Smart-Doc: AI based Medical Assistance System

Soumyadeep Ghosh, Anisha Roy, Chirag Lal, Mantsiz Zinath, Antara Ghosal, Anurima majumdar, Sunipa Roy
Department of Electronic and Communication Engineering
Guru Nanak Institute of Technology

Abstract- A tremendous impact has already been made by Artificial Intelligence (AI) on current technological fields. The emergence of AI technology has enabled machines to replicate the functions of the human mind. The AI-based health detection system our team has proposed and implemented is one of the many potential applications opened up by this development. It provides patients with recommendations for further treatment, diagnoses their medical condition, and communicates with them in their preferred language. By implementing this system, we hope to deliver healthcare more efficiently and effectively. In order to ensure the accuracy and reliability of the system, we have taken extra steps to ensure it is equipped with the latest AI technologies. With its excellent service, we are confident that those in need will benefit greatly.

Keyword: **Artificial intelligence, health detection system, diagnosis, quick treatment, speech recognition, chat-box**

1. INTRODUCTION

The elevated development of the cutting-edge social economy and the advancement of scientific knowledge has superior "health" attention most of the people. people normally assume "fitness" isn't any illness or disorder. global fitness employer defines health as a nation of bodily nicely-being, morale, and social well-being and not simply the absence of illness and sickness" [1]. From this point of view, the definition of "fitness" is not just about the improvement of mortality or the numbers of ailment however also inquisitive about improving the pleasant of existence. Health is an essential feature of human existence. Healthcare is becoming vital day by day, as the numbers of diseases are also increasing around us. Nowadays technology is taking over massively in the medical sector [008]. But sometimes there may be situations when the doctors are not available What if there is an application that will study the patients' symptoms as well as medical history and prescribe necessary medicines immediately? With the technological developments in the medical sector, more applications are being operable through smart and mobile devices. Infect the system can prescribe some alternative medication in case of any side effects.

In today's world, several lives gets affected for not getting proper treatment at proper time. Additionally, it is very difficult for a doctor to check every patient's health condition frequently in any hospital or clinic. To deal with this type of circumstances Smart Doctor system is beneficial. In this paper, we are going to discuss a smart system comprising of different options.

2. OVERVIEW

We can find numerous applications on app store that use a similar approach in assisting patients and diagnosing their health issue. A medical care and scheduling app is called "INTELLI DOCTORS"[9]. We can look up medical facilities and doctors quickly as well. Figure 1 shows the basic user interface of the application. We can analyse the symptoms of the disease. The prevention strategy proposed by Leavell and Clark [3] claims to prevent diseases that can be classified into primary prevention, secondary prevention, and tertiary prevention. In this study, we mainly focused on primary prevention. Similarly, a different application called Babylon [2] use AI technology to analyse

numerous kinds of symptoms with excellent accuracy and speed. Figure 2 shows the basic user interface of the application.Figure 3 depicts "Medisafe" is a thorough tool that gathers all of your health and medical data in one location. You may set up tailored medication reminders and receive important drug interaction alerts with Medisafe [8]. The application "NexHealth" functions as a round-the-clock receptionist who makes appointments, sends reminders, reschedules cancellations, and adds patients to a wait list for no-shows [4]. In contrast to other scheduling options, NexHealth automatically adjusts to complicated operationsshown in figure 4.Acloud-based accession to the layout of interoperable EHRs [5] expressing "Cloud health records device generation architecture" (CHISTAR) achieves distinct styles of interoperability thru using a commonplace design get admission to that uses a point out model that defines a fixed of frequently used facts systems and a prototype model that defines the data logically. clever and connected data (SCD) structures works with the prevalence and determinants of health-related situations and activities in the populace and use this research to make certain that fitness problems are monitored at reasonable tiers to manipulate them diagnosing illnesses [7].. The authors in [10] created a same type of healthcare app which mainly uses Aneka Cloud Platform for the development of availability, integrity and analysing of patient's data in the cloud. Comparing with our system we have been use HeidiSQL software for making the patient's database which is easier to understand and less time complexity.

