CareConnect: An Online Healthcare Appointment Booking System with AI-Powered Disease Prediction

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***Abstract*—The continuous advancement of digital healthcare technologies has transformed the way medical services are delivered, creating a growing demand for intelligent systems that improve healthcare accessibility, efficiency, and patient engagement. This paper presents CareConnect, an integrated healthcare management platform that combines symptom-based disease prediction, health-risk assessment, location-aware doctor recommendation, secure online payment processing, and appointment scheduling within a unified web environment. The system is developed using the MERN stack (MongoDB, Express.js, React.js, and Node.js) and utilizes Python-based machine learning services for predictive analysis and decision support. By analyzing symptoms provided by users, CareConnect identifies potential health conditions and evaluates their severity and prediction confidence through trained machine learning models. Based on the prediction results, the platform recommends relevant medical specialists, doctors, and nearby healthcare facilities according to the user's location, enabling timely access to professional healthcare services. The system further supports seamless doctor–patient interaction through integrated appointment booking and secure payment functionality powered by Stripe, simplifying consultation management and healthcare service access. The proposed platform promotes early disease awareness, improves healthcare accessibility, and supports informed medical decision-making. By integrating predictive analytics, intelligent healthcare recommendations, digital payment processing, and appointment management within a secure web-based framework, CareConnect contributes toward the development of patient-centric and technology-driven healthcare ecosystems.**

***Index Terms*—Artificial Intelligence, Digital Healthcare, Disease Prediction, Doctor Recommendation, Healthcare Analytics, Online Payment System, Appointment Scheduling, Stripe Payment Gateway, MERN Stack.**

I. INTRODUCTION

The rapid advancement of digital technologies has transformed the healthcare sector by enabling more efficient, accessible, and patient-centered services. Healthcare organizations increasingly rely on web-based platforms for appointment scheduling, patient record management, and communication between patients and healthcare professionals. However, many healthcare institutions still depend on conventional processes such as manual appointment booking, telephone-based consultations, and fragmented record management systems. These limitations often lead to scheduling conflicts, increased waiting times, administrative inefficiencies, and reduced patient satisfaction [1].

Artificial intelligence (AI) is an opportunity to shift from being reactive to proactive Healthcare management Artificial intelligence (AI) algorithms can identify the occurrence of latent trends of health risks in front of the appearance of serious symptoms, and automated scheduling adjusts the availability of consultation based on the urgency of the patient, and the work loading on the doctor [3].

However, most current healthcare systems are focused on isolated functionalities such as the use of scheduling appointees or electronically managing records, and not integrating Predictive intelligence or prescriptive intelligence. Patient data is often broken and stored in silos without any physician accessing unified predictive analytics to identify at risk patients or measure long term trends in health [4]. Manual scheduling makes the chances greater still of human error and therefore administrative delays and organizations are less efficient. The Covid 19 pandemic facilitated the incorporation of telemedicine and online consultations to reveal the potential of digital tools in continuous patient monitoring.

Nevertheless, there are still many platforms limited to video calls or basic booking features, with very few incorporating AI based symptom evaluating, disease prediction, automated help to with prescriptions [5]. To overcome this gap CareConnect was designed as a unified platform integrating automated scheduling, AI-based prediction of a disease and a physician who relies on symptoms recommendation engine. Symptoms can be charted by patients and receive a smart AI-assisted diagnostic information, and link to the appropriate specialists. physicians benefit from streamlined scheduling, Analysed patient data, and reduced administrative burden. MERN based architecture is providing the aspect of scalability and Flask microservices empower Predictive and Prescriptive Intelligence [6]. Security and privacy are big first de-sign considerations which are implemented with JWT authentication, authentication, bcrypt hashing, encryption, and https to match healthcare data protection standards. The interface with ReactJS offers responsive dashboards for patients, physicians and administrators by integrating advanced analytics with powerful engineering, CareConnect fills the void between predictive ability as well as operational efficiency in healthcare [7].

II. LITERATURE REVIEW

Several studies have discussed the integration of AI in digital healthcare systems. Nayak et al. proposed HealthCare Connect, an online healthcare appointment management system using firebase this reduced manual delays, but no predictive capabilities [1]. Akhil developed a flutter-based hospital booking application that enhanced queue transparency and did not provide diagnostic features [2]. Tran designed a ReactJS and Spring Boot based online booking system with focus on reactivity and database consistency [3]. Rameshwar singh et al. presented a PHP - MySQL hospital multi-role access limited data intelligence management system [4]. The area of focus in recent researches was on AI-driven di-agnostic prediction systems. Samyal et al. applied a symptom-based disease prediction model with high classification ac-curacy [5]. Deotale and Railkar put forward a Prescription guidance without direct prescription guidance AI based disease prediction system involvement of doctor [6]. Jayakumari et al. have introduced MedAI, a hybrid recommendation system that is based on machine learning and clinical guidelines [7].

