the patients.

Many people have worked to develop models that can forecast diseases. D. A. Davis, N. V. Chawla, N.Blumm, N. Christakis, and A.L. Barabasi published a paper titled "Predicting individual disease risk based on medical history," which included a novel system called CARE, which combined collaborative filtering methods with clustering to predict each patient's greatest disease risks based on their own medical history and that of similar patients.[17]

After the initial step of correct diagnosis has been done, one can focus on the disease's course.Understanding how the disease proceeds is more crucial for preventative medicine.

III. Problem Statement

The app should be used by all nurses, doctors, pharmacists, and other healthcare professionals whowork in hospitals. This is significant because we want all hospital workers to communicate through a single channel. I'll give you an example of how this app can help to bridge the communication gap that exists among employees. When nurses change shifts, the app would contain precise information aboutthem. The entry screen for a nurse for handover to the next nurse would require her to choose all of thepre-populated patient IDS from the hospital patient database. Details about the present drug being delivered and the required intervals of monitoring thepatient would be provided for each patient ID selected.

IV. Proposed System

In this project, we propose a chatbot that uses the patient's symptoms to anticipate the ailment and thenrecommends the right doctor appointment. To make the user's duty easier, instead of having to answer several questions that would ordinarily comprise a consultation, the user will just have to enter thesymptoms they are experiencing. The medical data related to the symptoms will be sent to our API, which is constructed using machine learning, and it will provide the predicted diseases. The system's roleis to answer to the user's query by applying a suitablemachine learning model on the dataset.

This system is mainly designed to help doctors integrate prediction modules and recommendation modules so that it can recommend medicines based on the respective disease, and thereby constitute a thorough system.

The framework employed mainly consists of eight modules, as shown in figure 1.

1. Database System Module
2. Medicine Recommendation Module
4. Doctors Module
5. Nurse Module
6. Patient Module
7. Chemist Module
8. Appointment Module

A Decision Tree map, and Random Forest algorithmare used to achieve the objective of disease prediction and medicine recommendation. Since high accuracy and potency is important for such an symptom based disease prediction and medication recommender system.

The framework employed for Centralized systemmainly consists of two modules, as shown in figure 1.

1. Records Module
2. Patient Module

V. Methodology

The objectives for developing the project are asfollows: To improve the existing online medicalexperience system using machine learning technology. To reduce the workload of setting up anmedical facility and conducting diagnosis in physical form. We are supposed to learn the concept of artificial intelligence and how it can be utilized to work on different sectors.

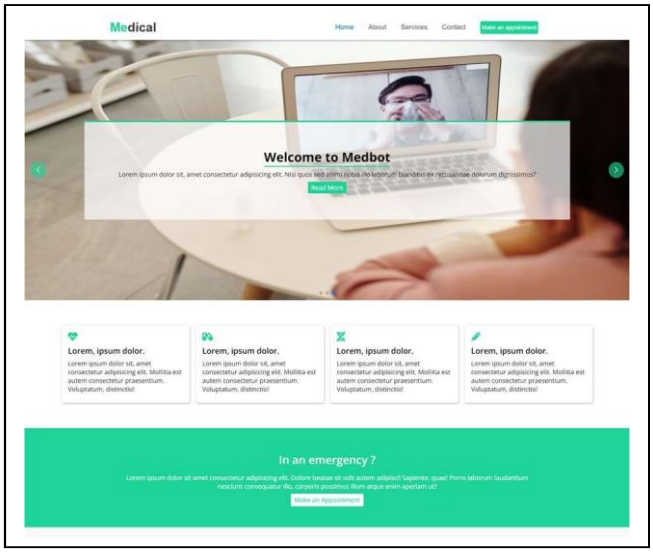

Fig. 2 – Index Page

This is the home page that will be accessible by everyone. Regardless of whether they're registered or not, as well as if they're a doctor or a patient. As you can see in the above figure, there is also a buttonto book an appointment that can be used by anyone who needs to be seen by a medical professional. Thiscan be done both physically as well as virtually(through Zoom).

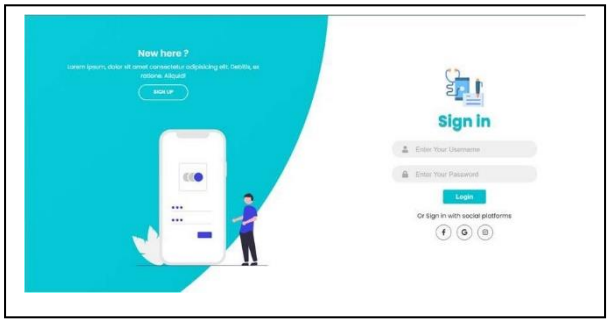

Fig. 3 – Sign-in Page

This is the sign in page. Here, the user (be it the doctor or the patient) has to go through the process of identifying and authenticating themselves. The user credentials are their usernames and a matching password. We've also added additional options to help the user's login with their social mediaaccounts.

VI. Future Scope

We have proposed an idea for a symptom-based disease prediction and medicine recommendation system and Patient health Proctoring system by applying various algorithms on the symptoms and the medicine datasets. This approach is based on fourmain steps: (i) Prediction of diseases (ii) Maintainingthe health record of every patient (iii) Lab Coordination iv) Appointment scheduling etc v) Recommending the proper medicine for a particular disease. The proposed system works as a tool for supporting the doctors in their disease diagnosis withthe accuracy of 85%. The reliability of the recommendation system may be improved as future work by providing age of the individual, demographic details during the training process. Theprescribed medication can also be improved by the brand and the chemical content present in the medication.

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