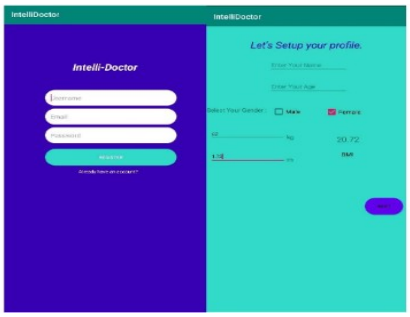

Figure 1: Intelli Doctor Medical application and webpage

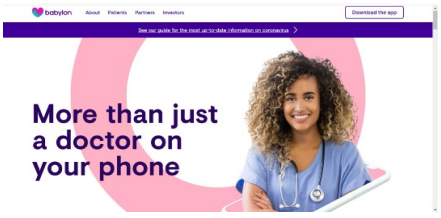

Figure 2: BABYLON application and webpage

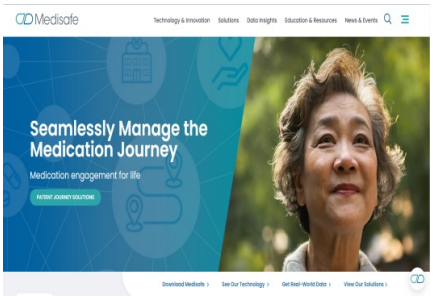

Figure 3: Medisafe web application

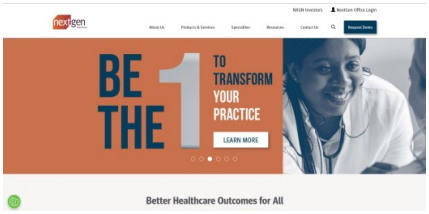

Figure 4: Nextgen Health Care Application

3. IMPLEMENTATION PLAN

A computerized system is needed to solve these problems and manage all the works. In addition, a web based application, which will provide a work environment that going to be flexible and provide all the freedom of work to identify many things in short time that will be helpful for the patients.

3.1 Basic details of patient: Patients need to log in with their phone number or email ID. They have to create an account for them. After scanning the prescription and analysing the old prescribed record of the patients, it follows the treatment.

3.2 Different Language System**:** It has been implemented in total 7 (English, Hindi, Bengali, Tamil, Telegu, Malayalam, kannada) languages to spread it to the people of all over India, so that people of all languages can be treated by it. The patients can choose their own suitable language for the process of their treatment from the time of logging in.

3.3 Voice Assistant:For the convenience of elderly patients and those who are not able to type properly, voice assistant has been provided. With the help of that the patients can express their problems by their own voice.

3.4 Prescribed Medicine and Price Range:It prescribes the appropriate medicines based on the patient's disease and those are readily available. If the medication dosage needs to be changed after reviewing someone's disease, that can also be done. In addition, there is a price range filter for similar medicines based on given range it will prescribe the suitable medicine.

3.5 Memory Storage**:** Patients who have logged in once do not need to provide previous health records for further treatment. Their records are stored in the database on that patient's account.

3.6 Online appointment System: Patient whose problem is not able to fixed by the Smart-Doc can automatically fixed doctor appointment schedule.

3.7 Order Medicine: After check-up, the medicine, which is prescribed by the smart-doc or doctor, can be manually or automatically ordered through the web-based application.

3.8 Reminder System: It give notification and alert the patient about their appointment with doctor's.

4. REQUIREMENTS

Computer hardware and software works together. The software has been loaded onto the devices, allowing us to observe the significance each system is and the way they have to function together when using the system, which speeds up the functioning process of this system for giving better quality treatment among the patients, and stores all the data. Necessary hardware that makes this system work:

Pulse Rate Monitoring Sensor: This sensor senses a person's heart rate and diverse it into electrical pulses. The diverse signals or pulse are amplified using a signal conditioning circuit and processed by a controller, and gives the correct pulse rate of that person.

