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A Novel System for AYUSH Healthcare Services using Classification and Regression

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Abstract— There are roughly 4000 AYUSH hospitals spread out across India under various councils and hospitals run by the Indian government. Today's atmosphere makes it more challenging than ever to locate a suitable AYUSH facility for the treatment. The AYUSH Ministry provides India's top option for healthcare delivery. The government is examining strategies to lower expenditures while enhancing patient care. We are proposing the ground-breaking idea of e-healthcare which involves various novel features like suggesting various tools to the patients those need to communicate with the healthcare professionals as per their convenience remotely. This research suggests an interactive system using Android in line with this trend. By integrating different bio-medical data sources that contain information pertinent to the hospital demographics, their inpatient procedure rates, Outpatient department, etc., we proposed a system that surveys on the various AYUSH hospitals to find. This system uses the Google Map API for tracking and highlighting the location to the nearby AYUSH hospitals with opening and closing timings. Additionally, the proposed system plays a crucial role in emergency scenarios by supporting the user in performing the necessary first aid techniques. Using this strategy, the entire system demonstrates that this research provides a superior method for making decisions than past studies.

Keywords— Java; HTML; Google Clouds Platform; XML; Flutter; Firebase; Android Emulator; etc.

I. INTRODUCTION

The word *AYUSH* stands for Ayurveda, Yoga, Naturopathy, Unani, Siddha, and Homeopathy, among other Indian medical systems. These systems reflect a method of healthy living with defined beliefs on illness prevention and health promotion and are founded on clear medical philosophies.

People are currently unaware of how well-equipped hospitals are and whether they have qualified physicians on staff who can treat patients effectively. The patient is frequently admitted to the incorrect hospital, wasting both time and money. Numerous such events have been reported in the past and are still occurring. Although Google Maps is available for any specific place, landmark, etc., it cannot be used to obtain more information due to the user's insufficient understanding of how to arrange the results.

This paper assists individuals in locating AYUSH hospitals and their medical services in and near any specific place, and it provides all required information such as hospital demographics, their inpatient procedure rates, Outpatient department, opening and closing timings etc. with only a single click.

In this system after registering and logging in, patients can schedule a doctor appointment for the time that works best for them, saving them from having to wait in line for a check-up.

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This paper aims to develop the feature where patient will receive notices and reminders about their appointments, including the time and dates. The use of a multilingual healthcare chatbot system is illustrated in this study. The system may answer users' health-related questions in addition to performing its primary task of identifying diseases based on user symptoms. Along with the disease diagnosis, the system also gives the user information on the disease description and any necessary precautions. Patients can be admitted to the hospital with the required services if the services offered by each hospital are known. The two main factors taken into account here are travel distance and time. A specified radius is used by this system to locate nearby medical services using the KNN algorithm.

This paper demonstrates, two different sorts of use cases are utilised. The system's administrator adds all the information regarding the cities, regions, hospitals, illnesses, symptoms, departments, and various services that are offered. In order to enjoy all the services, users or patients must register with the application. Users can browse the hospitals and services offered, as well as search using terms related to cities, hospitals, and departments. This will help them focus their search and locate the necessary care or services at any Ayush hospital.

The need to rely on applications or the internet for an emergency isn't something that happens on a regular basis. This Hospital Finder feature may be quite helpful in these circumstances.

Section I describes about introduction to the work, section II describes related work, section III describes about proposed methodology and algorithm, section IV about results and discussion and section V describes about conclusion and references.

II. LITERATURE REVIEW

The healthcare industry's fatality rates are increasing at an unprecedented rate as a result of shifting a seriously ill patient from one facility to another because there is a shortage of essential medical equipment. [1]. As a result, it becomes vital to suggest a cutting-edge mobile application that can display information about various hospitals in a specific place that have the appropriate equipment. In addition to managing information about various hospitals in the user's local area, this study has suggested a novel system that is designed to offer basic knowledge about medications [1]. The proposed system also plays a crucial role in emergency scenarios by supporting the user in performing the proper first aid procedures done in [13].

