

# **RV UNIVERSITY, BENGALURU-59**

## **SCHOOL OF COMPUTER SCIENCE AND ENGINEERING**



A Project Report On

**MediZap**

Submitted in partial Fulfillment for the award of degree of

B.Tech(Honors)

In

School of Computer Science and Engineering

Submitted By

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## DECLARATION

We hereby declare that the project report entitled **MediZap** submitted by **Prajna(1RVU23CSE339)**, **N Sanjana(1RVU23CSE292)**, **Noothan K T(1RVU23CSE320)**, **Prabhat M Masali(1RVU23CSE337)** to RV University, Bengaluru, is a record of bona fide work carried out by us under the supervision of **Prof.Shankar**, School of Computer Science and Engineering, RV University. We further declare that this work has not been submitted to any other institution for the award of any degree or diploma.

Place: Bengaluru

Date:12-11-2025

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## CERTIFICATE

This is to certify that the project report entitled **MediZap** submitted by **Prajna(1RVU23CSE339), N Sanjana(1RVU23CSE292), Noothan K T(1RVU23CSE320), Prabhat M Masali(1RVU23CSE337)**, School of Computer Science and Engineering, RV University, Bengaluru, for the award of the degree of B.Tech (H) in Computer Science, is a record of bona fide work carried out under my supervision.

Signature of the Guide

Prof. Shankar

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## ACKNOWLEDGEMENT

We express our sincere gratitude to **Prof. Shankar**, our project guide, for their guidance, continuous support, and encouragement throughout this project. We extend our thanks to the Dean **Dr.Shobha G**, Program Director **Dr.Sudhakar K N**, and all faculty members of the School of Computer Science and Engineering for their valuable inputs. We are also thankful to our peers, friends, and family for their constant support and motivation.

## ABSTRACT

*MediZap* is an AI-driven telemedicine and healthcare management platform designed to improve accessibility, accuracy, and efficiency in personal healthcare. In today's dynamic healthcare environment, individuals often face challenges in maintaining medical records, understanding prescriptions, and adhering to treatment plans. *MediZap* addresses these issues through an intelligent, user-centric system that unifies multiple healthcare services within a single platform.

The platform features an **AI-powered chatbot** that provides instant medical guidance based on prescriptions or user-described symptoms. Using **Optical Character Recognition (OCR)**, it digitizes handwritten prescriptions into structured records for better clarity and traceability. In addition, *MediZap* includes **smart reminders**, **daily health updates**, and **cloud-based data management** to ensure timely medication intake and continuous health awareness.

By integrating Artificial Intelligence, Cloud Computing, and NLP, *MediZap* empowers users to take proactive control of their health, enhances medication adherence, and contributes to a more connected and intelligent healthcare ecosystem.

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# 1. Introduction

In today's fast-paced and technology-driven world, access to timely and reliable healthcare remains a significant challenge, particularly in remote and underserved regions. *MediZap* is an **AI-powered telemedicine platform** designed to bridge this gap by offering users a smart, accessible, and automated healthcare experience.

The platform allows users to upload prescriptions or describe symptoms through an **interactive AI chatbot** powered by **Natural Language Processing (NLP)** and **Machine Learning (ML)** algorithms. These intelligent models validate prescriptions, recommend appropriate medications, and detect potential drug interactions to ensure safe and effective treatment.

To further enhance user convenience, *MediZap* integrates features such as **automated medicine reminders**, **prescription digitization**, and **pharmacy availability checks**. A dedicated **Pharmacist Dashboard** enables pharmacists to efficiently manage medicine inventories and update availability in real time. Additionally, the system includes **location-based services** to help users locate nearby pharmacies and hospitals using a simple pincode-based search.

By combining the capabilities of **AI, Cloud Computing, and Data Analytics**, *MediZap* aims to revolutionize healthcare accessibility and efficiency—empowering individuals to make informed health decisions and fostering a more connected digital healthcare ecosystem.

## 2. Objectives

The primary objective of this project is to develop **MediZap**, an AI-powered telemedicine platform designed to enhance healthcare accessibility, accuracy, and responsiveness. The system integrates Artificial Intelligence, Natural Language Processing, and Cloud Computing to deliver an intelligent and user-friendly healthcare experience.

