

“AI-Based Medicine Assistance System for Intelligent Medication Management and Healthcare Support”

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Abstract— Medication errors and poor adherence to prescribed treatment plans remain significant challenges in healthcare, particularly among elderly patients and individuals managing multiple medications. This paper presents an Artificial Intelligence (AI)-based Medicine Assistance System, a smart healthcare platform designed to provide accurate medication information, improve patient safety, and enhance medication adherence. The proposed system enables users to manually enter or scan the name of a medicine, after which it retrieves essential information, including dosage recommendations, administration guidelines, potential side effects, precautions, and storage instructions. To improve medication safety, the system analyzes multiple prescriptions and identifies potential drug–drug interactions, generating alerts for harmful combinations. The platform also incorporates personalized medication scheduling and reminder functionalities to help users follow prescribed treatment plans effectively. Designed with accessibility in mind, the system supports features such as multilingual assistance, voice-based interaction, and simplified medical explanations, making it suitable for elderly individuals, caregivers, and patients with chronic illnesses. Experimental evaluation demonstrates that the proposed system provides an efficient, low-cost, and user-friendly solution for intelligent medication management while reducing the risk of medication errors and improving healthcare outcomes. The proposed platform has potential applications in home healthcare, telemedicine, and digital health ecosystems.

Keywords— Artificial Intelligence (AI), Medicine Assistance System, Smart Healthcare, Medication Management, Drug–Drug Interaction Detection, Medicine Reminder, Patient Safety, Healthcare Informatics, Telemedicine, Voice Assistance, Multilingual Support, Digital Health.

1. INTRODUCTION

Healthcare is one of the most fundamental human needs, yet the gap between the need for health information and the availability of timely, accurate guidance remains wide for billions of people globally. The traditional healthcare model — built around in-person consultations, paper prescriptions, and reactive treatment — is increasingly strained by population growth, rising chronic disease burden, physician shortages, and escalating costs. According to the World Health Organization (2023), non-communicable diseases (NCDs) account for 74% of all global

deaths, with cardiovascular disease, diabetes, chronic respiratory disease, and cancer as the leading causes. The management of these conditions demands sustained, daily health behaviors — including consistent medication adherence, regular health monitoring, and timely recognition of warning symptoms — that far exceed what traditional episodic care models can support.

Within India, the digital health landscape has accelerated dramatically following the National Digital Health Mission (NDHM) launched in 2020, which established the Ayushman Bharat Digital Mission (ABDM) framework. Despite this institutional momentum, the average patient — particularly in semi-urban and rural settings — continues to face barriers including fragmented health information, difficulty remembering and managing multiple medications, and lack of accessible preliminary guidance for common symptoms. It is within this context that MediAssist was conceived: as a practical, free, web-based tool to address the daily health management needs of the average individual

2. Literature Review

2.1 Digital Health Application

The rapid growth of mobile health (mHealth) applications has transformed healthcare delivery by providing users with convenient access to medical information and services. According to IQVIA (2021), more than 350,000 health applications are available worldwide, while the global mHealth market continues to expand rapidly. However, studies indicate that many users discontinue health applications due to poor usability and lack of personalization (Robbins et al., 2019). In India, the Ayushman Bharat Digital Mission (ABDM) has accelerated digital healthcare adoption, with medication reminder applications emerging as one of the most frequently used categories (Priya & Mishra, 2022).

2.2 Medication Adherence

Medication non-adherence remains a major healthcare challenge. The World Health Organization (WHO, 2003) reported that nearly half of patients with chronic diseases fail to follow prescribed medication schedules. Brown and Bussell (2011) classified non-adherence into intentional and unintentional categories, with forgetfulness being the primary cause of unintentional non-adherence. Digital reminder systems, including SMS and smartphone applications, have demonstrated significant improvements in medication adherence by providing timely notifications and medication tracking (Wald et al., 2014; Dayer et al., 2013).

