Web-Based Disease Diagnosis and Health Chat System.

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Abstract

The current situation has forced humanity to move to the new normal. The most affected part of humanity is the health sector. The usual patient-doctor interaction is now limited to the pandemic. But there's more that can happen. The proposed system provides the virtual path for patients to find doctors based on their symptoms and talk to them. Technology working behind is based upon data mining and machine learning techniques like supervised learning and classification algorithms.

***Keywords:** Health Chat App, Disease Detection, Data Mining, Machine Learning.*

1. Introduction

Health has been a very major issue in very recent times. The pandemic has forced us to change our health habits and also has affected the routine health check-ups and the routine interaction of patients with doctors. Pandemic has limited the scope of many doctors to just pandemic patients. Though many treatments and medical conditions require one-to-one physical interaction, the proposed system uses Data Mining techniques in predicting diseases based on symptoms and habits and then recommends doctors or health experts/specialists that deal with the predicted disease. Thus the user would connect to the doctor using the chat system. [2]

The proposed web application uses python and Django as its backend framework and the front end framework consists of HTML, CSS, JavaScript, and AngularJs. The proposed data mining algorithm is coded/designed in python and the chat system is built using python and Django web socket and SQL Lite is the acting database. [3]
The Data Mining Technique used for prediction is Supervised Learning's [9],[10], Classification Naïve Bayes' and Decision Tree Algorithms.[1][9][10].
The whole system is designed in a way that a registering patient will punch in details as asked by the system and will move to the prediction module. The patient will punch in the symptoms and the model will evaluate them.

Once the Evaluation is done by the machine the patient will be suggested a list of concerned health specialists as predicted by the prediction module. [3]

2. Problem Definition

2.1 Statement of Problem

To predict disease using the proposed algorithms on the input of Symptoms and providing an interface for the user to reach to a concerned recommended health specialist.

2.2 Existing Systems

Existing systems as mentioned in the References are two independently existing systems i.e. the prediction system [2] and she health chat system [3]. Though there is a presence of various systems again coexistence is an issue. The coexisting of these two systems would result in a very handy option for users and patients to help them discover their problems and reach out to consultants at the earliest.

3. Literature survey:

Table 1. Literature Survey

Sr.no	Paper	Author	Advantages	Drawbacks
1	Multi Disease Prediction using Data Mining Techniques[1]	K.Gomathi, Dr.D. Shanmuga Priyaa	The mention of Algorithms used And their respective accuracy in predicting disease.	Very General Description Of Algorithm used and no support statements for the mentioned accuracy of algorithms used.
2	Disease Prediction System[2]	Sarthak Khurana, Atishay Jain, Shikhar Kataria, Kunal Bhasin, Sunny Arora	The implementation of the technique is visible through the user interface screenshot.	The prediction doesn't seem to have a large scope.
3	Mobile-Based Medical Health Application - Medi-Chat App[3]	Mustapha Adamu Mohammed, Anibrika S.K. Bright, Christ Apostolic, Franklin Degadzor Ashigbe, Clement Somuah	A very well informed and coded system for text-based communication.	No mention about how one would choose doctors to contact.

The Above done Literature survey has 3 papers being surveyed and what follows is the analysis of those papers.

Prediction Module:

(i) As shown in table 1 K.Gomathi and Dr. D Shamuga Priya [1]in Multi disease prediction using data mining has spoken about various attributes and properties one must identify to predict the 3 mentioned diseases in the paper. The use of algorithms is close to predicting the disease and a brief introduction to it has been provided for the same. The accuracy table mentioned helps one to determine how good these algorithms are in implementation.

(ii) The 2nd Surveyed paper of Sarthak Khurana, Atishay Jain, Shikhar Kataria, Kunal Bhasin, Sunny Arora [2] Disease Prediction System, is based upon disease prediction using symptoms and stresses upon some major factors of the proposed system like algorithms used, system design and model validation. The algorithms are quite descriptive and also the presence of a user interface validates the work to an extent, though there's no mechanism mentioned for collecting data and the prediction scope is quite limited.

