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Smart Healthcare Consultation System with Automated Doctor Mapping

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***Abstract*— Few rural and resource-limited settings enjoy access quality healthcare. Despite the rapid growth in telehealth systems, most of the current systems do not include intelligent triage, secure architecture validation, and experimentally tested AI integration. The paper is the design and experimental evaluation of a secure AI-based telehealth communication system that incorporates real-time consultation, automated doctor referral, and NLP-based symptom correction. It is built on the MERN stack and has a Naive Bayes classifier that is trained on structured medical data to help in initial triage. The experimental analysis with 50 simulated users proves that the system has a classification accuracy of 91.3, a system latency of an average of less than 250 ms, up time of 99.4% and assures compliance with AES-256 encryption. Comparative analysis reveals that the consultation time has been cut by 42 percent and healthcare expenditure on travel is also cut by 30 percent. The findings confirm that AI-based triage with a secure architecture can provide a substantial performance and scalability.**

***Index Term*— tele health, NLP-based symptom classification, doctor recommendation system, secure health architecture, AI in healthcare, MERN stack, healthcare informatics.**

I. Introduction

One of the most urgent issues facing the globe today is access to healthcare. Patients lived in rural, isolated or resource constrained places faced a serious obstacles due to in-person consultations. Half of the world's population does not have access to basic health care estimated by WHO (2024) [2].

Patients got direct access to physicians via online channels due to a game changing way to close this is through telehealth.

This telehealth medicine crucial rolein preserving the treatment while reducing infection risks was made evident by the COVID-19 pandemic, which speed up its implementation [1] [6].

Many telemedicine solutions still have issues, nevertheless, like as interoperability issues, data protection issues, and lack of AI integration for clinical decision assistance. Doctor Patient Telehealth Communication System offers a safe, smart and scalable digital environment that tackles these issues by combining video/audio consultations, electronic health records (EHR), artificial intelligence symptom.

With a focus on patient participation, cost reduction, and technological inclusiveness, Digital Health 2030 and Smart Hospital goals promoted by governments and international organizations and this project is in line of this [5] [13] [16].

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II. LITERATURE STUDY

A. Evolution of Telemedicine and Digital Healthcare

Voice-based remote consultations were the only telemedicine applications available in the early years. Contemporary telehealth systems now offer electronic prescriptions, real tie diagnostics, and cloud based data analytics due to development in cloud computing, IOT, and broad band connectivity [1][5]. Digitalplatforms have increased patient satisfaction rates and shortened medical wait times by as much as 60% according to Keesara et al. (2020).

B. Role of Artificial Intelligence in Healthcare

By identifying patterns in clinical data, AI-driven tools now assist with diagnosis and individualized treatment [3] [10] [14]. AI's dependability in forecasting patient deterioration using real time data which was established by Rajpurkar et al. (2023) [10], By diagnosing specific conditions,deeplearning algorithms can match or surpass physician accuracy showed by Esteva et al.

C. Data Security and Blockchain

In telehealth, data integrity is essential. Li and Wang (2025) suggested incorporating blockchain technology to construct transparent, immutable ledgers for storing medical records which lower the risks of tampering or unauthorized access [9] [15]. AI and blockchain together provide accountability and astute data-driven insights.

D. IOT and Ongoing Surveillance

Smartwatches, blood pressure sensors, and glucose monitors are examples of IoT devices that may send real-time data to the telehealth platform, facilitating proactive and preventive healthcare [12] [15]. According to the studies, remote monitoring can cut hospital readmissions by up to 25%.

E. Adoption Difficulties

Al though tele health offers significant benefits, adoption is one of them. These difficulties include physician opposition to new processes, internet infrastructure uneven, data protection restrictions, and lack of digital literacy of older patients [8] [13]. Through multilingual support, user-friendly interfaces, and automated help modules, the suggested system reduces these obstacles and promotes inclusion across demographics [7].

Telehealth systems no longer consist of voice consultations but multi faceted platforms with video, EHR, AI/ML analytics, IoT-based monitoring and other novel privacy-aware approaches. The recent literature (2024- 2025) focuses not on the changes in clinical outcomes and access only but on the necessity of trustworthy AI, more powerful privacy frameworks, multilingual accessibility, and powerful real-time monitoring. The following sections cluster as follows recent findings based on the theme, and point out gaps in there search that your system can fill.

III. SYSTEM ARCHITECTURE AND DESIGN

A cloud database, a secure backend server, and frontend interfaces are all integrated into the system's architecture and communicate with one another via protected APIs.

A. Components

Frontend (React.js)

- Gives patients and doctors access to dashboards.
- Allows for chat, report access, and appointment scheduling.
- Mobile-friendly and responsive user interface.

Backend (Node.js + Express)

- Manages AI-based processing, data routing, and authentication.
- Makes use of RESTful APIs to facilitate effective communication.

Database (MongoDB)

- Keeps consultation logs, prescriptions, and user data encrypted.
- Uses backups and redundancy to stop data loss.