This article introduces the "Careggi Smart Hospital" mobile application, which was created for the Careggi Polyclinic in Florence [2]. The contribution done in [2] which is free to download from the Google Play Store, is made for Android smartphones and tablets. Users of the hospital can access their own medical records that have been compiled on local electronic health records, as well as information about employees and building locations [2]. This system also added several updates. The first big update is the possibility to deliver a full navigation tool that uses the cell phone's localization signal to track the actual user position in real-time. For the hospital's navigable buildings, SVG files must be created for each floor in order to enable an internal navigation system [17].

The Internet of Things connects several devices. Things having sensors built in can communicate with one another. In a chatbot, device communication is automated [3]. In this research work [3], a mobile android system is suggested based on how hospitals keep tabs on their patient's health to communicate with them [3]. Big Data, chatbot technology, and sensor tracking devices are all part of this system. There are also sensor monitoring options accessible for patients with major health issues. consistently kept an eye on. Hope this submission resulted in to a fresh development in medicine that is advantageous hospitals as well as the user [14].

To help patients at the hospital front desk, an intelligent hospital information management system was created. The patient will have access to information regarding his or her medical condition, including the doctors, appointment times, relevant departments, laboratory tests, and the specific drug [4]. The system will offer patients at the hospital's entry an intelligent front desk information service. By utilizing the program's decision-making mechanism, it will also provide software support for the doctors to diagnose quickly and easily [4]. This helps doctors focus more on the patients while also saving a ton of time. Patient and staff data, supplies and medications, billing, and report generating are all included in this inventory. This sophisticated system converses with a background database server that oversees all data management pertaining to hospital operations [25].

The main objectives of this initial study were to create and evaluate the first iteration of a mobile health first aid application that suggests procedural steps in response to symptoms rather than relying on the user to diagnose the patient and prescribe a course of action. [5] The absence of visual components like images and diagrams is a constraint. No matter how accurate the descriptions of the methods are, they will not be sufficient for the system to be useable by persons. [19]

The mobile search engine for medical information on smartphones is presented in this research. [6] The proposed system was created to look for proper medication use. There

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are two types of searches available: searching by illness and searching by type of medicine. [20]

In this system the factors, including the completeness of the information, user interaction, and easily comprehensible data formats, it may become a crucial instrument in the management of medical equipment in hospitals. However, additional research is still required to be more sensitive to the new technologies coming out, such as linking with RFID and reading barcodes on medical equipment using a tablet. [29]

The relevance of the AYUSH system in providing healthcare services in rural India is evident given the appallingly inadequate state of the country's health infrastructure. AYUSH physicians and paramedics significantly restock the severely understaffed health workforces in rural India. [21] Numerous safe and efficient therapies are being employed in a variety of ways to handle problems with community health. Many of the fundamental ideas found in the classical texts of Ayurveda and other medical systems like Yoga and Naturopathy are put to use and many of them are advocated in the implementation and planning of state programs (PIP). Since health in India is a state-specific issue, this situation is not the same throughout the country. [30]

A MPL state-space representation that captures the behaviour of repetitive execution systems with a MIMO-FIFO structure was developed in this study. [9] Since the elements for representing precedence restrictions and execution durations are combined in the usual MPL form, all representation matrices must be recalculated whenever the system parameters are altered. [26] In this study, parameter matrices with logical numbers as each member provide the locations of the inputs, outputs, and precedence restrictions. [23]. Modernized techniques for feature extraction and leaf categorization called Bezier control points-based features and Capsule Network have been used by S. D. Pande et al. [34–36].

The authors of [10-12] have examined and realized the latest Capsule Network for several task including leaf classification and semantic analysis. This architecture could be configured for effective classification and segmentation.

According to the aforementioned literature review, there is room for research in the field of machine learning. An automated computer called a chatbot (conversational AI) simulates human conversation through text messaging, voice chats, or both. Additionally, database security presents a barrier, thus this system leverages Google Firebase to address the issue. It can be inferred that healthcare information systems have undergone a significant transformation and that a significant amount of medical data has been gathered. However, it is necessary to improve information technology. There has to be a lot of research done in this area. The existing systems are used by each hospital to keep information about its own patients as well as reports about patients who have been seen there. There are no universal patient and physician data in a single system. This study's presence is anticipated to deliver information swiftly and precisely. There are currently no systems that link doctors and patients through a network of communication and data storage, but the suggested system promises to fill this gap.

