Smart Hospital Appointment Booking System with AI Chatbot and Email Notification

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***Abstract*—In this paper, a new and efficient technique for the management of appointments in hospitals was presented. In most cases, the conventional appointment management techniques used in hospitals, such as manual booking and telephone-based scheduling, have resulted in longer waiting times, lack of coordination, and complaints from patients. However, the new technique presented in the paper aims to address the problems in appointment management in a comprehensive manner.**

The new appointment management system was a web-based system that incorporates a number of new and innovative features. The system was implemented by utilizing the ReactJS framework, Node.js, Express.js, and MongoDB. Furthermore, the system has users, including administrators, physicians, and patients. An AI-based chatbot was a major component of the system that will help patients choose a doctor according to their symptoms. An email notification and reminder system also be used in the new system to prevent absentee by sending appointment reminders to patients.

***Index Terms*—Smart Healthcare, Appointment Booking System, AI Chatbot, Email Notification**

I. INTRODUCTION

The healthcare industry plays a vital role in the maintenance of societal well-being, thus having a direct impact on the quality of life of a population. As a result of a growing population and a consequent increase in healthcare service needs, hospitals face a major challenge in managing patient appointments. Current appointment scheduling methods are prone to errors, causing a lot of inconvenience to patients due to increased waiting times.

The current path of digital transformation has significantly improved the quality of services in the healthcare domain by incorporating appointment scheduling systems. The appointment scheduling systems allow patients to make online appointments, thereby avoiding the need for physical meetings. However, the current appointment scheduling systems are not equipped with intelligent features.

II. LITERATURE SURVEY

In the recent past, a number of researchers have also concentrated on the digital tools that could be used in the efficient management of appointment management in hospitals. (Patil et al., 2022) proposed a smart web-based application that could be used in the efficient management of appointment management in hospitals. This paper is based on the above-mentioned work, and further discussion is based on the same. However, the proposed system has not used more intelligent features.

The intelligent chatbot for healthcare purposes using AI by (Fasha et al., 2020) help users answer simple queries related to health issues and facilitate the booking of appointments. The suggestion-based appointment scheduling technique put forward by (Deshpande & Kaushal, 2017) makes recommendations to patients regarding doctors based on their previous experiences and other relevant details.

An online doctor appointment scheduling system based on web technology has been designed by (Deeksha M Ramesh, n.d.) . In this method, patients selections and fix appointments via the simple interface provided. (Ele et al., 2020) suggested an online appointment management system that uses SMS alerts for patient notification regarding their appointments. A QR code based appointment

management system was designed by (Varshney & Gupta, 2021), where patients can use their smartphones to scan QR codes to access their appointments details instantly. (Sukesh & Yuvaraj, 2025) developed an intelligent appointment booking scheme for hospitals that seeks to increase efficiency in hospital operations. Their appointment booking system targets reducing waiting times and offering an efficient appointment booking experience to the patients. It utilizes advanced technology to improve the system's performance.
(Suman & Gossain, 2025) developed and implemented a complete stack appointment booking system for healthcare providers. They designed their system using contemporary web technology for its frontend and backend. Their appointment booking system offers functionalities such as authentication, booking appointments, and managing data.

The online hospital appointment booking and management system was developed by (Siri et al., n.d.) in order to make the operations in the hospital easier. The use of this system makes it possible for patients to book their appointments online and also eases the scheduling process for hospital personnel.
(Jadhav, 2026) came up with an online medical booking system that is mainly concerned with making access to healthcare facilities easy. With this system, patients can be able to make bookings easily without having to visit the hospital.

This shows that, based on the literature, although there are existing systems that can perform basic appointment scheduling and management, there still exists a gap in terms of providing a solution that can integrate intelligent chatbot support, automated notification, and usability. Thus, the proposed system aims to provide a solution to this problem by integrating AI-based symptom analysis with automated email notification.

When comparing the proposed system to the present system, it can be said that the proposed one is more efficient because the AI chatbot as well as the email notifications are used.