The specific objectives are as follows:

1. **Prescription and Symptom Input:**  
To enable users to conveniently upload prescriptions or describe their symptoms through an interactive AI chatbot.
2. **AI-Powered Validation:**  
To employ artificial intelligence for validating prescriptions, recommending appropriate medications, and detecting potential drug interactions.
3. **Smart Health Management:**  
To promote user engagement through smart medicine reminders, treatment adherence notifications, and clear guidance on medicine usage.
4. **Location-Based Healthcare Services:**  
To help users locate nearby pharmacies and hospitals using a pincode-based search for improved accessibility.



### 3. Literature Survey

Recent research in healthcare shows the transformative potential of advanced data-techniques across multiple domains. The study “The Role of Natural Language Processing in Medical Data Analysis and Healthcare Automation” explores how natural language processing (NLP) can ingest and structure unstructured clinical text, enabling automation of data extraction and decision support in health systems. The paper “Enhanced Medication Reminder and Alert System using IoT” presents an IoT-based framework to improve medication adherence via reminders and automated alerts linked to sensor connectivity infrastructure. In “Extracting Information from Drug Label Using Image and Text Processing” (not fully retrieved) the authors address combining image and text processing to extract structured content from drug labels, improving regulatory and pharmacy workflows. Similarly, “Supply Chain Efficient Inventory Management as a Service Offered by a Cloud-based Platform” investigates how cloud platforms facilitate inventory/service management across supply chains—applicable in healthcare logistics. The “Handwritten to Text Document Converter” tackles the conversion of handwritten documentation into digital text, thereby reducing manual transcription burdens. The “Med-Chatbot: Predicting Diseases From Symptoms Using NLP” leverages NLP-based symptom analysis for disease prediction, reflecting the shift towards conversational AI in healthcare. Finally, the two survey-type works—“Fine-Tuning Large Language Models for Domain Adaptation: Exploration of Training Strategies, Scaling, Model Merging and Synergistic Capabilities” and “Parameter-Efficient Fine-Tuning for Large Models: A Comprehensive Survey”—review strategies for adapting large language models (LLMs) and parameter-efficient fine-tuning, pointing to methods that future healthcare systems may adopt. Across these studies, despite strong advances, consistent gaps remain in domain-specific adaptation, real-time integration, and end-to-end system deployment.

#### Research-Gaps:

- Many systems use NLP or IoT in isolation; few integrate multimodal data (text + image + sensor) within one holistic healthcare workflow.
- Real-time, large-scale deployment remains underexplored: many prototypes remain in lab or pilot mode without robust scaling across clinical settings.
- Domain adaptation of large models (LLMs) for healthcare is still immature—few solutions finely tune models on medical-specific corpora with verified performance in live environments.
- User-centric design, such as explainability, trust, and human oversight in automated healthcare systems (e.g., chatbots, alerts) is insufficiently addressed.
- Logistics and supply-chain studies in healthcare (inventory, medication transport) often treat the problem abstractly and lack integration with clinical decision systems or patient-facing layers.

## 4. Project Description and Design

### 2.1 Project Description

*MediZap – Meds at Lightning Speed, Powered by AI* is an innovative telemedicine platform that leverages Artificial Intelligence (AI), Cloud Computing, IoT, and Natural Language Processing (NLP) to overcome inefficiencies in traditional e-pharmacy systems. The project aims to create a seamless, intelligent healthcare experience by automating key processes such as prescription validation, medicine availability checks, and symptom-based assistance.

The platform enables users to upload prescriptions or describe symptoms through a chatbot powered by fine-tuned **Large Language Models (LLMs)** such as *Gemini* or *LLaMA*. These AI models validate prescriptions, identify potential drug interactions, and provide real-time medical recommendations. To ensure instant access to medications, *MediZap* connects with local pharmacies using **Firestore** and **FastAPI**, allowing users to locate and receive medicines quickly and securely.