III. PROPOSED SYSTEM

The patients have access to an Android system with a strong user interface that enables them to sign up for the system and authenticate themselves using Firebase Authentication. In order to enforce fundamental software design principles and assure compatibility between various hardware and software, our prototype of healthcare management system uses a real-time database. Since privacy and security are crucial in this industry, we built the prototype with these considerations in mind.

Server will look up the closest hospital based on numerous KNN algorithm-related variables. server employs database to lookup the closest available medical facility. When done, the client will be given a list of the closest hospitals. Application of the suggested system is going to lead to the shortest way by mining the shortest distance, deliver the service to the user between the source and the target.

Our system provides user-friendly interfaces for busy healthcare professionals and patients. Since the system authenticates users, records session information, and ties resources to the resource creator, only privileged users can view or modify data. The suggested method offers data on various AYUSH facilities together with specifics like ratings of the hospital, its population, and the equipment available, assisting users in selecting the best hospitals for their needs. This equipment data is divided up into many ailments.

A medical chatbot is also available that can converse with patients and diagnose ailments by posing questions about signs including coughing, fever, diarrhea, and muscular pains. The consultation's general information exchange and patient pleasure are positively correlated. Effective doctor-patient communication can have a big impact on the patient's relationships and health so to address this, proposed system seeks to create a one-to-one interaction function.

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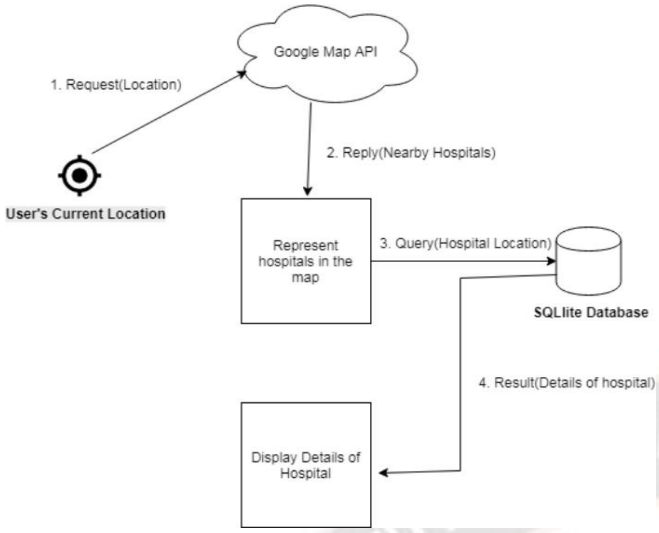

Figure- 1: Proposed System Architecture Diagram

Algorithm of Proposed System
step 1: Start
step 2: Find hospitals located near you and get details of it on home page
step 3: Interaction with chatbot for home remedies based on symptoms.
step 4: Open registration page
step 5: Enter information
step 6: Create unique patient id
step 7: Create username and password
step 8: Create entry to the database
step 9: Book the doctor appointment
step 9: Allocate doctor for the patient
step 10: Gateway for doctor patient interaction.
Step 11: Use Regression technique for suggesting the medicines based on previous history. Prediction is done and the suggested medicines by the system are verified by the doctor at the end.
step 12: end

IV. PROPOSED METHODOLOGY

A. Front-end Technology

Modern terminology has made the novel system development a very important component. As it outlines both designing and coding methodologies, we are applying both traditional methods and cutting-edge new ones. Since all technologies are moving in the direction of APIs, their significance is anticipated to increase quickly.

Java is utilized in this instance to run the project dynamically and for finding the best route from the patient's location, we have used the KNN algorithm [13].