III. METHODOLOGY

The proposed system works on the basis of a step-by-step process involving web technology and intelligent modules. It is capable of collecting different inputs from users like symptoms and appointment dates using an easy-to-understand interface. Based on these inputs, the AI chatbot suggests doctors and appointments for patients.

A. System Architecture

This design for the proposed smart hospital appointment booking system takes into account a three-layered architecture, comprising frontend, backend, and database layers. This system design assists in ensuring that modularity and scalability can be achieved along with effective system management. The overall design of the system is presented in Figure 1 below. The development of the frontend layer has been done using the ReactJS framework, which facilitates an interactive and responsive UI design.

The backend layer will be created using the combination of technologies such as Node.js and Express.js. Both of these technologies will be utilized to handle all the logic, manage the requests made by the user and secure interaction between the front-end and database layers. The database layer will be developed using the MongoDB database, which is NoSQL-based.

Apart from all this, the system is also linked with a chatbot that functions with the help of artificial intelligence. The technology is utilized for guiding patients about which particular medical specialist they should consult depending on the nature of the symptoms. In addition to all this, there is an email notification system that operates through the SMTP protocol.

Overall, this system is designed in a way that it is efficient, scalable, and user-centric, thus helping in the smooth operation of healthcare services.

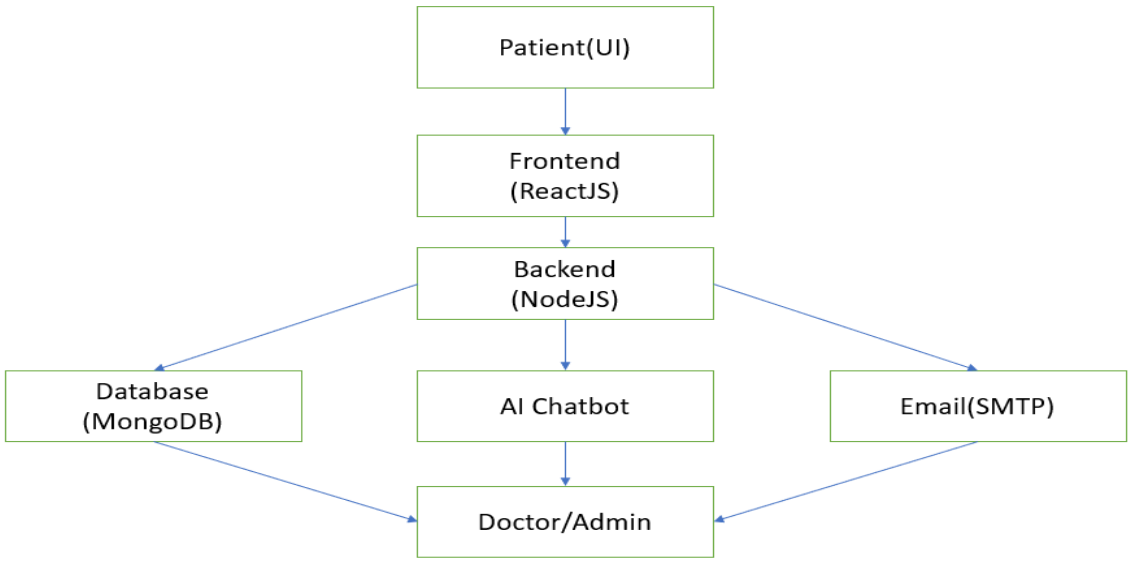

Fig. 1: System Architecture of Smart Hospital Appointment Booking System

B. System Workflow

The workflow of the smart hospital appointment booking system ensures that the patient and the doctor, along with the administrator, engage in an effective and efficient process. The workflow of the entire system proposed in the project is illustrated in Figure 2. In the proposed system, the workflow process starts with the user's login and registration. As soon as the patient logs in, they will be able to interact with the AI-powered chatbot using their symptoms. The AI chatbot processes the information provided by the patients and gives the appropriate medical specialists recommendation. The patients will have an option to view the schedule and doctors and book appointments according to their convenience. After booking the appointment, the system stores the details in the database and invokes the email notifications system that sends email notifications to the patients. The doctors log into the application to see the schedule appointments, whereas the administrator manages the entire system from his/her end. All of the activities stated above ensure that the information is processed in real-time, involve minimal human beings in the process, and facilitate effective communication among the users.

