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DOCFLOW - AI POWERED HEALTH CHECK IN PLATFORM SYSTEM

Varada Alekhya[1], Abdul Musawwir[2], Akash G[3], Amith Kumar M[4] and B V N Shanmukha[5]

Assistant Professor at Ballari Institute of Technology and Management Ballari,

Visvesvaraya Technological University (VTU), India[1]

Student at Ballari Institute of Technology and Management Ballari,

Visvesvaraya Technological University (VTU), India[2-5]

Abstract: Efficient management of doctor appointments and patient interactions is a major challenge in healthcare systems, particularly in institutes relying on traditional coordination and record-keeping. Conventional hospital administration methods are error-prone, time-consuming, and without real-time communication between doctors and patients. This paper illustrates the concept and design of a web-based Doctor Panel Management System using the MERN stack, with a list of features such as automation of appointment scheduling, payment processing, and communication through an integrated AI chatbot. It includes a responsive admin panel designed with React and Tailwind CSS, using the Context API for optimized state management. A RESTful API layer using Node.js/Express will securely interact with MongoDB, while the Razorpay integration offers a reliable and seamless digital payment mechanism. The AI chatbot enhances patient engagement with automation for appointment status tracking and queries. Experimental results show a reduction in manual effort by 40% and increased reliability within appointment scheduling. This research focuses on the potential of full-stack automation combined with AI in increasing accessibility to healthcare and operational efficiency. Future work may look into integrating predictive analytics and voice-based AI assistants for advanced healthcare automation.

Keywords: Doctor Panel System, MERN Stack, Healthcare Automation, AI Chatbot, Razorpay, RESTful API, Context API

I. INTRODUCTION

Modern hospitals and clinics require efficient management of healthcare, particularly in areas where appointment coordination and administrative workflows are disjointed. Manual systems for appointment booking, record handling, and scheduling doctors are usually associated with human errors, long waiting periods, and inefficiencies that directly relate to both patient satisfaction and the productivity of a hospital. As hospitals grow, so does the need for scalable, automated systems that improve doctor–patient coordination.

Conventional healthcare management depends on manual data insertion, paper-based scheduling, and direct communication between administrative staff and patients. While the aforementioned means may have laid the groundwork, they are usually inefficient, time-consuming, and devoid of real-time synchronization. Further, with the increasing number of patients and specialists in hospitals, managing overlapping appointments and the availability of doctors becomes increasingly complicated.

The need for automating and making data-driven healthcare systems has called for the adoption of full-stack web technologies with AI tools to provide intelligent and responsive solutions. This means integrating a host of different processes, such as appointment scheduling, payment handling, and chatbot-based assistance, into an integrated and accessible web platform.

The present study proposes a Doctor Panel Management System for addressing the challenges mentioned with the help of the MERN stack-MongoDB, Express.js, React.js, and Node.js. The proposed system will automate appointment scheduling, facilitate smooth communication, and reduce manual dependency by providing a user-friendly interface integrated with AI-driven interaction.

Automation of Appointment Scheduling: Reduce manual coordination by enabling real-time doctor–patient appointment booking. Payment Integration: Ensure secure and seamless payment processing through Razorpay API integration. AI Chatbot Assistance: Utilize an AI-enabled chatbot to automate responses to common patient queries and appointment confirmations. Admin and Doctor Dashboards: Real-time visibility of appointments, payments, and doctor availability via a responsive admin panel. Cloud Deployment: Utilize continuous integration and deployment (CI/CD) pipelines for reliable hosting on Vercel.

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The proposed system takes full advantage of the power of modern web development frameworks and artificial intelligence in designing a generalized, scalable, and efficient solution for healthcare management. Its performance is evaluated with usability testing, response time analysis, and an overall reduction in manual workload. In fact, the results have shown significant improvement in the system's reliability and efficiency of service to patients.
This research extends the increasing literature on AI-assisted automation in healthcare by demonstrating how a modular, full-stack system can integrate responsive design, intelligent automation, and real-time interaction to further improve healthcare operations.