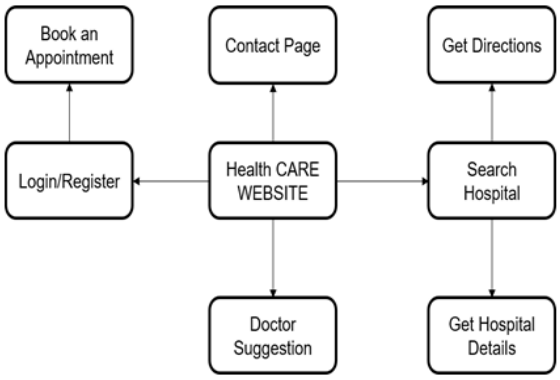

Figure- 2: Proposed System Block Diagram

B. K- Neareast Neighbour Algoritm

An introduction to the classifier is the K-nearest neighbour classifier. This algorithm is dependent on the customer's location. It uses neurons as its node to identify the output node, and it uses the shortest path approach. Each node indicates the driver's position, whereas the output node reflects the client's location.

Locations of hospitals are indicated by latitude, longitude, or point (x, y) coordinates. The function searches for the nearest neighbour(s) using an array of these places. The closest hospital's index is returned, and the Pythagorean theorem can be used to determine its distance. First we have to find the k nearest neighbours of points and return the indexes of nearest neighbour k. Utilizing the coordinates of these ordered pairs and the formula below, determine the distance between two points (x_1, y_1) and (x_2, y_2) by using their coordinates [14].

$$Distance = \sqrt{(X_2 - X_1)^2 + (Y_2 - Y_1)^2} \quad \ldots\ldots\ldots (1)$$

Additionally, if we had access to the API that returned the longitude and latitude of the hospital's location, we could determine the precise distance in miles or kilometres to the hospital.

C. Google APIs for Location

A powerful mapping platform service developed by Google is called Google Maps API. This mapping service can be incorporated by the developers into any program or website. Additionally, developer data may be connected with this service. This service provides information on detailed street maps and imagery. Data on distance and anticipated trip times are also available [15].

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To embed Google Maps in a particular website or application, an API key is needed. To use this service and create an API key, we need a Google account. The following form is provided by the Google Maps library: com. google. Android. gms. Map View and Map Fragment classes both display the map component.

D. Firebase

With the help of Firebase, we can create web applications without using server-side programming, making the development process simpler and faster. In its free edition, a single Firebase node provides up to 100 connections per second. For more than 3000 INR, the paid edition enables hosting and bespoke domains. Developers can use Firebase to complete all necessary tasks, including authenticating users, storing data, and putting in place access controls. Firebase uses NoSQL to store data, which is organised into pairs of keys. Developers can use the Firebase Cloud Messaging capability as well. Firebase offers an additional 1 Gigabyte of storage space and up to 10 Gigabytes of data transport for your database.

E. Chat-bot Algorithm

Healthcare Conversationalists known as chatbots operate according to the principles of machine learning, a kind of artificial intelligence. NLP determines how well a chatbot can comprehend human language and, consequently, how well it can produce appropriate responses. If the chatbot is to achieve its main objective, which is to engage users in meaningful discussions, then its algorithm must be operating effectively.

V. SYSTEM DESIGN

The patient, doctor, and receptionist must first register and log in to the suggested system. Patients must plan a doctor appointment for the time that works best for them after checking in and registering in order to avoid standing in line for a checkup. The time and dates of the patient's appointments, together with notices and reminders, will be sent. These alerts will make it easier for people to remember their doctor's appointments. Doctors will recommend therapies that will help their patients along with the next appointment's date and time, if one is required for the patient's therapy.

Patients can also express their opinions or provide feedback about certain services or treatments so that others can obtain a clear understanding.

a. One to One Interaction

With the aid of our recently suggested method, patients and doctors can converse. Both patients and doctors will find it simpler to communicate as a result. Doctors will recommend therapies that will help their patients along with the next appointment's date and time, if one is required for the patient's therapy. Overall, a tab with numerous features tailored to a patient's need will be created.

b. Medical Suggestion Chat-bot

One of the unique features of this system is its capability to give a user a rough prediction of the ailment and the department they should attend.

c. Receptionist Module

This module will give doctors assistance because they don't have enough time in their daily schedules to handle and reschedule patient visits.

d. Hospital Directions

Based on the user's current location, the software finds the closest hospitals and provides details about those hospitals' services.

