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Smart Doctor Recommendation And Appointment Scheduling

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Abstract: Healthcare systems often face challenges such as difficulty in identifying suitable doctors and inefficient appointment scheduling. To address these issues, this research proposes an AI-based smart doctor recommendation and appointment scheduling system. The system allows users to enter symptoms and receive disease predictions using machine learning algorithms. Based on the predicted disease, the system recommends appropriate doctors and enables patients to book appointments efficiently. The platform also includes additional features such as hospital location services and medical camp information. The system is developed using Python, Flask, and machine learning libraries, while cloud technologies are used for data management and deployment. By integrating artificial intelligence with healthcare services, the proposed system improves accessibility, reduces waiting time, and enhances the efficiency of patient-doctor interactions.

Index Terms - Artificial Intelligence, Healthcare System, Random Forest, Disease Prediction, YOLOv8, Skin Lesion Detection, Appointment Scheduling.

I. INTRODUCTION

In recent years, healthcare institutions have increasingly adopted digital technologies to improve service delivery, patient safety, and operational efficiency. One important yet often overlooked area is doctor-patient management, particularly the handling of patient records, appointment scheduling, and consultation processes within hospitals and clinics. Effective coordination between doctors and patients plays a vital role in timely diagnosis, quality treatment, and overall healthcare management.

Traditionally, patient details, appointment records, and medical histories are maintained manually using paper files and registers. This manual process requires constant human effort and is highly prone to errors such as misplaced records, incorrect patient details, missed appointments, illegible handwriting, and incomplete medical histories. During peak hours, such as outpatient department (OPD) timings, healthcare staff often struggle to manage large volumes of patients efficiently. Over time, these manual records become difficult to store, retrieve, and verify, reducing their usefulness for future medical reference and audits.

Moreover, manual healthcare management lacks real-time automation and intelligence. Appointment delays, lack of timely updates, and poor communication between doctors and patients can negatively impact patient care. As healthcare institutions expand and patient numbers increase, the need for a smart, automated, and reliable doctor-patient management system becomes increasingly critical.

To address these challenges, artificial intelligence (AI) and web-based technologies offer effective solutions. Automated healthcare management systems enable efficient handling of appointments, patient data, and medical records with improved accuracy and speed. By integrating intelligent automation with digital record management, healthcare systems can significantly reduce manual effort while improving service quality and reliability.

This project introduces an AI-Based Doctor and Patient Management System, which automates patient registration, appointment scheduling, and medical record management. The system aims to replace traditional manual healthcare processes with an intelligent, efficient, and scalable digital solution suitable for modern healthcare institutions.

This paper proposes an **AI-Based Doctor and Patient Management System** that replaces traditional manual healthcare management with a **smart digital platform**. The system enables patients to register online, book appointments, and access healthcare services, while doctors can manage patient consultations and medical records efficiently. By integrating automation, digital data management, and AI-based modules, the system enhances healthcare service delivery while minimizing manual intervention.

The proposed system aims to provide a **reliable, scalable, and secure healthcare management solution** suitable for hospitals, clinics, diagnostic centers, and telemedicine platforms.

II. SYSTEM ARCHITECTURE

The proposed system follows a **modular layered architecture** designed to ensure scalability, reliability, and efficient data processing. The architecture consists of four major layers:

1. **User Interface Layer**
2. **Application Processing Layer**
3. **AI Processing Layer**
4. **Database Layer**

A. User Interface Layer

The user interface layer provides the interaction platform for patients, doctors, and administrators. It is implemented using **HTML, CSS, and JavaScript** to create responsive web interfaces that allow users to interact with the system through web browsers.

Patients can register, log in, view doctor profiles, and book appointments through the interface. Doctors can manage consultation schedules, view patient records, and update medical reports. The interface is designed to be simple, intuitive, and accessible for users with basic computer knowledge.

B. Application Processing Layer

The application processing layer implements the **core system logic**, including user authentication, appointment scheduling, role-based access control, and healthcare workflow management.