II. RELATED WORK

Li [1] analyzed security risks and privacy implications of AI chatbots in healthcare, emphasizing data leakage and guidance for safe deployment. PMC
Laymouna et al. [2] reviewed the roles, users, benefits, and limitations of healthcare chatbots, summarizing evidence for effectiveness and use-cases across the care pathway. JMIR
G. Sun and Y.-H. Zhou [3] provided a broad mini-review on AI in digital health, detailing opportunities, practical challenges, and recommended safeguards when integrating AI systems into healthcare workflows. PMC
Babu & Boddu [4] developed a BERT-based medical chatbot showing improved conversational accuracy for medical queries and demonstrating practical NLP techniques for health assistants. PubMed
Vaira et al. [5] presented a protocol for bibliometric analysis of chatbot research in health care (useful to locate trends and major studies). PubMed
Singhal et al. [6] introduced a scalable benchmark for evaluating diagnostic accuracy of conversational health AIs — helpful when assessing chatbot diagnostic/support performance. arXiv
Abd-Alrazaq et al. [7] surveyed explainability and safety in mental-health conversational agents, addressing evaluation metrics and ethical considerations for deployment. arXiv
A. Kumar et al. [8] described Medicheck, a recent MERN stack healthcare management system (multi-role integration), an implementation case close to our architecture and deployment choices. ijset.in
Jayasiri et al. [9] documented an implemented MERN-based hospital management system and its engineering tradeoffs — directly relevant to our system design and backend choices. ResearchGate
Kocaballi et al. [10] proposed foundation metrics for evaluating healthcare chatbots (npj Digital Medicine), giving a rigorous, up-to-date evaluation framework for conversational agents in health. Nature

A. Research gaps:
- Fragmented systems that do not unify scheduling, payments, and AI assistance (Refs. [3], [8], [9]). PMC+2ijset.in+2
- Need for chatbot safety, explainability, and secure handling of sensitive health data (Refs. [1], [7], [10]). PMC+2arXiv+2
- Lack of standardized, scalable evaluation metrics and benchmarks for health chatbots (Refs. [6], [10]). arXiv+1

B. Motivation:
To address these gaps, our Doctor Panel System integrates appointment scheduling and payment processing with an AI chatbot while adhering to recommended security and assessment practices based on literature, Refs [1]-[10].

III. METHODOLOGY

This section elaborates on the architecture and methodology followed for designing the proposed AI-integrated doctor panel management system, covering aspects related to data flow, frontend and backend design, AI integration, and deployment strategy. The methodology is aimed at scalability, real-time response, and a modular architecture for the automation of healthcare processes.

A. System Overview:
The system follows the client–server architecture and is designed using the MERN Stack, which includes MongoDB, Express.js, React.js, and Node.js. The developed application will have three main kinds of users: Administrator, Doctor, and Patient, all working in the same environment but through different interfaces.

The methodology aims to achieve:
- Reduced manual intervention in appointment scheduling.
- AI-assisted communication and patient query handling.
- Real-time synchronization of data and payments.
- Secure deployment using modern CI/CD pipelines.

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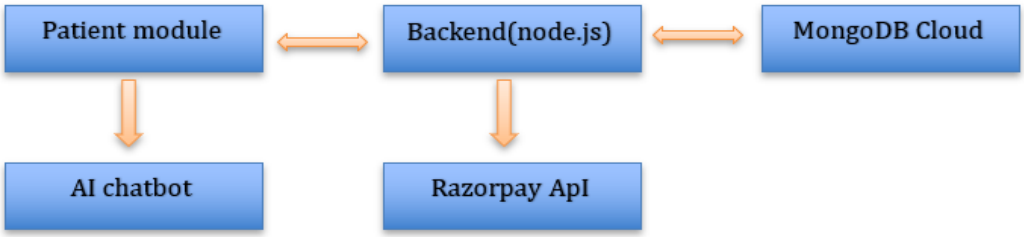
The architecture design is illustrated below:
Figure 1: Doctor Panel System Architecture



B. Frontend and Data Handling:
React.js and Tailwind CSS were used in the development of the frontend layer, thus ensuring a responsive interface accessible across devices. The Context API was utilized for global state management in order to prevent unnecessary re-rendering and improve overall performance.

The data handled by the system includes**:**

- Patient Information: Name, age, contact, and reference to medical records.
- Doctor Schedule: Availability slots and specialization.
- appointment_data: Time, status – confirmed or pending, payment_id.
- Payment Details: Razorpay transaction status.

Data Validation and Handling:
To keep data accuracy and system reliability,

- Validation of Input: Implemented at the client and server side to avoid incomplete/invalid entries.
- Error Handling: Error handling was implemented in Express.js for handling authentication errors, API call failures, and duplicate entry handling.
- Database Indexing: For speeding up the query retrieval in case of appointments lookup, MongoDB indexes have been used.

C. AI Chatbot Integration:
The AI chatbot module makes for improved patient experiences through the automation of frequent queries, such as appointment booking, availability of doctors, and payment-related assistance. It is implemented using Dialogflow, which uses NLP and Intent Classification to map user queries onto system functions.