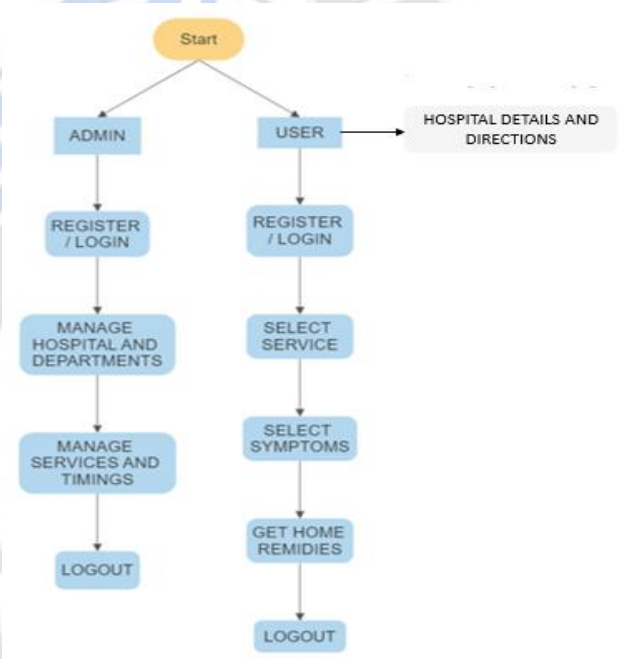

Figure- 3: Proposed System Flow Chart

VI. RESULTS

Building a “AYUSH” hospitals finder application that displays the location and nearby AYUSH hospitals with opening and closing times while integrating various bio-medical data sources with information on the hospital’s demographics, inpatient procedure rates, and outpatient department is the project’s proposed work, Etc.

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This study demonstrates that when three elements are taken into account—the radius value, journey distance, and travel time—better decisions are made than when simply the radius value is taken into account. The researchers' suggested approach also shares 95% of its characteristics with human decision-making.

a. Test Cases

The specifics of the test cases created for the produced app are highlighted in this section. The test cases and outcomes for functional, compatibility, and performance testing are shown in Tables I, II, and III, respectively.

TABLE I. TEST CASES RELATING TO THE VALIDATION OF FUNCTIONALITY VALIDATION

Functionality	**Result**
Check to see whether spinning the device works on all app stages and displays.	Passed
Check sure the application is operating as required when it begins or finishes.	Passed
Check to see if the application follows the specifications while switching between modules.	Passed
Make sure you can return from any screen to the previous one.	Passed

TABLE II. TEST CASES CONNECTED TO APPLICATION COMPATIBILITY

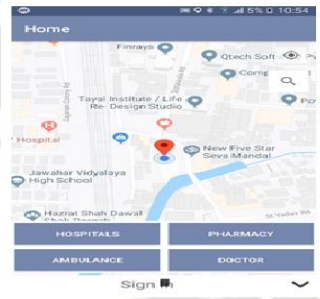
Compatibility	**Result**
Make sure that the program is running while making sure the device can still receive calls and texts.	Passed
Whether a device allows the removal of an application.	Passed
Check the application's installation after uninstalling.	Passed

TABLE III. ASSESSMENTS OF TESTS RELATED TO PERFORMANCE TESTING

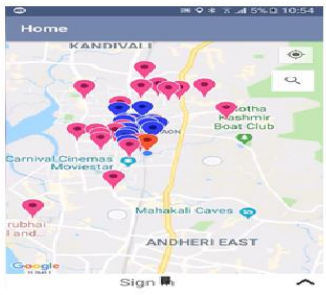
Action	**Expected Result**	**Actual Result**	**Remark**
App start-up time.	2000ms	2000ms	Passed
Memory consumption for Application.	120-190 Mb	134Mb	Passed
Network Speed Per Read/write.	12 kbps-1 Mbps	134Mb	Passed
Response time for read	134Mb	134Mb	Passed
Response time for write	3 seconds	3 seconds	Passed