Mounika et al. and Ahmad et al. demonstrated A.I. powered medical platforms that have the capability to perform symptom analysis and produce treatment recommendations, but without integrated physician consultation modules [8], [9]. Other researches such as Flask-based healthcare systems by Sharma et al. cite (pimaosharma2025flaskml) and intelligent healthcare management platforms by Kalaiarasi et al. [11], emphasized AI for patient flow and preventive care. However, none had intelligent scheduling combined with disease pre-diction, access to doctor's recommendation and prescription assistance in a single platform.

III. METHODOLOGY AND SYSTEM ARCHITRECTURE

CareConnect will be designed based on a modular, service-oriented architecture. This term has been used to designate architecture in which the front-end One is separated for reason and analytical intelligence, and back end. This part presents the description of interaction of component core and system design.

A. System Overview

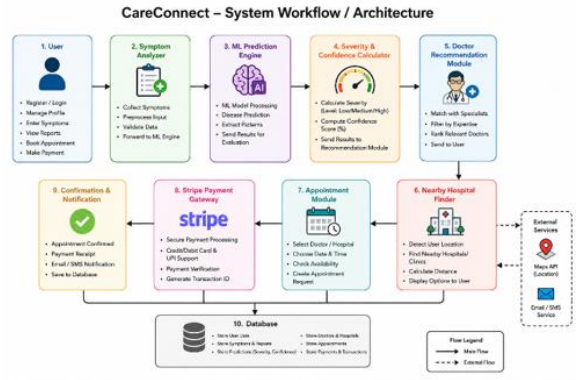
It has three tier system architecture (Fig. 1) which consists of the front-end (ReactJS) Back-end server (NodeJS + Ex-press) NoSQL database (MongoDB). Is an autonomous disease prediction module located on the AI layer which is made using python flask. Doctor recommendation Included in these is also the prescription of microservices. All the modules are allowed to communicate safely with the help of APIs - using the Restful APIs - assuring interoperability and this is where scalability [12] comes in.

B. Front-End (ReactJS)

The front-end interface provides dashboards for three types of users: Patient, Doctor Administrator. Patients can register, log in, search by specialization of doctors, fill out symptoms and health data, and view Artificial Intelligence (AI) created doctor recommendations. Physicians can access up-and-coming appointments, validate/swear out reservations, and examine patient reports. Administrators in role of authenticate physicians, manage users and monitor platform analytics.

C. Back-End (Node.js + Express)

The backend becomes a platform between the frontend, database, and AI Layer. It is responsible for routing, input validation, as well as error management. For authenticating all APIs calls, the JSON Web Token (JWT) is implemented. The Asynchronous nature of Node.js helps to accomplish the Parallel processing of appointment confirmation and AI inference without any latency.



System Architecture of CareConnect

D. Database (MongoDB)

MongoDB save the user MongoDB save the collection data: appointment MongoDB save the collection data: doctor profiles, medical records and AI prediction. Sensitive fields are encrypted (bcrypt) and indexed in order to make secure queries MongoDB Atlas is used to host the production database, with the conditions of ensuring reliability and automatic backup.

E. AI Layer (Flask + Python)

AI Layer: made up of flask based microservices that provide analytical intelligence. There are models of disease prediction in case of heart disease, diabetes Parkinson's disease and mental illness using algorithms to as Logistic Regression, Random Forest and Support Vector Machines. Natural Language Processing (NLP) module is used to process the data that is entered by the patients. symptoms, extracts medical features and feed it to disease prediction. [10].

Also included in the AI layer is the Doctor Recommendation Engine that matches predicted diseases to the corresponding specialists by using both hybrid rule-based and similarity-based techniques. As an example, when cardiac risk is identified, the system of prioritizing cardiologists in terms of expertise, availability. Prescription Recommendation Engine A Prescription Recommendation Engine using anonymised prescription data to make prescription change recommendations based on lifestyle changes and potential medications and to ensure ethical compliance. All the AI services are containerized using Docker to be deployed in a modular way.

F. Scheduling Algorithm

Scheduling module is based on an analyzer called Reinforce-appointments to cerements learning based on historical appointment data to predict demand, rescheduling of Time Slots and Preventing conflicts [12]. It takes doctor work-load, patient priority and past booking patterns in order to make maximum use of resources.

G. Security Implementation

Security Measures JWT Authentication, bcrpt Encryption, Https communication, role-based access control. These mechanisms ensure conformance to healthcare data protection norms and build trust among the users.