SPO2 Rate Monitoring Sensor:These devices are mainly used to take a single set of vitals from a patient at any given time and are used on multiple patients over the course of a single shift. it's used to track the patients by constantly monitoring the vital signs. A central screen, a wireless monitor, oxygen saturation monitors a blood-pressure monitor and alphanumeric paging device set up the full system.

Temperature Monitoring System: Temperature sensors are used to measure the patient's degree of coldness or warmth and alert the patient if temperature variations occur. The temperature variation corresponds to the diode's resistance. This converts the resistance across the diode into readable units, such as Celsius and Fahrenheit. It can be easily measured and shows the temperature on the display.

Necessary software that makes this system work:

Video Conference Software: Video conferencing is one of the most useful forms of telemedicine, and is essential to practically communicate with different type of patients. Patients can be visually connected to hospitals and physician clinics for various therapeutic consultations.

Store-and-forward Software: This software is very useful around the world for telemedicine. it's useful to enable patient's health data for diagnosis. It's stored the data and forward for a response.

Operating System: Windows XP, Windows 7, Windows 10**.**

5. WORKING PRINCIPLE

5.1 For New Patient:

The flowchart of figure 5 depicts the whole operating for new patient of the Smart Doctor system. The system creates a new account for the patient, which contains personal details. Then the system takes input of the symptoms seen in the patient.

The system compares the patient's symptoms to previous disease cases and other diseases, if the symptoms match 95% or above match with a disease. Then its medicine is prescribed to the user, which have different choices of medicines of similar composition, sorted according to pricelist.

A prescription is generated for the user, and the data is stored in the cloud for future use. Then the system demands a check-up fee from the user.

5.2 For Regular patient:

The flowchart of figure 6 depicts the whole operating for new patient of the Smart Doctor system. The system takes input of the patient details; it runs a regular-checkup and checks the patient's previous case history from the cloud storage created by the system on earlier checkups to get more information.

The patient's report is checked, upload to cloud. Then these reports are analyzed by the system. If the feedback comes good then the patient is advised to stop taking medicine after course completion. When imperfect feedback comes then the system prescribes medicines to the patient using CART-algorithm.

The reports are noted again and medicines are prescribed to the user, which have different choices of medicines of similar composition, sorted according to pricelist; a prescription is generated. The patient is advised to take these medicines for 10days and do the checkup again.

After 10 days the patient is advised to do the test again. When good feedback comes user has to stop taking medicines and for an imperfect result again the user has to continue taking previously prescribed medicines.

A prescription is generated and the test reports are uploaded to cloud. Then the system shows a Checkup fee to the user.

6 SYSTEM ARCHITECHTURE

6.1 Web page Designing

We choose HTML (Hyper Terminal Markup Language) and CSS (Cascaded Spread Sheet) for design as web application development is a key component of the project. Page layout, layout designs, and data fields have been developed and are exactly ordered using the right commands and instructions.