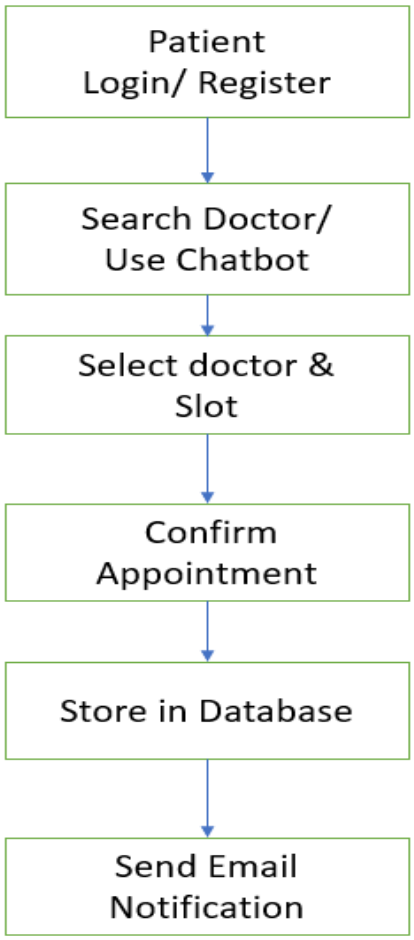

Fig. 2: Workflow of Smart Hospital Appointment Booking System

C. Module Description

In the Admin module, the main role is that of system management. This includes adding doctors, checking the patients, and appointment management. In the Doctor module, the role is that of appointment and doctor scheduling. In the Patient module, the role includes registration, searching for doctors, chatting, and making appointments.

a. AI Chatbot Module

The AI chatbot is one of the most important features available in the application. The chatbot enables patients to input their symptoms in plain text format. The chatbot processes the symptoms based on keywords and suggests the most appropriate specialist for the patient.

For instance, if the patient's symptoms include fever and cold, the chatbot recommends that the patient consults a general physician. In the same way, if the symptoms are related to headache and dizziness, then it recommends a neurologist.

b. Email Notification System

The application has a feature that can be used to provide automatic email notification for appointments. The process involves sending emails to the patients concerning their appointments. This is accomplished using the Simple Mail Transfer Protocol (SMTP). Once the patient books an appointment, an email notification will be sent to the patient. The information includes details like the doctor's name, date, and time.

D. Implementation Details

The proposed system is implemented by utilizing modern web technologies to ensure efficient performance. The overall database structure of the proposed system is given in Figure3. The proposed system is implemented by utilizing ReactJS for the frontend, which provides an interactive interface. The proposed system is implemented by utilizing Node.js and Express.js for the backend.

In this project, MongoDB is used as a database to store and manage patient, doctor, and appointment information. In addition, this project includes an AI-based chatbot that helps users select suitable doctors based on their symptoms

In addition, a module for sending email notifications through the SMTP protocol has been developed for sending appointment confirmations and reminders.

Overall, it is a scalable, secure, and user-friendly system for managing hospital appointments.