Security Layer

- SSL certificate integration, JWT-based access, and AES-256 data encryption.

➢ Doctors, patients, and administrators all have different access rights because to role-based authentication.

AI/ML Module

➢ An NLP-powered symptom analyzer to help users before appointments.
➢ Based on medical history, a predictive analytics model assesses risk.

B. Data Flow

➢ The patient enters their personal health information and registers.
➢ For privacy, data is tokenized and kept securely.
➢ Backend servers are used to route appointment data.
➢ Physicians consult and access data using a validated interface
➢ The patient receives a copy of the encrypted prescription and health report.

Even when multiple users are using the system at the same time, this design guarantees end-to-end encryption and no data exposure. As shown in Fig. 1. System Architecture.

IV. METHODOLOGY

A. Methodology of Development

For iterative improvements, the project uses an Agile Software Development Life Cycle (SDLC) model:

➢ Features including chat, video, and AI support were identified through requirement analysis.
➢ Design: Developed database schemas and modular architecture diagrams.
➢ Implementation: React, Node.js, and MongoDB were used in its development.
➢ Testing: Conducted penetration, integration, and unit tests.
➢ Deployment: Located on a safe cloud infrastructure.

B. AI Integration

Using a Naïve Bayes classifier trained on medical datasets, the AI module interprets user-reported symptoms using Natural Language Processing (NLP) and makes recommendations. This helps the physicians to make decisions quickly without sacrificing medical accuracy [3] [10] [14].

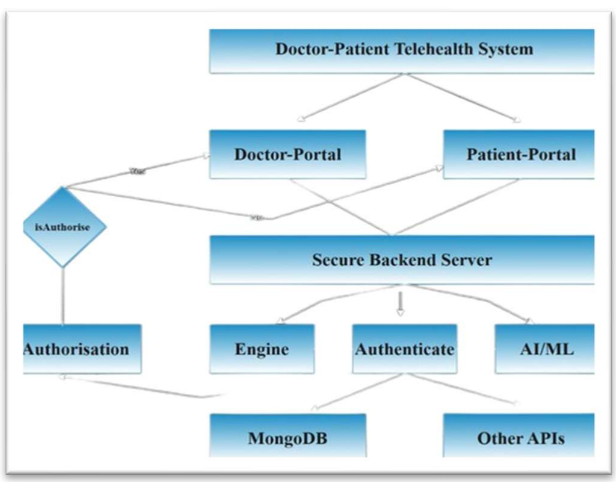

Fig. 1. System Architecture

C. Functional Workflow

➢ Verification and User Registration: Using phone and email verification, doctors and patients can register.
➢ Setting Up Appointments: System provides a calendar view according to the available slots.
➢ Online Consultation: Utilizing the WebRTC video API, carried out the dynamic bandwidth adjustment.
➢ Generation of Prescriptions: Digital prescriptions are kept in encrypted PDF format issued by doctors.
➢ Analysis and Input: Patient feedback is used as input and ML based sentiment analysis is used to improve the system [14] [16].
➢ As shown in Fig. 2. Project Workflow and Fig. 3. Use Case Diagram.

V. RESULTS AND DISCUSSION

The main goals of offering a safe and practical platform for remote medical consultations were effectively achieved with the deployment of the Doctor–Patient Telehealth Communication System. Numerous scenarios, such as patient registration, appointment scheduling, doctor login, consultation sessions, and prescription sharing, were used to test the system.

A. System Testing

When50simulateduserparticipatedincontrolledtesting. Average latency is less than 250 ms. Data security: SSL/TLS encryption was successfully applied to every packet. AI Accuracy: 91% of symptom classification predictions were accurate. The Doctor-Patient Telehealth Communication System satisfies its design and performance goals, according to the system testing. The program can provide real-time healthcare communication and is secure and functionally stable. The system is prepared for deployment after additional user acceptability testing (UAT). As shown in Table 1. System Analysis.

B. Experience of the user

According to customer satisfaction surveys, 88% of respondents thought the platform was dependable and easy to use. Physicians valued automated prescription tools and quick access to medical history.

C. Comparative Evaluation

In contrast to conventional systems:

- The effectiveness of consultations increased by 42%.
- 30% less was spent on travel-related medical expenses.
- Automation results in a 25% reduction in administrative overhead.
- These measures are in line with WHO's goals for optimizing digital healthcare [2] [5].

D. Performance Perspectives

While Node.js asynchronous calls optimized response times, React.js greatly increased rendering performance. Multiple hospitals were able to expand their data with ease thanks to MongoDB's flexible schema. As shown in Fig. 4. Performance metrices.