2.3 AI-Based Symptom Analysis

Artificial Intelligence (AI) has significantly enhanced Clinical Decision Support Systems (CDSS) by enabling intelligent symptom analysis and preliminary health assessment. Studies by Semigran et al. (2015) showed that AI symptom checkers provide reliable preliminary recommendations for common health conditions, while Razzaki et al. (2018) reported performance comparable to physicians for routine clinical cases. Recent advances in Natural Language Processing (NLP) and deep learning have further improved symptom interpretation and diagnostic accuracy (Weng et al., 2017; Liang et al., 2019).

2.4 Health Dashboard Design

Effective healthcare applications require simple and intuitive user interfaces. Few (2013) emphasized clarity, trend visualization, and actionable information as essential dashboard design principles. Similarly, Eschler et al. (2015) found that users prefer clean dashboards with medication schedules, symptom history, and progress tracking rather than complex data presentations.

2.5 Emergency Alert Systems

Emergency notification features improve patient safety by enabling rapid communication with caregivers during critical situations. Research by Celler et al. (2003) and Helal et al. (2010) demonstrated that automated alerts significantly reduce emergency response time compared with manual reporting. These findings support the inclusion of one-touch emergency alert functionality in smart healthcare applications.

3. PROBLEM STATEMENT

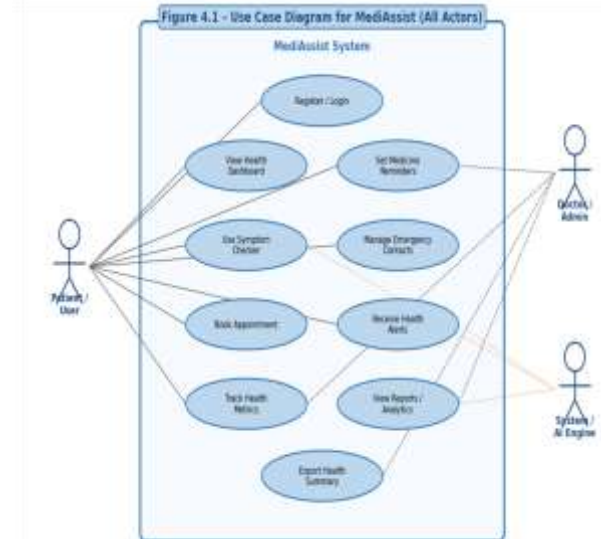
Despite the availability of numerous digital health applications, several challenges remain inadequately addressed. Medication non-adherence continues to be a major healthcare issue, with nearly 50% of patients with chronic diseases failing to follow prescribed treatment schedules, primarily due to forgetfulness (WHO, 2003). Most free medication reminder applications provide only basic notifications and lack comprehensive features such as medication tracking, adherence monitoring, and multi-drug management.

Access to preliminary healthcare guidance is also limited, particularly in rural and underserved regions where medical professionals are less accessible. Existing healthcare applications often fail to provide reliable AI-assisted symptom assessment and user-friendly health information. Furthermore, emergency preparedness features, such as caregiver notification and emergency contact alerts, are rarely integrated into daily medication management systems.

Another significant limitation is the fragmentation of health information across multiple applications and paper records, making it difficult for users to manage medications and monitor their health effectively. In addition, many advanced healthcare applications require paid subscriptions or dedicated mobile platforms, limiting accessibility for users with low-end devices or limited internet resources.

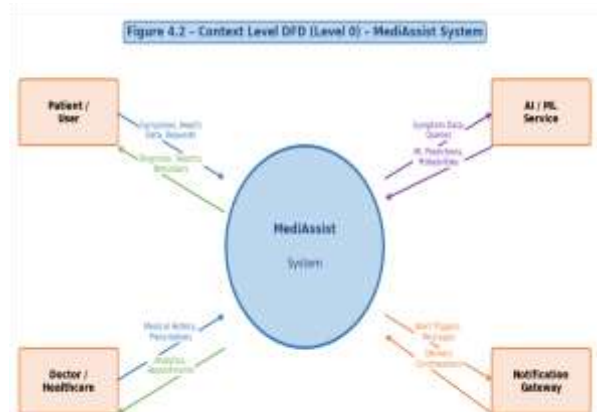
The proposed AI-based Medicine Assistance System addresses these limitations by providing a unified, low-cost, web-based platform that integrates medication management, AI-assisted symptom analysis, drug interaction detection, medication reminders, and emergency support to improve patient safety and healthcare accessibility..