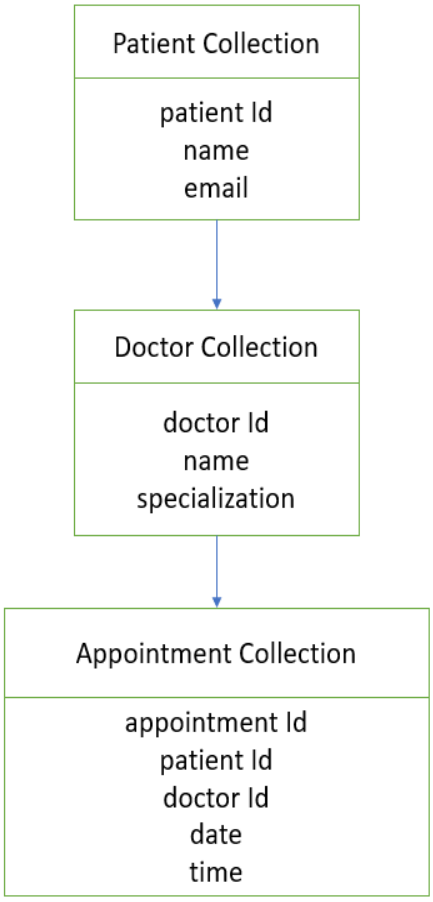

Fig. 3: Database Schema of Smart Hospital Appointment Booking System

IV. RESULTS AND DISCUSSION

The proposed system for the smart hospital appointment booking has already been successfully developed and tested to determine the efficiency of the system. Furthermore, the system has already been implemented by utilizing the latest technology in the development of the web, and it has the ability to perform the tasks efficiently.

The user registration/login functionality was also tested to ensure that secure access is granted to the different roles, namely Admin, Doctor, and Patient. This was confirmed by the test, which ensures that the functionality of the authentication and authorization mechanisms is working correctly, thereby offering role-based access to the different functions, as illustrated in Figure 4 and Figure 5.