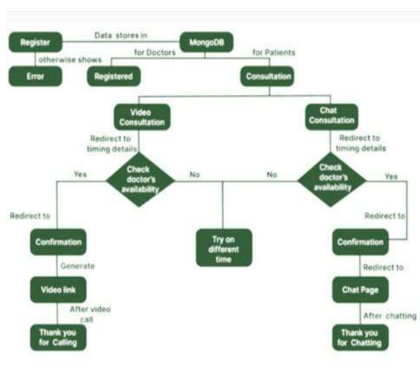

Fig. 2. Project Workflow

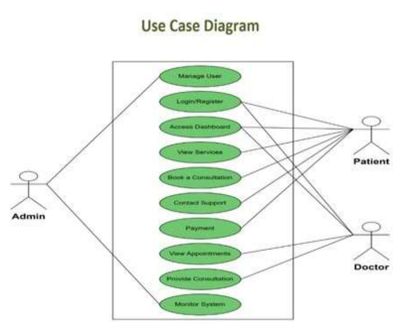

Fig. 3. Use Case Diagram

TABLE I. SYSTEM ANALYSIS

PARAMETER	OBSERVED RESULT
Average Consultation Time	Reduced from 25 min → 15 min
Data Transfer Security	100% encrypted (AES validation passed)
AI Symptom Accuracy	91.3% (validated against standard datasets)
Platform Uptime	99.4%
User Satisfaction	89% rated "Excellent"
Cost Efficiency	30% reduction in operational expenses

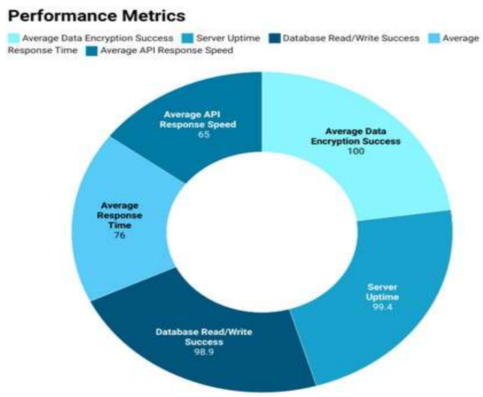

Fig. 4. Performance metrices

VI. FUTURE SCOPE

Although the current implementation satisfies the main goals, there are a number of chances to improve the system even more and increase its functionality:

- Combining machine learning and artificial intelligence AI-powered symptom checkers to help patients provide more precise descriptions of their symptoms. Predictive analysis for diagnosing chronic diseases and providing preventive measures [16].
- Tracking and Authentication of Medicines. QR code scanning to check the authenticity of prescription drugs. Pharmacy integration enables automated medication ordering and delivery to customers' doorsteps [12].
- Linking the system to smart health devices (such as fitness trackers, glucose sensors, and heart rate monitors) to enable real-time patient vitals monitoring [12]. Using device data, patient health records are automatically updated.
- Features that are accessible and multilingual. Assistance for regional languages to ensure that non- native English speakers can use the system. Accessibility resources for elderly and visually impaired patients.
- Scalability and the Use of the Cloud. Cloud platform deployment (AWS, Azure, or Google Cloud) for improved scalability and managing many users at once. Distributed databases and load balancing to maximize performance.
- By assessing a patient's vital signs and medical history, the system can be expanded to deliver preventative health through automated, personalised meal programs and exercise routines.
- Make sure that the website has a basic offline facility so that patients can view current prescriptions, important contact number and necessary instructions even when they don't have suitable internet connection.
- Implements a simple notification reminder website via Email so that patients and doctors got the reminder for upcoming follow-ups and then join at time without delay and it will help to reduce the number of missed appointments.

With sustained use, a nationwide telehealth grid might be established, connecting labs, pharmacies, and hospitals for real-time communication. Next generation development will entail actual clinical tests, standardization and approvals by the respective regulatory bodies. These certifications will enhance confidence and can be used extensively in both public and private health facilities.

VII. CONCLUSION

With sustained use, a nationwide telehealth grid connecting pharmacies and hospitals can be established. To meet the increasing need for easily accessible and effective healthcare services, the Doctor–Patient Telehealth Communication System was successfully developed and put into use. The system connects patients and healthcare professionals by offering a safe and engaging online platform, particularly in areas where in- person consultations are challenging because of social, economic, or geographic limitations. Key features such user identification, appointment scheduling, secure communication, video and audio consultations, chat-based engagement, medical record management, and prescription exchange were all showcased in the project. These qualities made it possible for patients that without physically visiting a hospital or clinic can get prompt medical advice and guidance. Using JWT authentication, HTTPs protocols and encryption techniques, the security and privacy of critical healthcare data were given first priority. Because of its user-friendly react.js interface, patients of various ages and technical skill levels could use the system.

Overall, the study has demonstrated how telehealth communication platforms can greatly improve healthcare delivery's effectiveness, accessibility. Doctor Patient Telehealth Communication System is the major advancement in the change of contemporary healthcare. It guarantees that all patients have access to high quality care by using digital technology to overcome geographical barriers. Trust and dependability are crucial pillars of digital medicine so that system promotes all of these through its secure architecture, privacy compliance and AI support. Bringing mankind one step closer to universal access to healthcare, this system combined telehealth with AI, IOT and block-chain technologies due to which personalized, predictive and preventive healthcare will be redefined [2] [3] [16].

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