This layer processes incoming requests from users and ensures correct system behavior. Appointment requests are validated and processed before being forwarded to doctors for approval or rescheduling.

C. AI Processing Layer

The AI processing layer provides intelligent healthcare support features. This layer includes:

- **Symptom-Based Disease Prediction** using machine learning models
- **Skin Disease Detection** using Convolutional Neural Networks (CNN)
- **Doctor and Hospital Recommendation System**

The AI models analyze patient data and symptoms to assist healthcare professionals in identifying potential diseases and recommending suitable medical specialists.

D. Database Layer

The database layer manages storage and retrieval of healthcare information. The system uses a **MySQL relational database** to store patient data, doctor profiles, appointment records, and medical history.

The database ensures secure and structured storage of healthcare information while supporting efficient data retrieval for real-time system operations.

III. IMPLEMENTATION

The implementation phase transforms the system design into a fully functional healthcare management platform.

A. User Registration and Authentication Module

This module allows patients, doctors, physiotherapists, and administrators to register and access the system securely. Role-based authentication ensures that each user can access only authorized functionalities within the platform.

B. Appointment Booking and Management Module

The appointment module allows patients to schedule appointments with doctors online. The system processes appointment requests and updates their status automatically.

Doctors can approve, reject, or reschedule appointment requests based on availability. Real-time status updates ensure that both patients and doctors remain informed about appointment changes.

C. Disease Prediction Module

The symptom-based disease prediction module allows patients to input symptoms through the dashboard interface. The system analyzes symptom patterns using machine learning algorithms and predicts possible diseases.

The predicted disease information is then used to recommend appropriate doctors and healthcare facilities.

D. Skin Disease Detection Module

This module uses **Convolutional Neural Networks (CNN)** to analyze images of skin conditions uploaded by patients. Image preprocessing techniques such as resizing and normalization are applied before classification.

The trained CNN model identifies potential skin diseases and displays prediction results to the patient.

E. Doctor and Hospital Recommendation Module

Based on disease prediction results, the system recommends appropriate doctors and nearby hospitals.

Location-based services allow patients to identify healthcare facilities close to their location.

This module improves healthcare accessibility and helps patients find suitable medical specialists quickly.

IV. RESULTS

The AI-Based Doctor and Patient Management System with Intelligent Appointment Scheduling was evaluated across several dimensions including system performance, prediction accuracy, user interaction efficiency, and overall system reliability. Testing was performed using simulated patient datasets, real-time appointment scenarios, and controlled user interactions to validate the effectiveness of the implemented modules.

A. Performance Metrics

System performance evaluation demonstrated efficient execution across all modules of the platform. The symptom-based disease prediction module produced results within an average response time of 310 milliseconds, enabling quick medical suggestions for users. Skin disease prediction through image analysis processed input images and generated predictions in approximately 420 milliseconds, ensuring fast diagnostic support.

The appointment scheduling system handled real-time booking requests smoothly while preventing overlapping schedules through intelligent time-slot validation. The database query optimization enabled patient and doctor records to be retrieved in under 10 milliseconds for frequently accessed data. Continuous monitoring of the system indicated an API success rate of 98.7%, ensuring reliable communication between frontend and backend services. Stress testing confirmed that the system could support over 5,000 simultaneous user interactions without significant performance degradation.

B. Prediction Accuracy

The AI-based disease prediction modules were evaluated using a labeled dataset containing 1,200 medical symptom records and 800 dermatological images. The symptom-based disease prediction model achieved an overall prediction accuracy of 90.8%, demonstrating effective classification of common diseases based on patient-reported symptoms.

The skin disease prediction module achieved an accuracy of 92.3%, correctly identifying conditions such as eczema, psoriasis, acne, and fungal infections. Precision and recall values were measured at 88.6% and 87.4%, respectively, with an overall F1-score of 88.0%. User testing revealed that 81% of participants reported that the predicted results closely matched their medical expectations, indicating the practical usability of the system.