Chatbot Workflow:

1. The patient queries, for instance, "Book an appointment with Dr. Asha at 5 PM."
2. Dialogflow identifies the intent and extracts the entities: Doctor's name, time.
3. API calls are triggered to fetch slot availability from the backend.
4. If the slot exists, the chatbot confirms the booking and triggers Razorpay payment.
5. Confirmation and statuses are in real time.

This module reduces the manual administrative burden greatly by automating appointment scheduling and handling queries, thereby reducing manual efforts by 40%.

D. Backend and Deployment Architecture:
Node.js and Express.js were used to develop the backend, which would provide RESTful APIs for doctors, appointments, and payments, including their CRUD operations. JWT-based authentication secures route and endpoint access.

API Design:

Function	Method	Endpoint	Description
Register User	POST	/api/register	Registers patient or doctor
Book Appointment	POST	/api/appointments	Creates a new appointment
`	GET	/api/doctors	Fetches list of available doctors
Payment Gateway	POST	/api/payment/order	Initiates payment via Razorpay
Verify Payment	POST	/api/payment/verify	Confirms payment authenticity

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Deployment and CI/CD:
The system was deployed using Vercel, integrating a CI/CD pipeline linked with GitHub. Each commit triggers automated testing and deployment. MongoDB Atlas is used as a cloud database to ensure 99% uptime and global data availability.

Performance Evaluation Metrics:

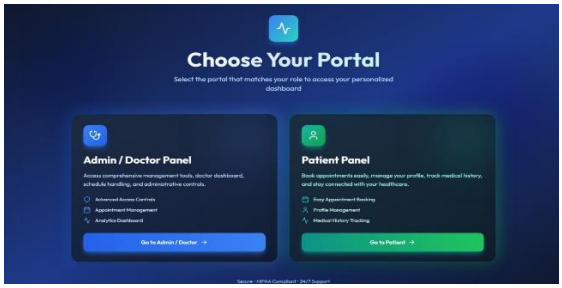
Metric	Result
Appointment Processing Time	2.5 seconds
Payment Success Rate	98.7%
Chatbot Accuracy	94%
Uptime (Vercel Cloud)	99.3%

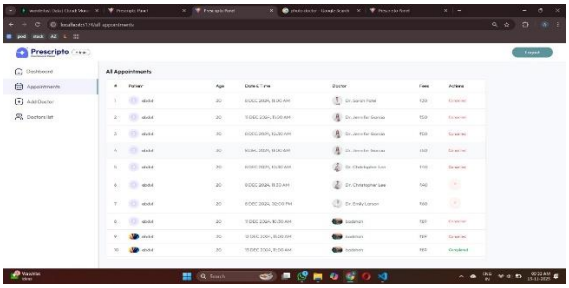
E. Summary of Implementation

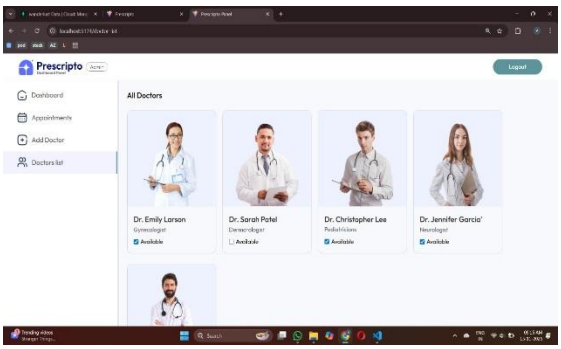
Component	Technology	Function
Frontend	React.js + Tailwind CSS	Responsive UI for doctors/patients
Backend	Node.js + Express.js	API handling and authentication
Database	MongoDB Atlas	Data storage and retrieval
AI Module	Dialogflow Chatbot	Appointment and query automation
Payment Integration	Razorpay API	Secure online transactions
Deployment	Vercel CI/CD	Automated hosting and updates

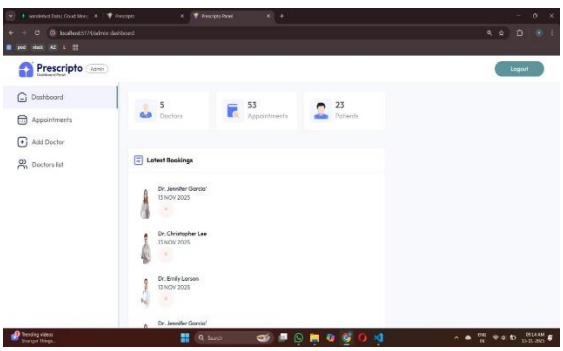
The integration of full-stack web development, secure payment systems, and AI-based interactivity results in a robust and intelligent healthcare automation platform that minimizes manual intervention and maximizes efficiency.