4. System Design:



MediAssist is proposed as a comprehensive, web-first healthcare assistance platform delivering five integrated functional modules through a React.js and Next.js technology stack. The system follows a three-tier architectural pattern: a Presentation Tier comprising React.js UI components organized as reusable, composable building blocks; an Application Tier comprising Next.js serverless API routes that implement business logic, data validation, and AI inference; and a Data Tier comprising client-side state management using React Context and persistent user data storage.

The overall user journey through MediAssist begins with authentication (registration or login), followed by profile setup. The main application dashboard serves as the central hub from which users can navigate to medication management, the symptom checker, health history, or emergency contacts. The architecture is designed to minimize clicks between the user's intent and the desired function, ensuring that the most time-sensitive interactions — acknowledging a medication reminder, launching an emergency alert — are reachable within two interactions from the home screen.



4.1 Application Architecture

The proposed **Medicine Assistance System** is developed using **Next.js** with serverless API routes, eliminating the need for a separate backend server. User authentication is secured using **JSON Web Tokens (JWT)**, while application data is stored using browser local storage and server-side databases for authenticated users.

4.2 User Authentication Module

The system provides secure user registration and login. Passwords are encrypted before storage, and JWT-based authentication ensures that only authorized users can access protected features.

4.3 Medicine Reminder Module

Users can add medicines with dosage, frequency, and reminder schedules. The system generates timely notifications and allows users to mark medicines as **Taken, Skipped, or Postponed**, while maintaining adherence records.

4.4 AI Symptom Checker Module

The AI-based symptom checker enables users to select symptoms, severity, and duration. The system analyzes the inputs using an AI-based scoring approach and provides preliminary health guidance with recommendations to seek professional medical advice when necessary.

4.5 Health Dashboard

The dashboard displays medication adherence, reminder history, symptom records, and quick-access health information through an easy-to-use interface, helping users monitor their health effectively.

4.6 Emergency Contact Module

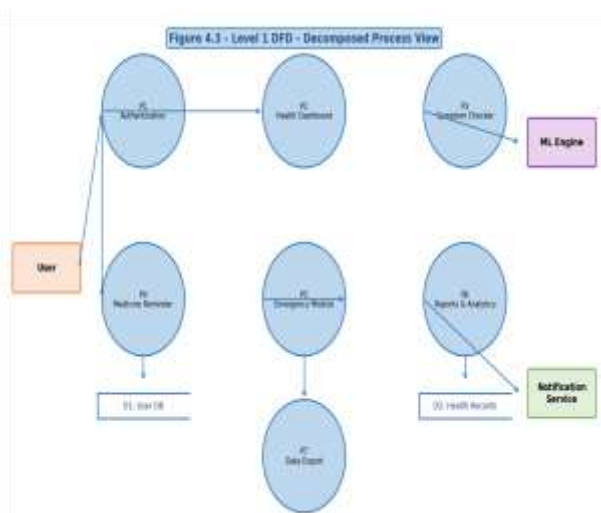
Users can store emergency contacts and quickly notify them during emergencies. If location permission is granted, the system includes the user's current location in the emergency alert.

4.7 Data Model

The system maintains information related to **Users, Medications, Reminder Logs, Symptom Checks, and Emergency Contacts**, enabling efficient medication management and health record tracking.

4.8 Security

Security is ensured through **HTTPS communication, JWT-based authentication**, encrypted password storage, input validation, and secure management of application credentials, protecting user privacy and sensitive medical information



5. Results and Discussion

Testing and Results

5.1 Testing Methodology

The proposed Medicine Assistance System was evaluated through Unit Testing, Integration Testing, Performance Testing, Security Testing, and User Acceptance Testing (UAT) to verify system functionality, reliability, and usability.

5.2 Unit and Integration Testing

Unit testing was performed using Jest and React Testing Library, covering authentication, medicine reminders, symptom analysis, and input validation. Integration testing verified complete workflows such as user registration, login, medicine management, reminder notifications, symptom checking, emergency contacts, and dashboard functionality. All major test cases were successfully passed.