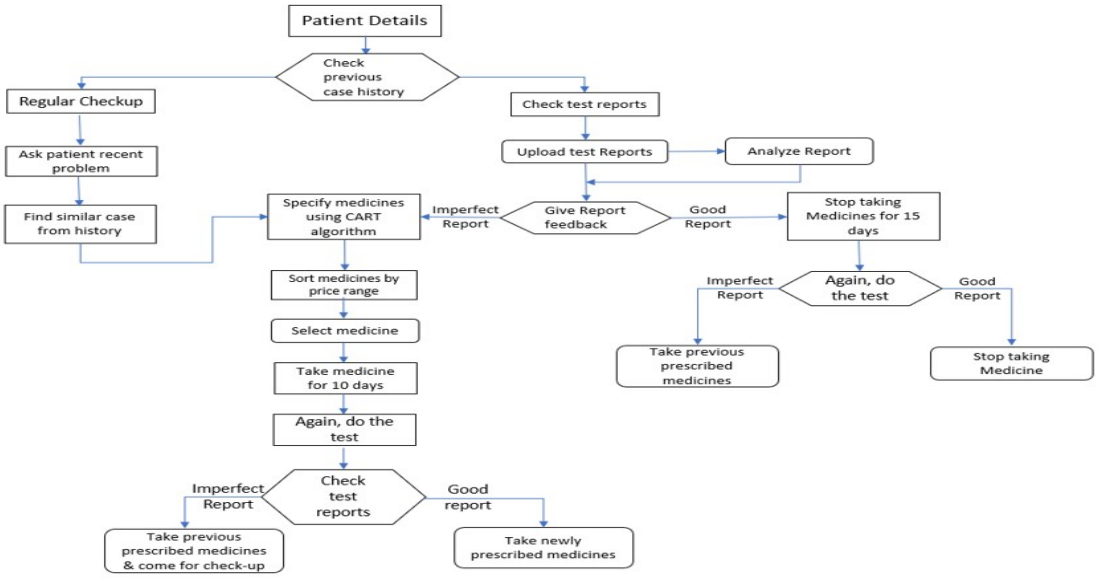

Fig 6: Proposed flowchart for regular patient of the smart doctor system

6.2 Web page Coding

The purpose of a dynamic web application is to store, update, and retrieve data entered into multiple user interfaces. In order to accurately construct, add, access, and maintain the database

at local host network, it is first essential. Relational database management systems(RDMS) are capable of doing this task. The system uses HeidiSQL software to create MySQL databases, with MySQL code done in C# scripting language. HTML code is created using the programming language ASP.net.4

6.3 Data Collection:

The system depicts the framework of the health monitoring system described in this research, which is based on C-IOT and deep learning. It improves on the typical three-layer IOT design and is explained from the standpoint of system implementation and data flow, encompassing data collection, data preparation and net layer, data processing, and application layer.The data gathering layer, which is mostly consisting of Internet-connected or wearable devices, is in charge of acquiring physiological markers of health. Temperature, body weight, blood pressure, and exercise metrics are all recorded.

Database and distributed servers, web servers, and deep learning model engines are the core components of the data processing and application layer. The distributed server implements various business processing logic, the web server offers users and personal doctors with a user-friendly web interface for background operation, and the database stores and manages user personal information, including health monitoring data, personal doctor information, equipment information, etc. The deep learning model is trained using the deep learning model engine, and then it is applied to the problem of solving the health parameter image. Private doctors may enhance the personal health data set, annotate the data, and retrain and update the deep learning model as a result of the growth in user data.

In figure 7, we briefly describe the procedure of the data collection from patient and stored them in clod database. First new patient has to create account using their credentials and for regular patient they have to log in into their account. After that they need to choose whether to check up or to show test-report. For new patient they first need to check-up then show their test-report. After describing their problem either by voice or by text, system going to analyze them and identify them. After that further process of disease detection, medicine prescribe process will held.

6.4 Data Processing:

Data preparation is frequently carried out using Python modules, in this instance Keras. For instance, to avoid problems, an image file that is damaged or empty should be deleted from the dataset.

In another instance, if a file has a different size from the others, it needs to be adjusted to fit. As a result, data augmentation can help the model generalize the characteristics it learns by rotating, rescaling, moving, and performing a set of transformations to the input pictures.