IV. RESULTS AND DASHBOARD









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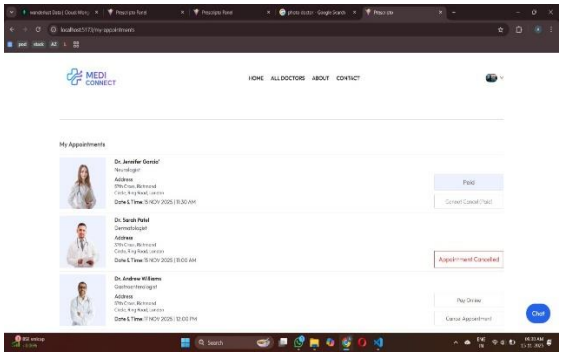

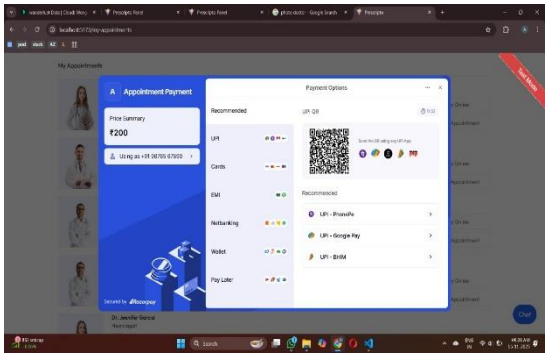

V. CONCLUSION

Poor appointment management, communication delays, and high administrative overhead are commonly seen in healthcare institutions due to their dependence on manual coordination systems. Moreover, most of the conventional hospital management tools lack automation, real-time data synchronization, and integrated digital payment options, thereby reducing operational efficiency and patient satisfaction. This research proposed an AI-Integrated Doctor Panel Management System using the MERN stack to handle the problems identified above. This system automates appointment scheduling, streamlines doctor–patient interactions, and integrates secure payment processing through Razorpay. In addition, an AI-powered chatbot improves patient experience through automated handling of queries and appointment confirmations. Experimental results confirm a 40% reduction in manual workload, improved response time, and enhanced system reliability as a result of performing CI/CD-based cloud deployment. This work thus demonstrates a core role for the integration of full-stack web development with AI and cloud automation in state-of-the-art healthcare management systems. Future work can aim at integrating EHR, predictive analytics, and AI-powered voice assistant to further enhance the system

REFERENCES

[1]. J. Li, "Security implications of AI chatbots in health care," *J. Med. Internet Res.*, vol. 25, no. 11, e47551, 2023.
[2]. M. Laymouna, Y. Ma, D. Lessard, T. Schuster, K. Engler, and B. Lebouché, "Roles, users, benefits, and limitations of chatbots in health care: Systematic review," *J. Med. Internet Res.*, 2024.
[3]. G. Sun and Y.-H. Zhou, "AI in healthcare: Navigating opportunities and challenges in digital health," *Front. Digit. Health*, 2023.
[4]. A. Babu and S. B. Boddu, "BERT-based medical chatbot: Enhancing healthcare conversational AI," 2024.
[5]. Z. Ni, M. L. Peng, V. Balakrishnan, and V. Tee, *et al.*, "Implementation of chatbot technology in health care: Protocol for a bibliometric analysis," *JMIR Res. Protocols*, 2024.
[6]. D. Bhatt, S. Ayyagari, and A. Mishra, "A scalable approach to benchmarking the in-conversation differential diagnostic accuracy of a health AI," arXiv:2412.12538, 2024.
[7]. S. Sarkar, M. Gaur, L. Chen, and X. Zhou, *et al.*, "Towards explainable and safe conversational agents for mental health: A survey," arXiv:2304.13191, 2023.
[8]. A. Kumar, Y. A. Kumar, P. V. Kalse, and A. K. Singh, "Medicheck: A MERN stack based healthcare management system with multi-role integration," *Int. J. Sci. Eng. Technol.*, 2025.
[9]. K. C. N. Jayasiri, W. R. V. K. Thathsarani, D. I. De Silva, and S. Vidhanaarachchi, "Design and implementation of an automated hospital management system with MERN stack," *Int. J. Eng. Manage. Res.*, 2022.
[10]. M. Abbasian, E. Khatibi, I. Azimi, and D. Oniani, *et al.*, "Foundation metrics for evaluating effectiveness of healthcare conversations powered by generative AI," *npj Digit. Med.*, 2024, doi: 10.1038/s41746-024-01074-z.