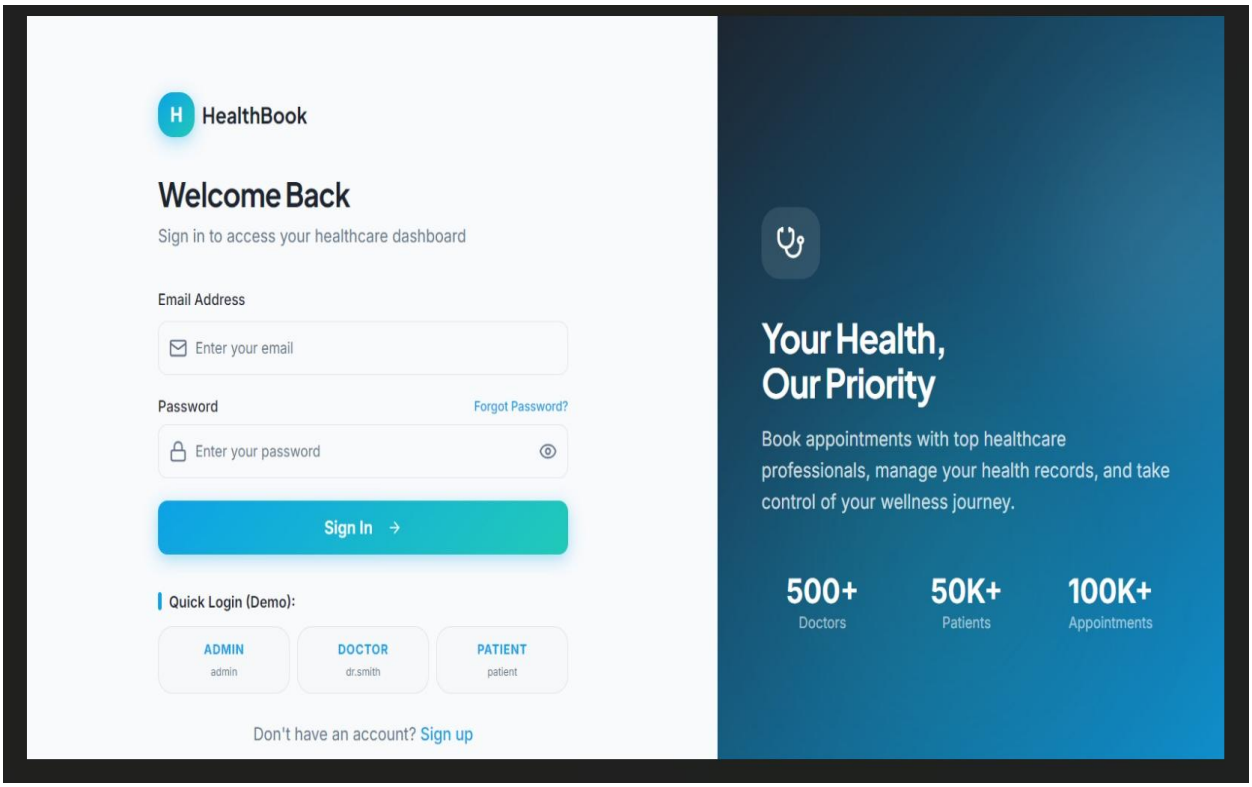

Fig. 4: User Login Interface

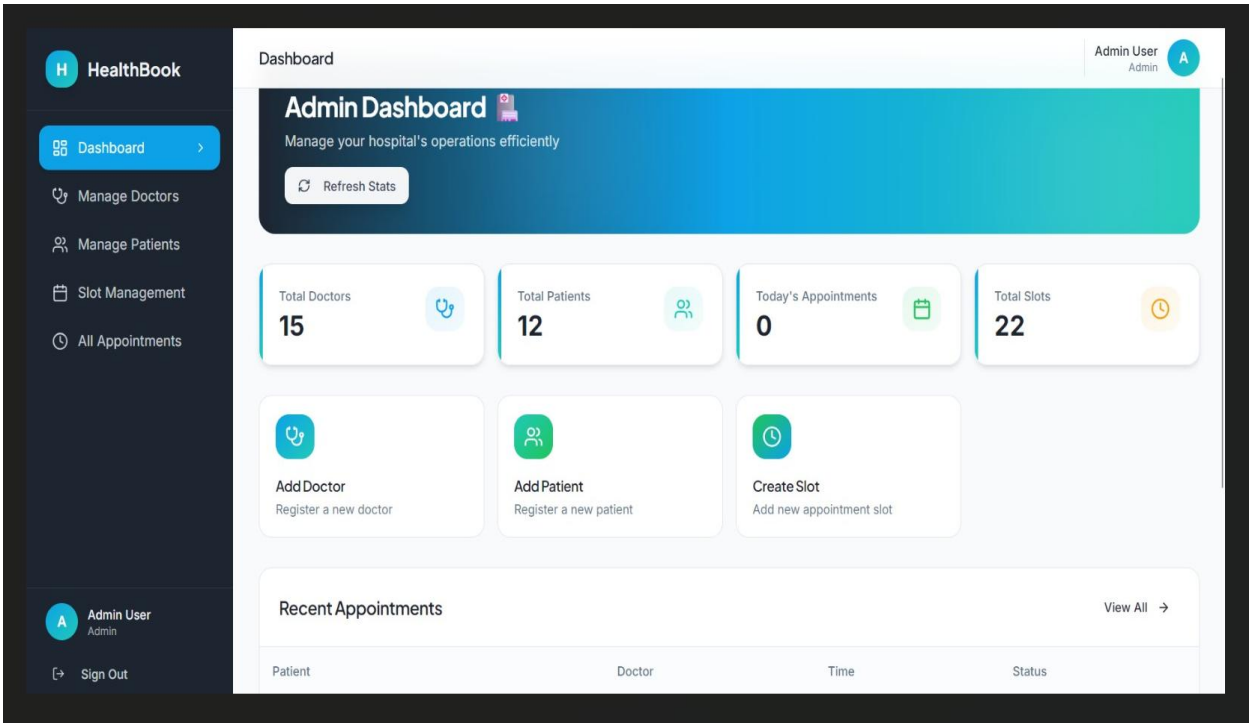

Fig. 5: Administrator Dashboard

The appointment booking feature allows patients to see the availability of doctors and book appointments without any overlaps, thus demonstrating efficient management of time slots, as depicted in Figure 6.