Chat Module:

(iii) The 3rd Paper of Mustapha Adamu, Mohammed, Anibrika S.K. Bright, Christ Apostolic, Franklin Degadzor Ashigbe, Clement Somuah [3] Mobile-Based Medical Health Application - Medi-Chat App is about the system of connecting the patient with the doctor. The implementation here is quite detailed and explanatory though no talks about the basis on which the patient selects a doctor.

4. Proposed System:

4.1. Prediction Module:

4.1.2. Objective :

The Objective of the system is to use appropriate algorithms and to predict the disease based on symptoms provided by the user.[2]

4.1.3. Collecting Data :

The data has been collected from people and organizations through Google forms which were given having information like gender, age, disease name, nature of the disease (acute, chronic), symptomatic or asymptomatic, state of the disease (suffered or suffering), description of the disease, habits that might have led to the disease and lastly any extra info.

4.1.4. Preparing The Data :

The data has been cleaned as there were instances when the data collected was not totally according to the topic, such data was eliminated. Then the diseases and their symptoms were cross verified using certain authentic sources and classified into the required

categories. Then the basic symptoms for every category were identified and then the hallmark symptoms for every disease for identified.[2]

4.1.5. Training a model :

The cleaned data here is provided to the algorithm. Data provided to the algorithm for training purposes is termed as the Training Data and the data which tests the algorithm is known as the test data and is a subset of the training data. Here the training data and the test data both are extracted from the processed data.[2]

4.1.6. Evaluating the model:
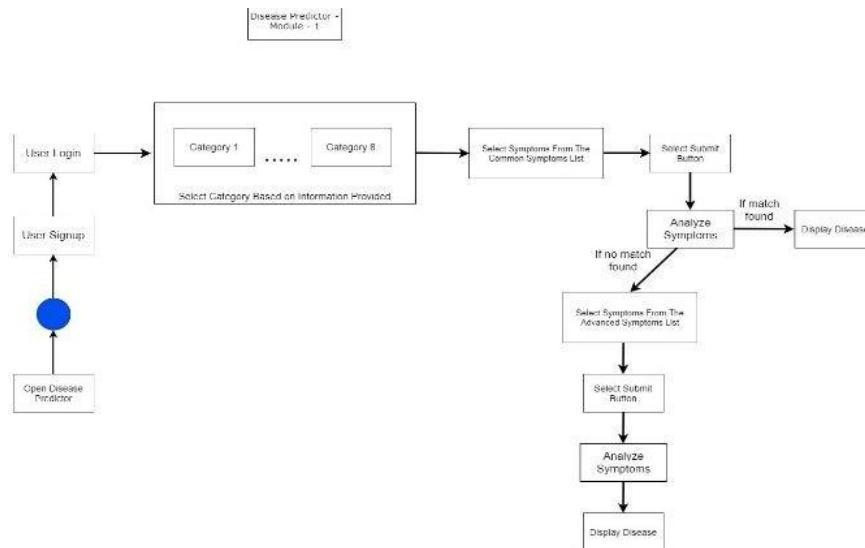
The evaluation of the proposed model is done using the above-mentioned test data. The test data used here is of two types one is the subset of the training data and the other is not part of the training data

Figure-1. Block Diagram of Predictor Module

The prediction module interface has the following properties

1. The User First Enters Signup Details and registers into the system.
2. Then The User has to login to the system with valid credentials.
3. Then the patient/user is given 8 categories of diseases to choose from.
4. These categories have information about the concerned affected body part and a list of common symptoms one could get.
5. Once The Category is Chosen the user is taken to a page where he is asked about some basic symptoms he/she might be facing.[2]
6. The categories available are: **Cancers and Neoplasms, Ear, Eye, Mental Health, Oral and Gastrointestinal, Respiratory and Skin.**
7. On Evaluation if patient doesn't get any reply from the system the user is advised with some health tips and also the option to connect to the concerned specialists.[1][2]

8. If the above condition doesn't stand true then the user is asked for more symptoms and .i.e. how severe these symptoms are and other necessary information as coded in the system.