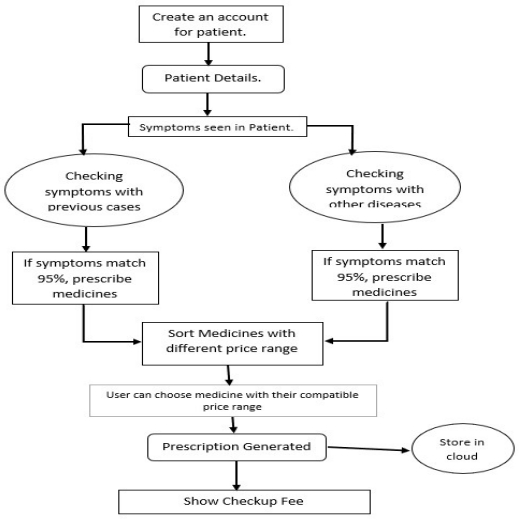

Figure 5: Proposed flowchart for new patient of the smart doctor system

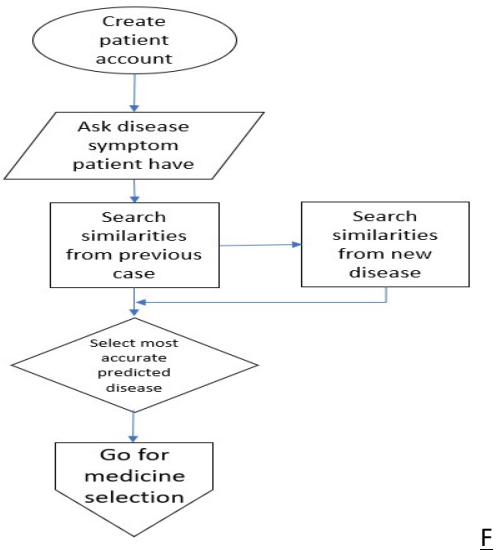

Fig 7: workflow of the data collection system

6.5 Disease Prediction:

Doctors may use artificial neural networks as a potent tool to model, evaluate, and make sense of complicated clinical data in a variety of medical applications. Artificial neural networks and computer-aided diagnosis with deep learning are particularly active research areas in medicine right now [6], and it's anticipated that these systems will be employed more frequently in biomedical systems. Since they are excellent at identifying disorders from scans, evolving neural network approaches for medical diagnostics are frequently taken into consideration. For instance, using ANN models based on deep learning helps with the sensitive and specific early identification of stomach cancer. Deep learning-based ANN model improvements enable diagnosis with efficacy, accuracy, and dependability.

6.6 Medicine prescribed:

The aim of embodied cure search out select and transfer situations tailor-made to the individual patient in consideration of attain highest in rank likely consequence accompanying minimum payment. The challenge is deciding high-quality situation as the number of potential predictors of good reaction, to a degree ancestral and different biomarkers, and situation alternatives evolves.

Furthermore, cause most dispassionate troubles are established average situation belongings, complementary cures grant permission enhance useless for few subjects while being active for possible choice. The use of a changed sapling-located approach implies the likelihood of draft of best choice distinguished situation established standard face.

Applying the filtering system for price range which will going to help every patient to have medicine at their affordable range with best quality medicine.The patient-specific modelling strategy is more effective in identifying individual variations in treatment responses. A patient-specific modelling strategy that performed marginally better than the CART method was the personalized decision tree model.

Gini impurity, informational diversity, and variance lowering are three key decision tree algorithm metrics. Gini impurity is the preferred metric among the three. It assesses the degree to which a randomly selected element is erroneously labelled.Figure 1 describe the whole procedure of the medicine prescribe system.

Tree-building criteria

1. Each parent node with a greater Gini impurity or information complexity is divided into child nodes to reduce its Gini impurity. Pure sets have a Gini impurity of 0.