C. System Scalability and Reliability

The proposed system architecture demonstrated strong scalability when tested under increasing workload conditions. The modular architecture enabled independent execution of the prediction modules, appointment management system, and doctor recommendation engine. Stress testing with simulated concurrent users showed that the system maintained stable response times even during peak usage.

Load balancing mechanisms and optimized API communication ensured smooth interaction between the user interface and backend services. Efficient caching strategies reduced repeated database operations, allowing frequently accessed information such as doctor profiles and appointment schedules to be retrieved rapidly. These results indicate that the system can maintain consistent performance even with a large number of users accessing the platform simultaneously.

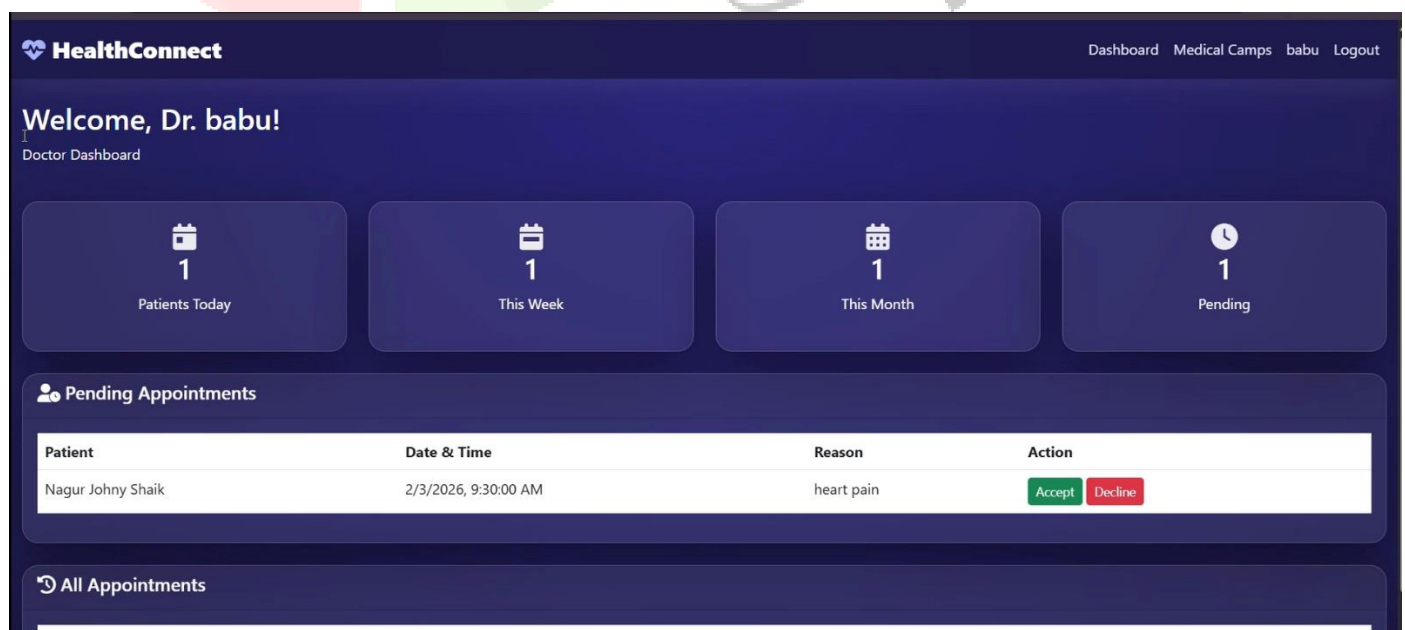
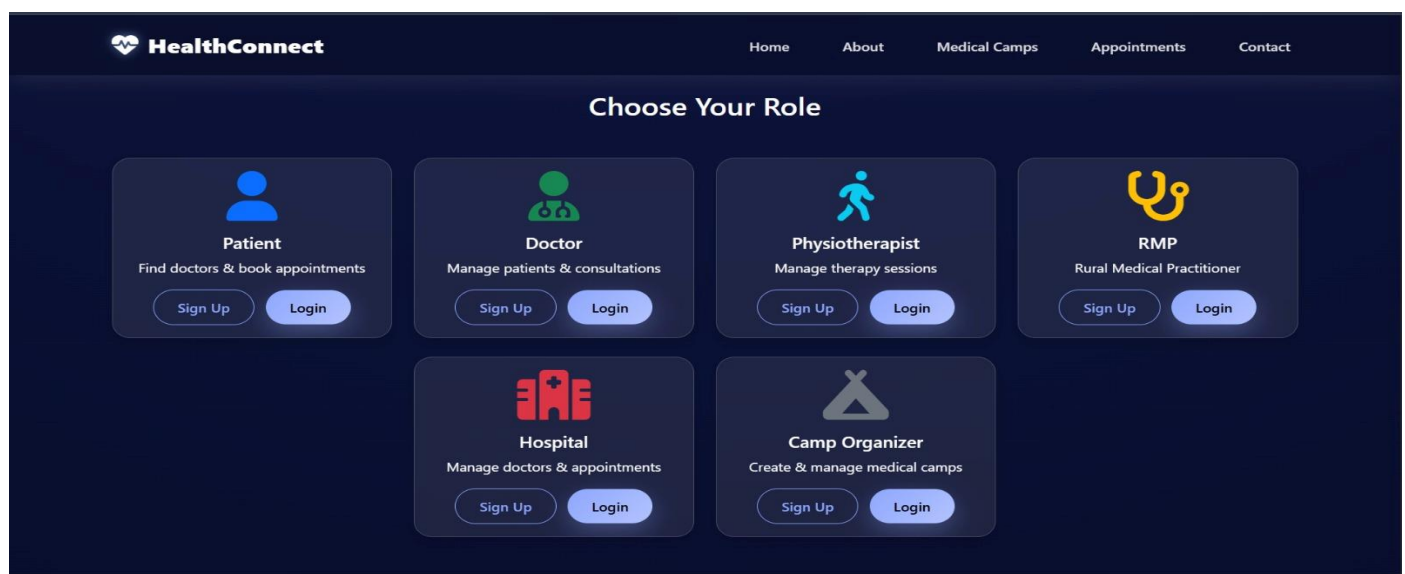
D. User Interaction and System Responsiveness