Fig. 6: AI Chatbot Interaction

When tested with different symptoms, it provided accurate information on whom to visit for consultation, thus enabling patients to make quick and informed decisions, as depicted in Figure 7. It shows that the intelligent assistance works effectively.

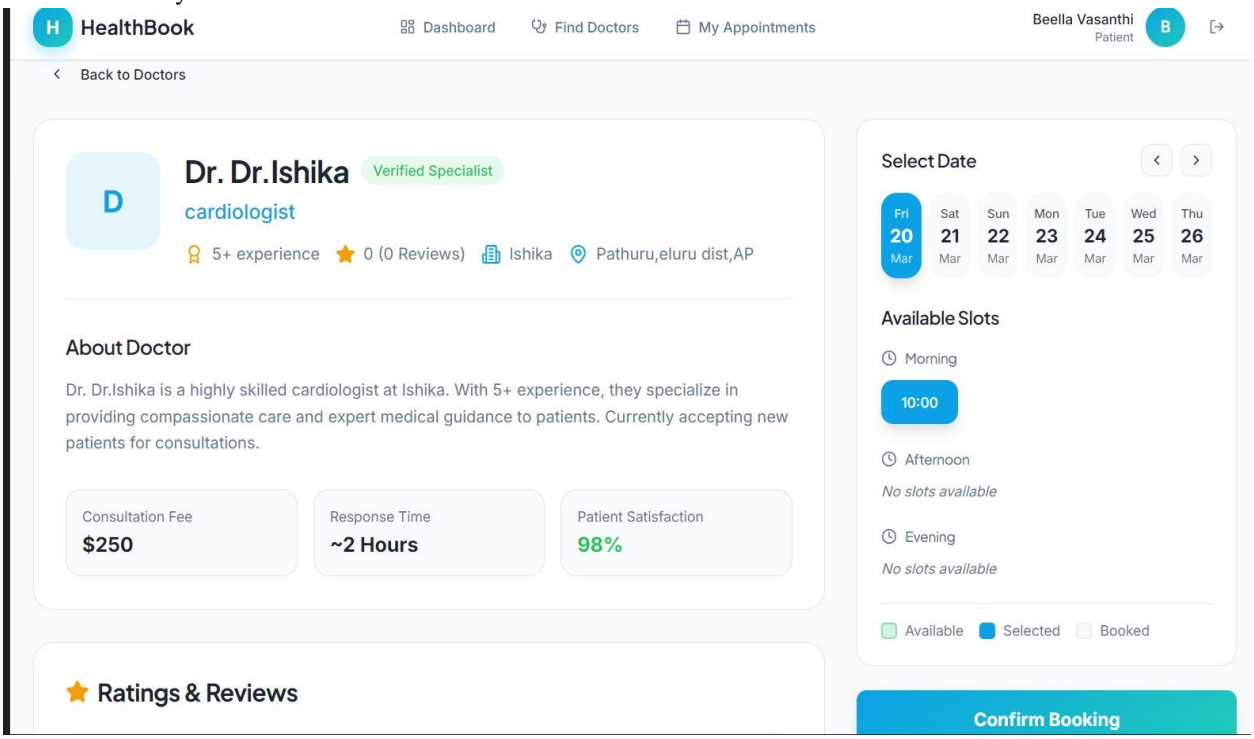

Fig. 7: Appointment Booking Page

The testing was also conducted on the function of emails sending notifications. This was tested to determine whether the system could send confirmation emails and remind patients about their appointments. The result is shown below in Figure 8. This indicates that the communication process will be made easier and hence reduce the probability of missing appointments.