2. The optimal split between the two child nodes is the one that has the highest Gini impurity.

3. The exploration of nodes is stopped based on how complex the parameters are.

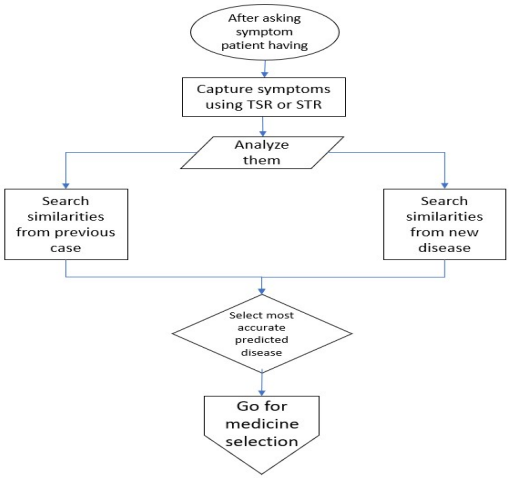

Fig 8: workflow of the disease prediction system

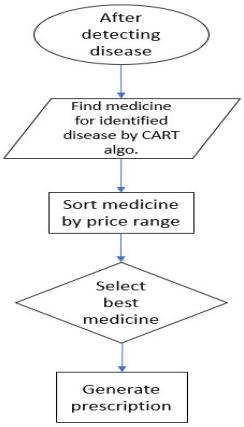

Fig 9: workflow of the medicine prescribe system

6.7 Test Report Analysis from image:

To start the analysis, the polarisation of light serves as the basic foundation for the polarisation properties of light. The Stokes vector approach is the most popular way to describe the polarisation impact of light. It may be applied to fully polarised light, partially polarised light, and so on.

The electric field E is divided into two orthogonal plane waves in the z axial direction, known as $E_x(t)$ and $E_y(t)$, assuming that the partial polarised light intensity value is total and the average frequency is v(t).

$$E_x(t) = a_x(t)e^{j[\phi_x(t)-wt]}$$
$$E_y(t) = a_y(t)e^{j[\phi_y(t)-wt]} \quad \text{——(i)}$$

Where $a_x(t)$, $a_y(t)$ is the amplitude of the electric field component in two mutually perpendicular directions, and$\phi_x(t)$,$\phi_y(t)$ is the phase of the corresponding element of the electric field. In Stokes, four parameters are used to characterise the polarisation properties of light. Using the formula above and the respective parameter definitions, the following Stokes parameter expression is obtained:

$$I(\alpha) = (I + Q\cos 2\alpha + U\sin 2\alpha)/2 \quad \text{——(ii)}$$

To show the test report check-up patient first select it then upload the test report photocopy to the system. The system analyses them through Stock vector approach. If it finds the report status is good then it will tell patient to stop taking medicine for ten days and after that do the same test and show it. If the test report is good after not taking medicine,then there no need to take medicine further. Else they need to continuously take medicine and check-up after giving time period. If test report is not good in first case then it ask to change the medicine and by same procedure of medicine prescribe it will prescribe another medicine other than previous prescribe medicine. Then after few days they need to do the test. If test report comes good then they need to continue newly prescribe medicine. If test report comes negative then again new medicine will

going to prescribe and the process repeats till patient report comes positive. This whole is represented in the diagram below in figure 10.