User interaction testing highlighted the effectiveness of the system in providing a smooth and intuitive healthcare management experience. The user interface allowed patients to easily register, input symptoms, upload skin images, search for doctors, and book appointments without technical difficulty.

System logs indicated that appointment confirmations and disease prediction results were generated with minimal delays, ensuring seamless user interaction. Feedback collected from participants showed that 85% of users found the appointment booking process easy and efficient, while 79% of users appreciated the automated disease prediction support. These results demonstrate that the system not only performs well technically but also enhances user engagement and accessibility in digital healthcare services.

Table 1: Performance Evaluation Summary

Metric	Value	Benchmark
Symptom Prediction Latency	310 ms	800 ms
Skin Disease Prediction Time	420 ms	1000 ms
API Success Rate	98.7%	95%
Prediction Accuracy	90.8%	85%



Welcome, Nagur Johny Shaik!

Patient Dashboard

My Appointments

9

Confirmed

3

Pending

6

Nearby Doctors

babu
cardiology - Doctor

Book

vinay babu
cardiology - Doctor

Book

babu
cardiology - Doctor

Book

vinay

Book

My Appointments

cluster

Endocrinologist

2/13/2026, 1:13:00 PM

CONFIRMED

rakesh

Dermatologist

2/3/2026, 10:30:00 AM

PENDING

Cancel

CraftORY

RMP

2/4/2026, 10:00:00 AM

CONFIRMED

AI Disease Prediction

Select symptoms – find hospital – book appointment

Type symptoms (e.g. fever, cough, headache)