9. Then if the entered details match to any of the diseases present in the system it responds with the name, description, and recommended specialists for it.[3]

10. If no disease is matched then the symptoms are stored in the system and then verified and added to the active list of diseases and the user is, in general, recommended health specialists.
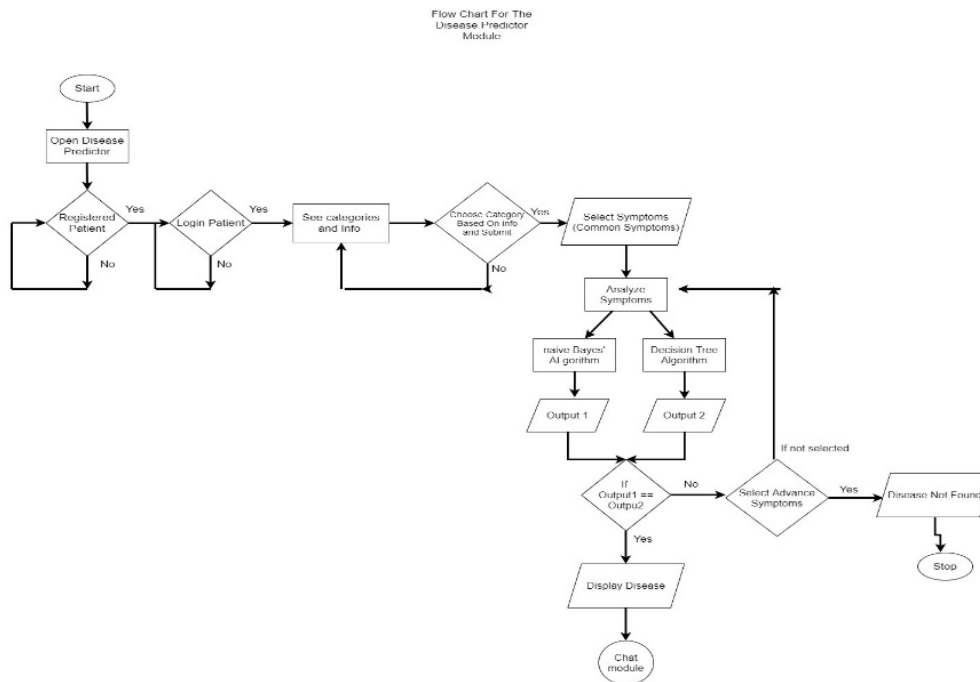
Figure 2. Flow Chart for the prediction module

5. Chat Module :

The Patient enters the chat module when the model has predicted a disease using Naïve Bayes' [1],[2],[7] theorem and Decision Tree[1],[2],[8]and has generated a message consisting of the name, description, severity of the disease. The working of this section of the system is though quite simple one has to look at how all the components in this system are interacting with each other.

5.1 Methodology

The methodology employed in this paper is organized into several stages and sections as indicated below:

5.1.1 General Objectives :

Since it's a real-time application the objective is to provide patients/users after they are done with disease prediction and got the results could move forward and reach out to the concerned doctors with their issues.[3]

5.1.2 The Scope of this chat application development are :

a) Text-based communication with a doctor based on the results generated by the disease predictor module on any independent platform based on python and web programming language.
b) The user interface is designed using various web programming languages.
c) The user interfaces include, login interface, chat interface, and chat list interface. [3][7]
d) The backend development is done using SQLite and the user interaction is real and extraction and adding of data happens through various processes. [3]

5.2 System Requirement Specification:

The System Requirement Specification includes Functional and non-functional requirements. The functional requirements are those requirements one could use to understand the system whereas the latter means that what are the measures one can adopt to validate the success of the implementation of the functional requirements.