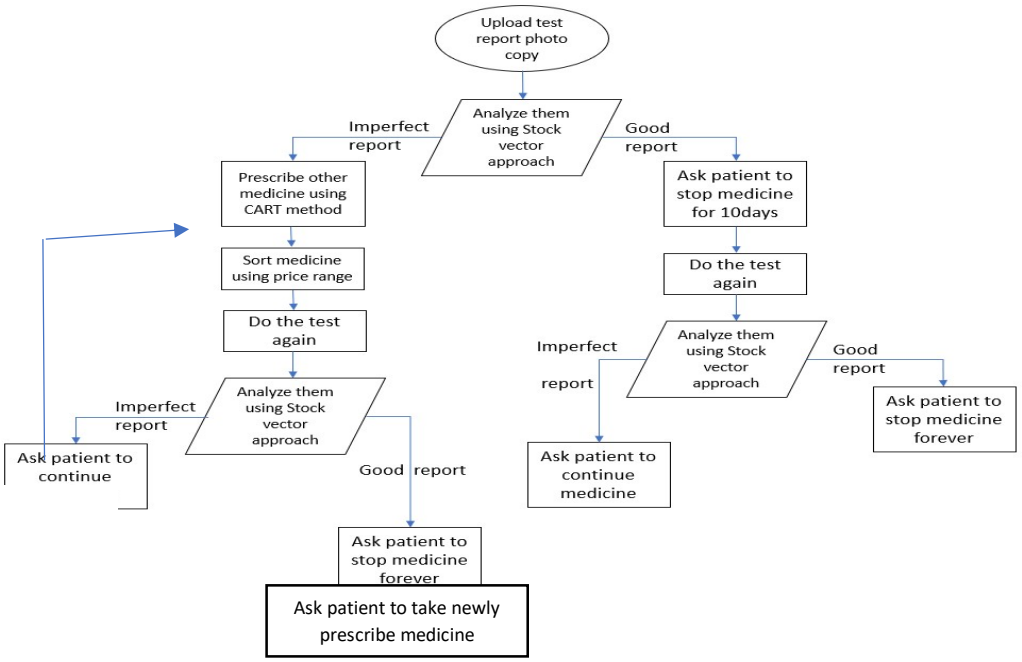

Fig 10: workflow of the report testing system

6.8 Voice assistance System:

The Speech Recognition library has many built-in features that will enable the assistant to understand the command given by the user and the response will be sent back to the user in voice, using Text to Speech functions, shown in figure 6 and speech to text, shown in figure 7 in the proposed concept effective way of implementing a voice assistant. The algorithms used in the background will turn the user's voice command into text when the assistant catches it and also convert

The system's design includes:

1) Using the microphone to capture speech patterns.
2) Text conversion from audio data recognition.
3) Assessing the input against pre-programmed directives.
4) Delivering the desired results.

The information is initially gathered via the microphone as speech patterns.In the second phase, the information gathered is analysed and transformed into textual information employing NLP. The needed output process is finished in the next step by manipulating the data in the resultant string using Python script. And knowing our voice to our assistant is one of the most important characteristics. For this we have also given speech-to-text recognition. The last step is presenting the result, which may either be written or transformed to speech via TTS. This system supports different language which is helpful to all kind of users in India.

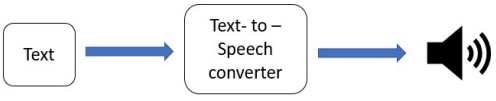

Fig 11: Procedure of text-to-speech conversion

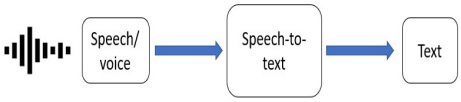

Fig 12: Procedure of Speech-to-Text Conversion

6.9 Referral System:

The suggested algorithm is a decision-making tool that may provide recommendations by leveraging knowledge that has been recorded and maximising the efficiency of the selected

action. This algorithm can suggest a course of action based on a number of factors and how those variables interact with one another. Examples with well-known results are used to collect information in the form of a prediction model (classifier) and a validation map that calculates the likelihood that any patient/action pair will experience the intended result. By understanding the correlation between class labels and predictive scores (Eq. iii),

$$P(y = +1|d) = \frac{1}{1+\exp(Ad(x)+B)} \qquad \text{——(iii)}$$

we may examine the distribution of predictive scores related to survival. A computational solution to this issue is offered by Platt's calibration approach. This technique offers a strategy for translating SVM scores, d, into probabilities, p, using a sigmoid function.

$$\underset{A,B}{\text{minimize}} \quad \sum_i t_i \log(p_i) + (1 - t_i) \log(1 - p_i)$$

$$\text{where } p_i = 1/(1 + \exp(Ad(x_i) + B)) \text{ and} \qquad \text{——(iv)}$$

$$t_i = \begin{cases} \frac{N_+ +1}{N_+ +2}, & \text{if } y_i = +1 \\ \frac{1}{N_- +2}, & \text{if } y_i = -1 \end{cases}$$

Here the system when not able to understand the patient symptoms, not able to identify the disease by 97% matching case, then it will refer the patient to the specialized doctor of that disease for safety purpose of the patient.