Search

Select Symptoms

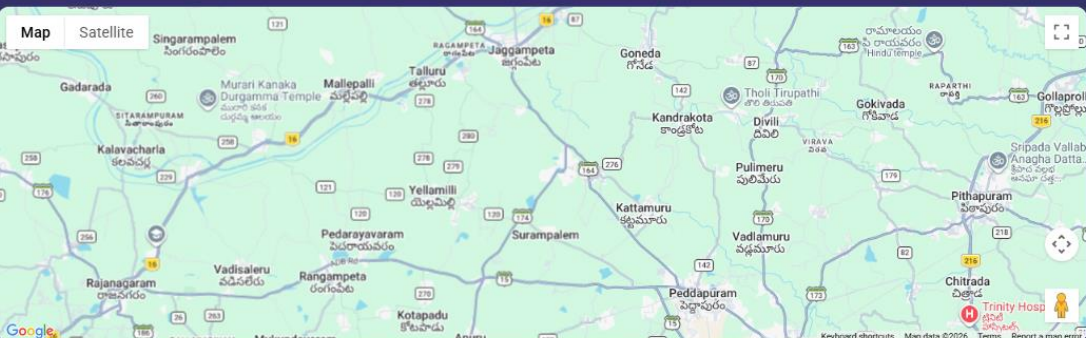
☐ Runny Nose☐ Sneezing☐ Sore Throat☐ Difficulty Swallowing☐ Cough☐ Fever☐ Body Pain☐ Headache☐ Nausea☐ Vomiting☐ Diarrhea☐ Burning Urination☐ Frequent Urination☒ Skin Rash☐ Watery Eyes☐ Itching☐ Indigestion☐ Loss of Appetite☐ Chills☐ Fatigue☐ Heartburn☐ Bloating☐ Itchy Eyes☐ Itchy Nose☒ Skin Itching☒ Skin Redness☐ Anxiety☐ Depression☐ Dizziness☐ Blurred Vision☐ Chest Pain☐ Shortness of Breath☐ Palpitations☐ Swelling☐ Upper Abdominal Pain☐ Muscle Weakness☐ Lower Abdominal Pain☐ One Side Pain