TABLE IV. RESULTS OF THE ALGORITHM EVALUATION METRICS

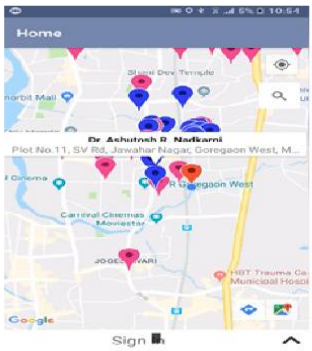
Algorithm	**Accuracy**	**Precision**	**F1 Score**
Random Forest	0.9843	0.9774	0.9781
Decision Tree	0.9712	0.9693	0.9697
SVM	0.9622	0.9547	0.9582
MNB	0.9539	0.9440	0.9454
KNN	0.9788	0.9731	0.9749



(a)



(b)



(c)

(d)

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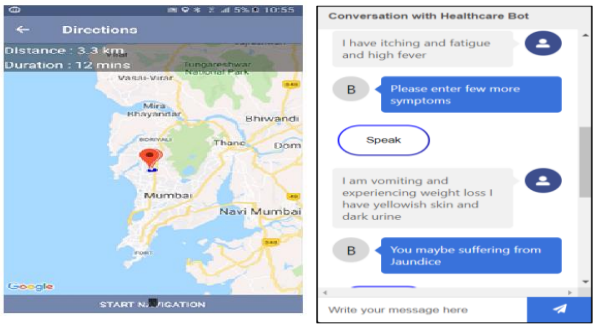
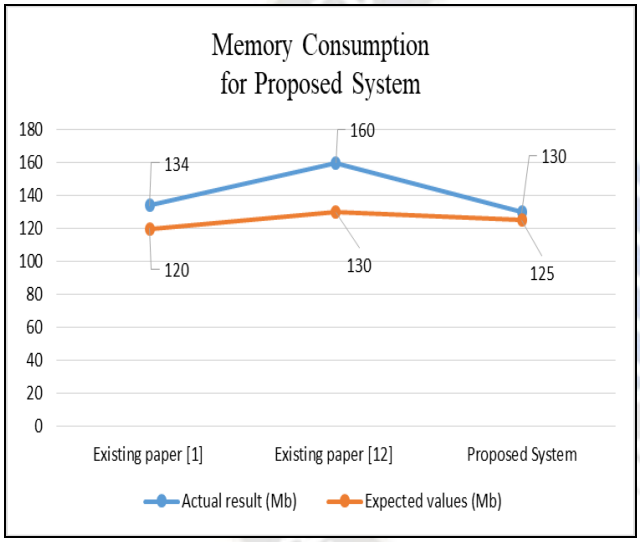


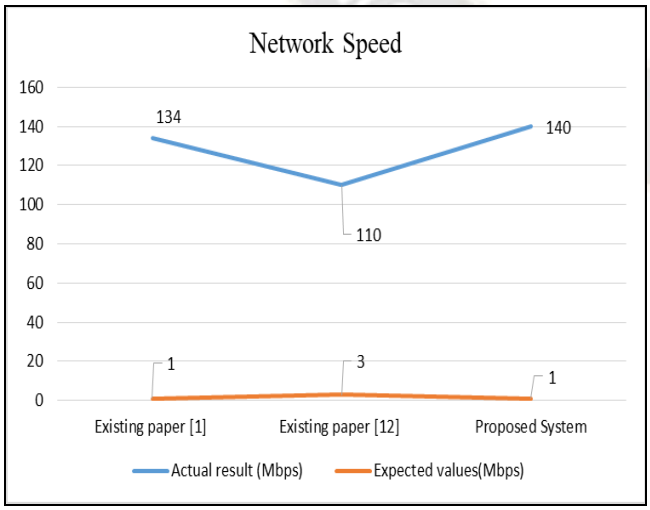
(e) (f)

Figure 3. AYUSH application implementation results; a) Home page; b) list of nearby hospitals; c) Doctor's details; d) Doctor's Availability; e) Hospital Directions; f) Chatbot