6.10 Order Medicine

Below are a few crucial components that must be present in the user module of the medication delivery app solution.

Profile: In order to trigger authentication, users must enter a few required personal data like their phone number or email address.

Choose meds: Users will choose the necessary medications and either take them right away or save them for later.

Filters: Users may filter selections based on price

Prescription uploading: Users submit images from their galleries that they have scanned with cameras in order for a licenced pharmacist to verify them before transferring prescriptions.

Detail information on each medicine is available to users, who may also view the manufacturer.

Location Map: Users may view all active service-providing businesses on Google Maps in map view, along with their current locations.

Show similar: Customers will see generic versions of name-brand drugs.

Notification: Users will receive messages from the pharmacy about their purchase confirmation, status updates, discounts, and other items.

Payment: Users can pick the option of paying with cash on delivery

Offers: Users will receive the specified medications at a discounted price.

Order history: Users may easily and quickly view all the information, including completed order details, store information, and delivery provider information.

Reorder from previous orders: Customers can place new orders using their previous purchases' updated prices.

Order Tracking: Users may follow the whereabouts of the delivery service in real-time as soon as their order is delivered.

Order Cancellation: Users may cancel an order by offering a valid reason for doing so.

6.11 Online Appointment System:

This web-based totally solution solves the trouble of maintaining and scheduling appointments in accordance with the alternatives or needs of the person [11]. The work of manually assigning appointments for the users in accordance with their availability can every now and then emerge as quite laborious for the compounder or health practitioner himself. As a result, this undertaking presents a beneficial answer that lets in customers to browse the many reserving slots which are to be had and pick the ideal day and time. The reserved location might be highlighted in yellow and unavailable to others for the certain period of time. customers of this gadget may additionally cancel their reservations at any second.

6.12 Reminder and Notification System:

Due various works and pressure sometimes patient fall to remember about the appointment timing and date. So our proposed application sends appointment reminders and notifications to users, helping them stay organized and ensuring they don't miss their scheduled appointments.

6.13 Telehealth Services:

Sometime due to some emergency patient need to go to doctor for urgent consultant, which may sometimes not possible for all that doctor to available every time. So, in absence of that doctor our system refer the case to similar doctor. Using telehealth service which will provide by our proposed application will help them to contact with doctor who is available at that time. This feature allowing patients to have virtual consultations with healthcare providers. This feature enables users to receive medical advice and treatment remotely, without the need for an in-person visit.

7 COMPARISION

Our proposed system is far better than others available products and it is also user friendly so that everyone can use it. The comparison table between our proposed project smart-doc and INTELLI DOCTOR application shows that our proposed system is much better than that one.

	Features	Smart Doc	Intelli Doctor
I.	Basic details of patient	✓	✓
II.	Different language system	✓	×
III.	Consult Doctors Online	✓	✓
IV.	Voice Assistant	✓	×
V.	Medicine price range control	✓	×
VI.	Memory Storage	✓	✓
VII.	Schedule Appointment with Doctor	✓	✓
VIII.	Order Medicines Online	✓	✓

8 CONCLUSION AND FUTURE SCOPE

Artificial intelligence will be the norm of any technological development. This project narrowed the gap between AI and health sciences, opening up new possibilities for using AI to advance human development.

This project uses AI system to develop a virtual doctor at home, which will take our details and provide medicines of that particular disease with ease. The system asks sever questions from the user, checks test reports and based on the proper feedback suggests a proper remedy.

If we use mapping feature then it will help patient not to find the doctor address, they directly get the doctor's chamber address, which saves their valuable time.In addition, the system will require an extension of the database for mass usage.

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