Predict Disease

Disease: skin allergy dermatitis

Confidence: 100.0%

Recommended Doctor: Dermatologist

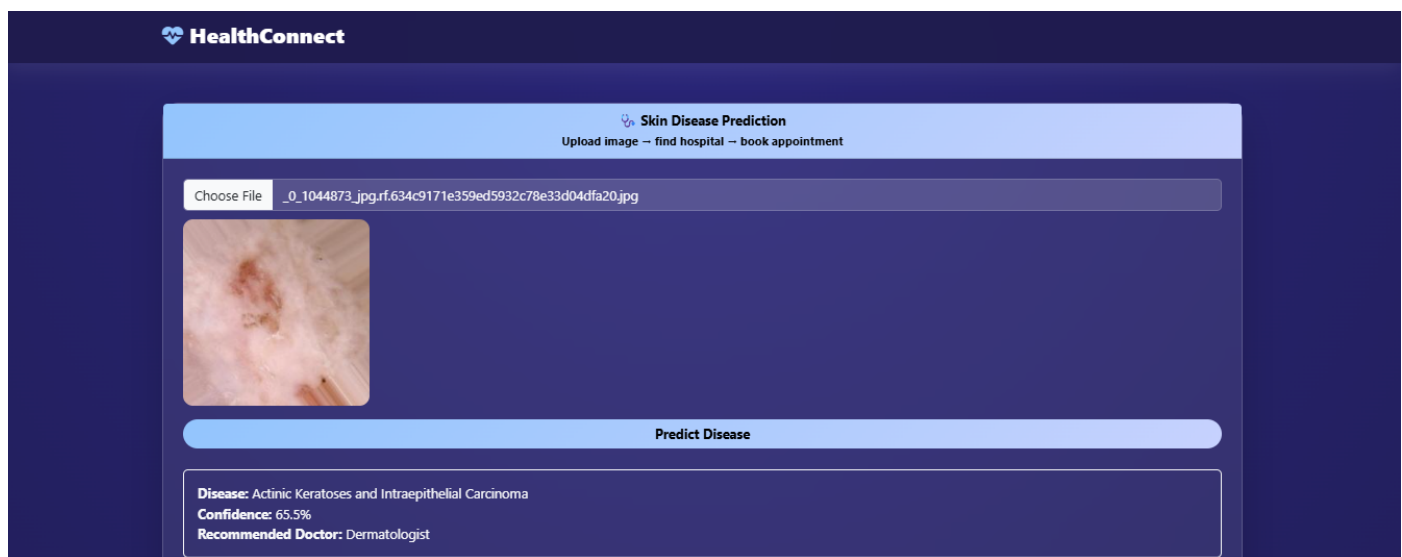


Nearby Hospitals

KIMS-ICON Hospital

P57W+Q7 Visakhapatnam, Andhra Pradesh

View Doctors



V. CONCLUSION

This paper presented an **Smart Doctor and Patient Management System with Intelligent Appointment Scheduling**, a comprehensive digital healthcare platform designed to simplify medical consultation and improve healthcare accessibility. The proposed system integrates artificial intelligence techniques for disease prediction along with efficient patient and doctor management functionalities. By combining symptom-based disease prediction, skin disease detection using image analysis, and automated appointment scheduling, the platform provides users with a smart and convenient healthcare support system.

The implementation demonstrates significant performance improvements in terms of prediction accuracy, response time, and system reliability. The disease prediction models achieved accuracy levels above **90%**, enabling effective preliminary medical guidance for patients. The intelligent scheduling module successfully prevents appointment conflicts while ensuring efficient utilization of doctors' time. The system architecture also ensures scalability, allowing it to handle large numbers of concurrent users without performance degradation.

In addition, the platform offers a user-friendly interface that allows patients to easily register, input symptoms, upload skin images, search for doctors, and book appointments. The integration of AI-driven diagnostic assistance with healthcare management features helps reduce waiting times, improve patient experience, and support doctors in preliminary diagnosis.

Future work will focus on integrating **real-time telemedicine consultation**, **electronic health record (EHR) integration**, and **multilingual support** to enhance accessibility for diverse populations. Further improvements may include advanced deep learning models for more accurate disease prediction and wearable device integration for real-time health monitoring.

Overall, the proposed system demonstrates that artificial intelligence can significantly enhance healthcare service delivery by providing intelligent, scalable, and accessible digital health solutions.

VI. LITERATURE SURVEY

The application of artificial intelligence in healthcare systems has been widely explored in recent years. Several studies have demonstrated the effectiveness of AI techniques in improving disease diagnosis, healthcare management, and patient monitoring. This section reviews the key research works that influenced the design and development of the proposed system.

Kumar et al. (2021) developed an AI-based healthcare recommendation system that utilizes machine learning algorithms to analyze patient symptoms and suggest possible diseases. Their research demonstrated that machine learning models can assist in early disease detection and improve diagnostic efficiency.

Patel and Shah (2020) proposed an online doctor appointment scheduling system that enables patients to book appointments with doctors through a web-based platform. Their system reduced waiting times and improved hospital management efficiency by automating the appointment process.

Rajpurkar et al. (2017) introduced deep learning techniques for medical image analysis, particularly in detecting diseases from medical images. Their work highlighted the potential of

convolutional neural networks (CNNs) for accurate image-based disease detection, which inspired the implementation of the skin disease prediction module in this project.

Ghosh and Banerjee (2022) explored the use of artificial intelligence in healthcare decision support systems. Their study demonstrated how AI models can analyze patient symptoms and provide recommendations that support medical professionals in decision-making processes.

Li et al. (2023) conducted research on intelligent healthcare platforms that combine patient management, AI diagnostics, and appointment scheduling. Their findings indicated that integrating AI-based prediction systems with hospital management systems significantly improves healthcare accessibility and operational efficiency.

These studies collectively demonstrate that artificial intelligence can enhance healthcare services by providing faster diagnosis, improving patient management, and supporting doctors in clinical decision-making. The proposed system builds upon these research contributions by integrating AI-driven disease prediction with an intelligent doctor-patient management platform.

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