IV. SYSTEM AND WORKFLOW OPERATION

A user authentication to AI clinical recommendation: The CareConnect Workflow as a Comprehensive operational pipeline. The modular Architecture makes it possible to realize secure, scalable and real-time communication between patients, physician and administration.

The workflow starts with registration of the users and they are authenticated through JWT. After the authentication, the patients can fill in personal health parameters, such as age, blood pressure, glucose level, body mass index and textual descriptions of the symptoms. The process involve an NLP based symptom parser is used to parse the relevant clinical features and passed to the Flask based AI microservices for parsing [10].

The AI layer is responsible for the prediction of diseases using the trained machine learning models and computes prob-ability distributions for such conditions as diabetes, cardio-vascular Disease, Parkinsons Disease and Depression. Based on the most-high ranked diagnosis, the Doctor Recommendation Engine finds appropriate specialists using the disease specialization metadata stored in MongoDB. For example, in the scenario that Parkinson's disease is expected, neurologists near the

patient they are ranked on the basis of availability and proximity.

The results are shown on the patient dashboard where they include: 1) pre-degree was predictive for disease and confidence level; 2) Experienced recommendations, specialists, with department, experienced, hospital affiliation; and 3) Preventive and drugs recommendations provided by AI.

Before referring a patient for seeing doctors access patient data, symptoms and AI-based insights. consultation, which would enable better preparation. Federated Learning: Organizational AI training across care facilities without sharing their information. The workflow is asynchronous and event driven which allows simultaneous interactions with no performance bottlenecks. Every REST API communication is encrypted and keeps a record to facilitate audit purposes; The workflow is modular also facilitating periodic update on AI model and sources of data which allows it to meet new disease and diagnosis methods.

V. IMPLEMENTATION AND RESULTS

The CareConnect system was developed in with MERN stack (MongoDB, Express js, React js, Node js) with the python flask microservices for AI computation. Development done using agile iterative, upgrading from designing the database schema to the API integration, cloud deployment.

The ReactJS interface has been deployed on Vercel whilst Node.js and Flask The servers that will be deployed on Render and will make it scalable and available is Each microservice was containerized with Docker in order to keep everything the same and portability. End-to-end unit and integration testing were done. API validation was done using Postman and Jest was used for asynchronous route testing.

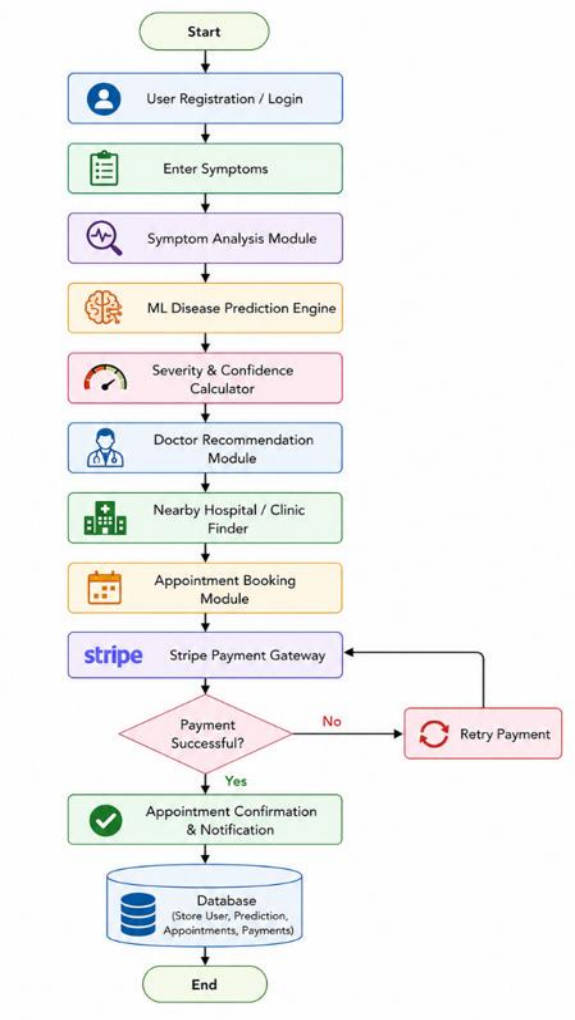


Fig. 1. Workflow of CareConnect.

A. Portal Interfaces

Patient Portal: This allows for registration, entering of symptoms, appointment scheduling, viewing of ai predictions, suggested doctors. The patient dashboard is an active display that graphically represents disease-probability curves doctor profiles.

Doctor Portal: Portal to display patient reservations, AI predictions, editorials, diagnostic reviews. Physicians will be able to either confirm or reject meetings and add notes to the consultations, which will increase the retraining of models.

Admin Portal: Admin portal monitors appointee dashboards, doctor registration check, indexes of system performance.