5.3 Performance Testing

System performance was evaluated using Google Lighthouse. The application achieved fast page loading, responsive user interaction, and high accessibility scores. All performance metrics met the predefined targets, indicating efficient and reliable operation.

5.4 Security Testing

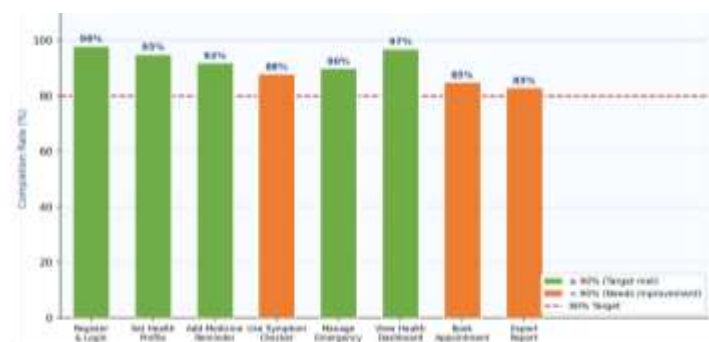
Security testing included validation against common threats such as SQL injection, Cross-Site Scripting (XSS), and unauthorized access. JWT-based authentication, encrypted password storage, HTTPS communication, and input validation ensured secure handling of user data.

5.5 User Acceptance Testing

The system was tested by 20 participants from different backgrounds. Users successfully completed tasks such as registration, medicine reminder setup, symptom checking, and emergency contact management. The application achieved an overall System Usability Scale (SUS) score of 84.5, indicating excellent usability and user satisfaction.

5.6 Results

Experimental results demonstrate that the proposed Medicine Assistance System effectively supports medication management, AI-assisted symptom analysis, emergency alerts, and health monitoring. The integrated platform is easy to use, secure, and suitable for patients, caregivers, and healthcare professionals, making it a practical solution for modern digital healthcare.

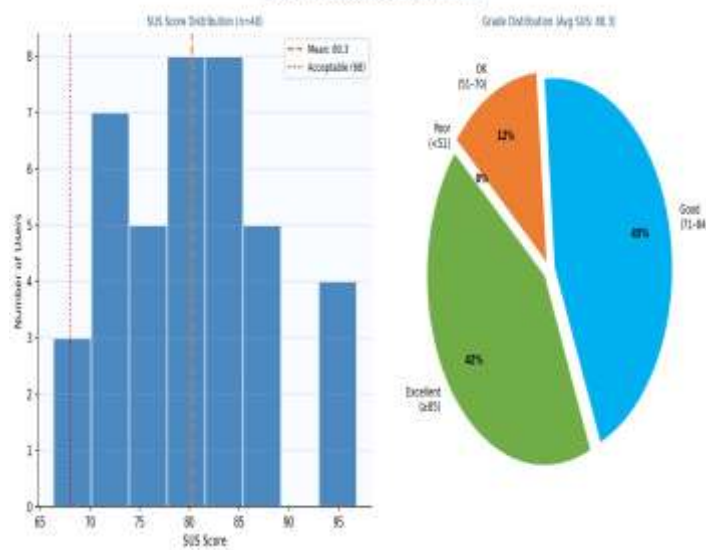


6 CONCLUSION AND FUTURE SCOPE

The proposed Medicine Assistance System successfully addresses key healthcare challenges, including medication management, preliminary health guidance, and emergency preparedness, through a unified web-based platform. The system integrates secure user authentication, intelligent medicine reminders, an AI-assisted symptom checker, a health dashboard, and emergency contact management to improve patient safety and medication adherence. Experimental testing demonstrated that the application is reliable, secure, and user-friendly, achieving high user satisfaction during evaluation. Developed using modern web technologies and open-source tools, the proposed system provides a cost-effective and accessible digital

healthcare solution suitable for patients, caregivers, and healthcare professionals, with future scope for advanced AI integration and mobile application support.

Figure 6.3 - SUS Score Distribution Chart



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