5.2.1   Functional Requirements:

1. Users should be able to register in the system with appropriate details.
2. Users must be able to login to the system and access the features.
3. Users must be able to logout of the system of their will.
4. The system must handle any request failures as coded.
5. The system must provide a list of available doctors based on the category chosen and predicted disease.[3][7][8]
6. The system must allow the doctor to register and log in.[3]
7. The system must allow the doctor to allow patient reports and make themselves available for communicating.[3][7]

5.2.2 Non Functional Requirements:

1. The User Interface must be user friendly with proper navigation for tracing various facilities.[3]
2. The user should be notified about the messages from the doctor and other processes.
3. The system should have the least bugs and should be able to handle any wrong operation.
4. The system should be able to run all devices.
5. The system supports simultaneous users.[3]
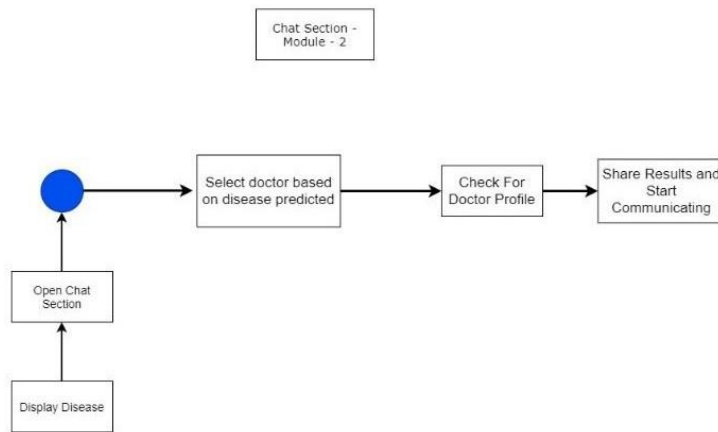
Figure 3. Block Diagram for Chat Module

5.3 System Design :

The System design has two sections namely the front end and the back end. These sections are thoroughly explained below with their features and properties :

The front end talks about the user interface of the chat module and its various attributes :

The front end consists of the following properties :
5.3.1 Users section :

1. Displaying the Doctors List based on the disease predictor report. [3]
2. Selecting doctors based on their profiles, experiences, and testimonials.
3. Communicating with the doctors using the common chat interface and consulting them. [3]
4. Receiving prescription from the doctor in pdf format.
5. Downloading the prescription in pdf format.

5.3.2 Doctor's Section:

A) Logging into the system if registered and verified.
B) Getting the list of patient's chat and profile.
C) Reading the system generated patient report.
D) Making him/her available/online and start communicating or advising patients.

The Back end consists of the following properties :

1. Accepting Details from patients and doctors and storing them on the appropriate table.
2. Verifying the doctor by the admin and storing the doctor's information.
3. Validating users and patient data to log in to the system.
4. storing the report of each patient sent to the doctor.
5. Storing doctor-patient chat messages, audio files, images.
6. Storing and sending the prescription to the patient.
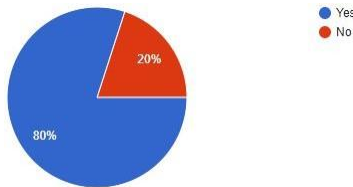
Flow Chart for Chat Module
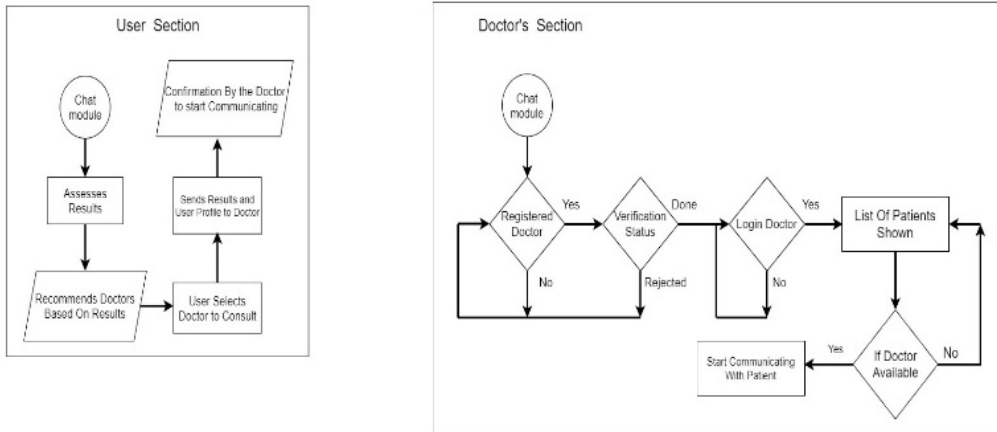
Figure 4. Flow Chart for the chat module
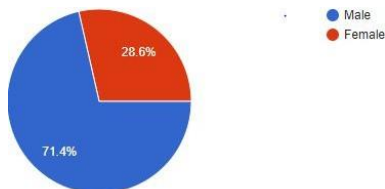
6. Survey Analysis :