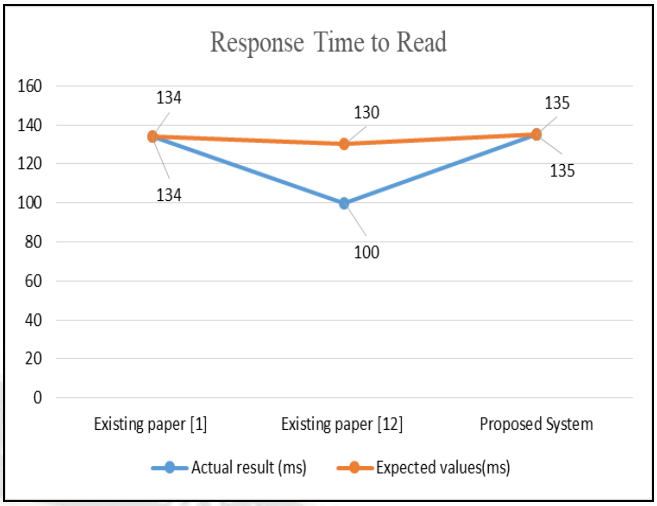
b. Graphs



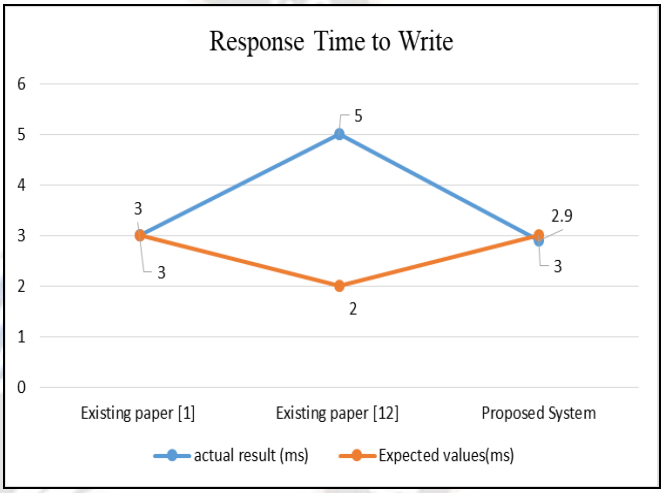
Graphs I. Memory Consumption



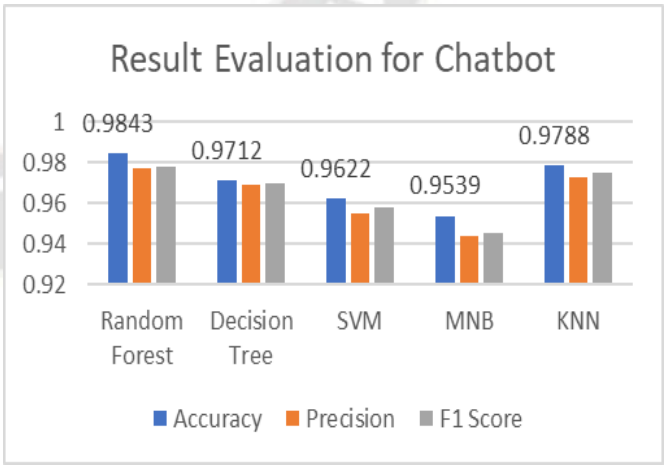
Graph II. Network Speed



Graph III. Response Time to Read



Graph IV. Response Time to Write



Graph V. Result Evaluation for Chatbot

Graph V shows that the Random Forest Classifier demonstrates the greatest accuracy of 98.43% out of the five Machine Learning Classification algorithms studied in the research.

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Based on that algorithm, the medicines will be suggested by the system and then verified by doctor. The nearest location of hospital in India is also suggested by the system based on the tracking of current location of the patient.

V. FUTURE SCOPE

In every field, there is always room for development. The research can be updated to meet the needs of the majority by gathering user feedback. Currently, this application only shows a static list of hospital data. This tool could be enhanced to give current details about the doctor who is on call at any given moment in a certain hospital. In the future, we can leverage block-chain technology for improved security.

VI. CONCLUSION

Finally, it is determined that the health conditions require immediate attention. Using a mobile application to offer the necessary information to users in an emergency case will be beneficial. Additionally, giving customers access to medical information and first aid advice on a single platform saves them time. The user can learn more about AYUSH hospitals and medications through here. This eliminates the need to search through every piece of information on the Internet. One can select the ideal AYUSH hospital nearby by using the system. However, in order to be more responsive to the emerging technologies, considerable work is still required.

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