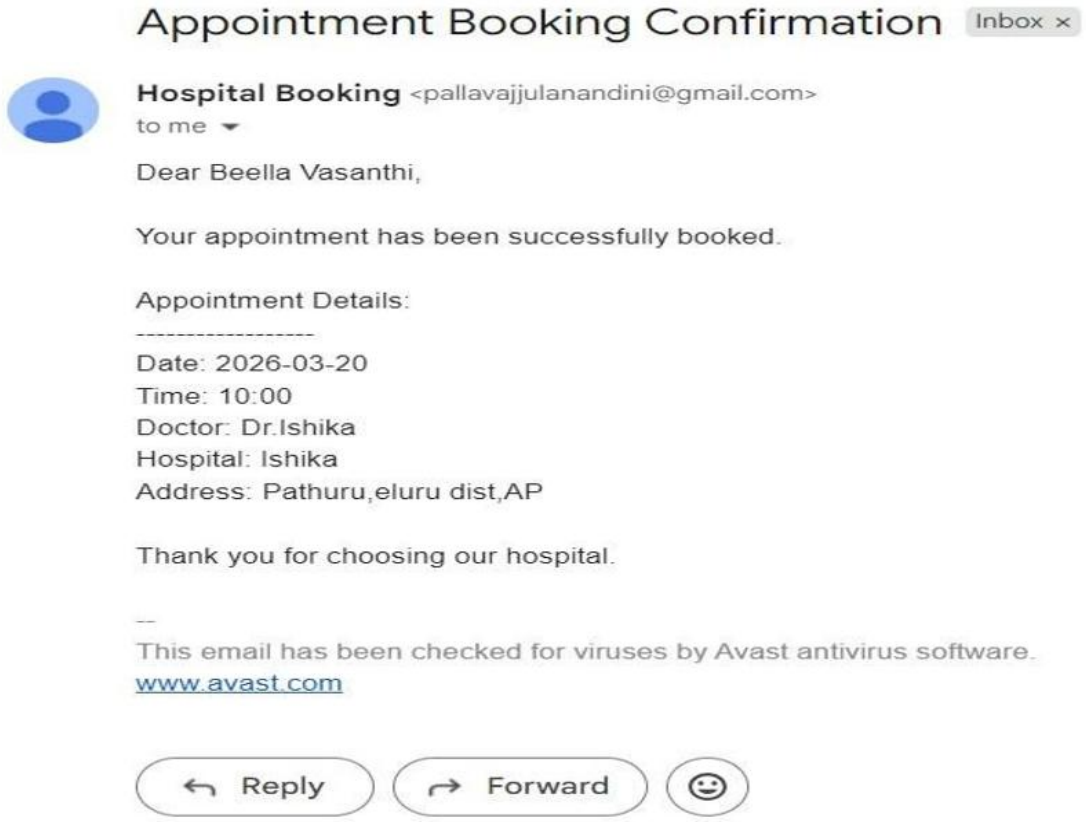

Fig. 8: Email Notification Output

The interface of the application looked interactive and user-friendly, and it became possible to move around from one module to another very easily. Moreover, the frontend, backend, and database were compatible and allowed the processing of data in real time.

From the analysis in this study, it can be concluded that the system is effective in reducing the waiting time and assisting the access to the facilities, as well as operations in the hospital. For the future, integration of smart components, for instance, the use of chatbots, may yield some benefits.

V. CONCLUSION AND FUTURE SCOPE

The article offers an outline of how a smart system for making appointments in a hospital can be developed, which has the objective of enhancing efficiency and quality in service delivery. It also has the objective of reducing waiting times in the hospital and the burden that comes with managing a hospital. Among the features are role-based access, AI chatbot, and email notification. Based on the findings, it has been effective, efficient, and user-friendly in resolving some of the issues that are present in conventional systems. In conclusion, it is a step in the right direction in modernizing healthcare services digitally.

The system can also be improved by incorporating cutting-edge AI technology that can enhance both the accuracy of results and the smartness of recommendations. A mobile app can also be designed to make everything easier and more convenient for users, especially patients. This is because they can schedule appointments and access services whenever they need them. This can also be done by incorporating Electronic Health Records (EHR) to make information management easier. More online consultations can

also be incorporated to make remote medical assistance more accessible. In addition, incorporating multiple languages can make the system more inviting and accessible to a wider audience. Finally, security can also be improved to make everything secure.

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