The following survey was conducted and 100 responses were recorded of what the mass thinks about this application :

Question 1:   Do you think that the pandemic has affected traditional doctor-patient communication?
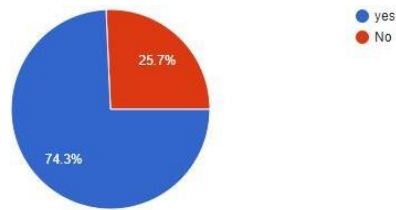

Figure 5. Analysis of Answers

Question 2: Gender
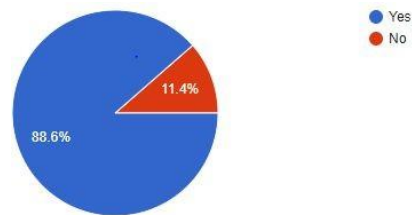

Figure 6. Analysis of Question 2

Question 3: Do you wish to have an alternative for the current doctor-patient system?

Figure 7. Analysis of Question 3

Question 4:Would you prefer an online disease predictor which takes your symptoms and predicts your disease?
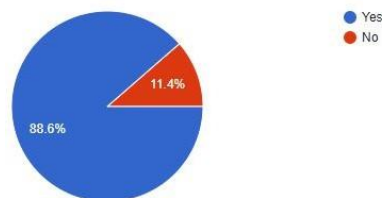

Figure 8. Analysis of Question 4

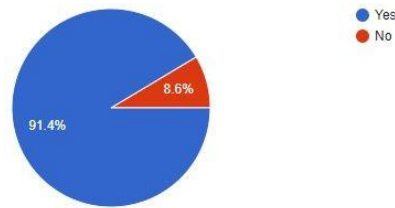Question 5:After prediction if the system connects you with a doctor would you prefer it?
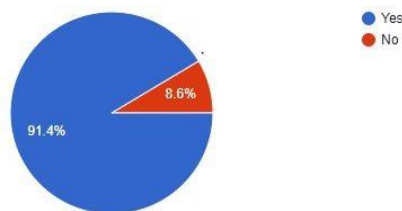
Figure 9. Analysis of Question 5

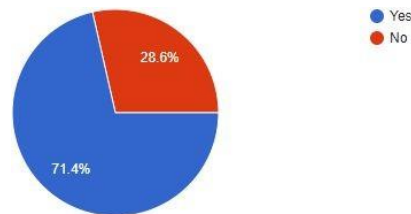Question 6: would you be comfortable about having an online real-time chat with the doctor?

Figure 10. Analysis of Question 6

Question 7:would you prefer an e-prescription from a doctor?

Figure 11. Analysis Of Question 7

Question 8: Would you prefer an online health system as mentioned above?

Figure 12. Analysis of Question 8

7. Conclusion

The above-proposed system is an attempt to redefine the traditional patient-doctor interaction and provides all data and requirements one needs to build this system out. This could be a great way for the people who fear going to the doctor due to a lack of confidence in any disease that they think is too personal to discuss in person. One who is busy and requires a quick look at what could be done about his / her health, this system would be a great help to those as reaching time to the hospitals is reduced.

8. Future Work

Any project has always got the scope of improvement and this project has an immense scope of improvement. One could always add the categories of diseases so that the system attracts more and more users and could also be helpful to a greater mass. The Chat Module could be added with features like video-based communication, share information in different formats like upload reports, x-rays, and other reports for doctor's assessment. One could go for updating the chat module with new features as well.

9. Acknowledgment

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10. References

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