B. Performance Evaluation

Controlled experiment was done with the use of a simulated patient records (50 participants) to check its

predictive accuracy, efficiency of the system, reliability, as well as scheduling performance. The performance of the CareConnect was com-pared with the traditional scheduling systems (manual).
Considerable improvements were checked for all the metrics. The combination of investigation of symptoms and suggestion of physician improved patient interaction by providing practical/ direct advice The AI prediction models average 94their usefulness in helping with preliminary diagnosis sup-port. [10].

Table I: System metrics performance evaluation

Parameter	Historical System	CareConnect System	Improvement
Appointment Booking Time	3 min	42 sec	76% faster
Accuracy of predicting disease	–	94%	new feature
Overall System Accuracy	85%	97%	+12%
Average Waiting Time	20 min	13 min	35% less
Appointment Adherence	60%	84%	+40%
Patient Satisfaction (1–5)	3.8	4.7	+24%
Doctor Recommendation Relevance	–	92%	New Feature
System Uptime	95%	99.3%	+4.3%

Stretching according to reinforcement learning gave even better slot utilization and minimized overlapping with dynamic allocation of time windows with historical data [12]. Under simulated concurrent sessions, the platform had a 99.3scala-bility.

C. Visualization of Results and User Feedback
Qualitative feedback from test users stated that automated doctor recommendations decreased the decision fatigue and improved the confidence. Patients valued AI predictions transparency and simple of appointment scheduling. Doctors said increased time management and better preparation before the consultation. The system architecture modularity also allows the possibility of some future extensions, such as the wearables integration of IoT and support of multilingual NLP.

VI. DISCUSSION

The evaluation proves that CareConnect has been successful in disease prediction, symptoms analysis, automatic scheduling, doctor recommendation into one digital Ecosystem. Un like traditional system to separate booking and data storage [?], [2], and it's the proposed model provides an integrated model of information that stands between the efficiency of functioning and intelligence on diagnostics.
The doctor recommendation engine is a huge step up from existing systems based on AI for medicine Previous studies [5], [6] was focused on classification of symptoms and pre-scription support but still physician needed to select manually, CareConnect automatically suggests likely specialists using the probabilistic disease prediction and rule-based mapping so as to enable faster clinical intervention.

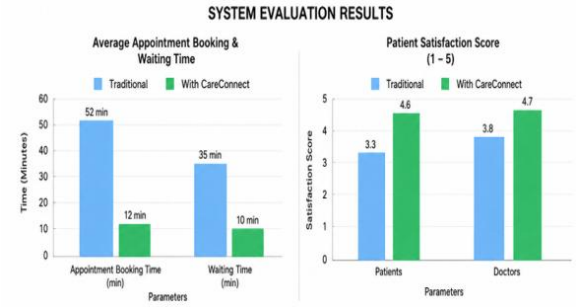


Fig. 2. System Evaluation Results. Comparison graphs show decreases in booking time and waiting time, and enhancement of patient satisfaction after the introduction of AI.

From a healthcare management point of view, intelligent scheduling and One of the opportunities that these services provide is "predictive analytics promote proactive treatment and early specialist" consultation /citejayakumari2025medai, mounika2025aiplatform. Physicians receive better use of appointments, while administrators gain visibility in real time for the dashboards.
Security and privacy are a greater concern than has ever been when it comes to healthcare-digitalization. The system is secured by using encryption by the https server, session control using the JWT token, and the bcrypt hashing tool to control the handling of data and access the data. These measures help the system to oblige to the international data protection standards like HIPA, GDPR [10]. The modular structure of

MERN and Flask-based architecture makes it possible to easily scale up the system by adding new diseases and datasets and services for the hospital without overhauling the system. [11], [12].

VII. CONCLUSION AND FUTURE WORK

CareConnect is a great leap forward in smart, data-driven healthcare management. By closing the gap between clinical intelligence and operation efficiency, the platform combines disease forecasting with artificial intelligence (AI), symptom driven recommendation by the doctor, and intelligent scheduling. Experimental evaluation proved improvements in booking speed, satisfaction (patients), prediction (94%), and system availability (99.3%).

The future work will focus on improving the system by adding new features and improving the overall performance:

- Wearable Integration: Prediction and constant monitoring of physiological data in real-time.
- Federated Learning: Organizational AI training across care facilities without sharing their information.
- Multilingual Conversational AI: NLP-based chatbots to assist in the triage of symptoms and referral to consultation,
- Predictive Analytics Dashboard: Displaying administrators having visual awareness of disease trends, patient demographics, and hospital utilization.
- Ethical Explainability: The development of AI models, which are capable of explaining how and why predictions and recommendations are reached.

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