In addition to medicine management, *MediZap* offers features such as **daily health news**, **smart medication reminders**, and **cloud-based prescription storage**. Its modular, cloud-integrated architecture ensures high scalability, data privacy, and rapid AI inference through **GCP Cloud Functions**. Overall, *MediZap* enhances healthcare accessibility, accuracy, and responsiveness while promoting proactive and informed health decisions.

### 2.2 System Design

The design of *MediZap* follows a **modular and service-oriented architecture (SOA)** that ensures scalability, flexibility, and maintainability. Each module performs a specific function and communicates with others through secure APIs and cloud-based integration.

#### 1. Frontend (User Interaction Layer)

- Developed using **React.js** for a responsive and user-friendly interface.
- Includes modules for **chatbot communication**, **prescription upload**, **reminder management**, and **health news display**.
- Communicates with backend services via **REST APIs** and **WebSockets** for real-time data synchronization.

#### 2. Backend (Application Logic Layer)

- Implemented using **FastAPI** for high-performance, asynchronous request handling.
- Manages AI inference requests, real-time inventory updates, and prescription validation workflows.

### 3. AI/ML Components

- **Gemini / LLaMA LLMs** fine-tuned for medical context understanding to analyze symptoms and generate chatbot responses.
- **OCR Models (Tesseract + Deep Learning)** for extracting structured text from handwritten prescriptions.
- **Scikit-learn models** for disease prediction and estimated medicine delivery time analysis.

### 4. Cloud Infrastructure

- **Firebase** for user authentication, real-time database management, and notification delivery.
- **AWS Lambda / GCP Cloud Functions** for serverless deployment and AI model inference scalability.
- **Firestore** for structured storage of user data, prescriptions, and transaction history.

### 5. Core Functional Modules

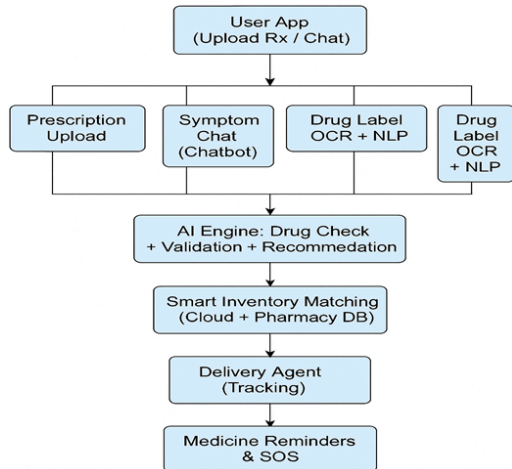
- **Prescription Upload & OCR Parsing:** Converts handwritten prescriptions into readable digital records.
- **Symptom Chatbot:** Interprets user symptoms and suggests appropriate medication or next steps.
- **Drug Safety Checker:** Validates prescriptions and detects harmful drug interactions.
- **Smart Reminders:** Sends scheduled notifications for medicine intake and prescription refills.

## 2.3 Design Overview

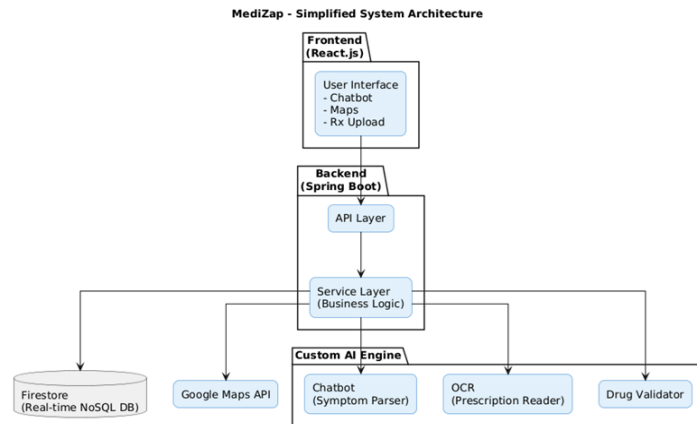
The system follows a **three-tier architecture** to ensure efficient operation and separation of concerns:

- **Presentation Layer:** React-based web interface for seamless user interaction.
- **Application Layer:** FastAPI backend managing AI logic, API communication, and business rules.
- **Data Layer:** Firebase, Firestore, and cloud functions for secure storage, data retrieval, and scalability.

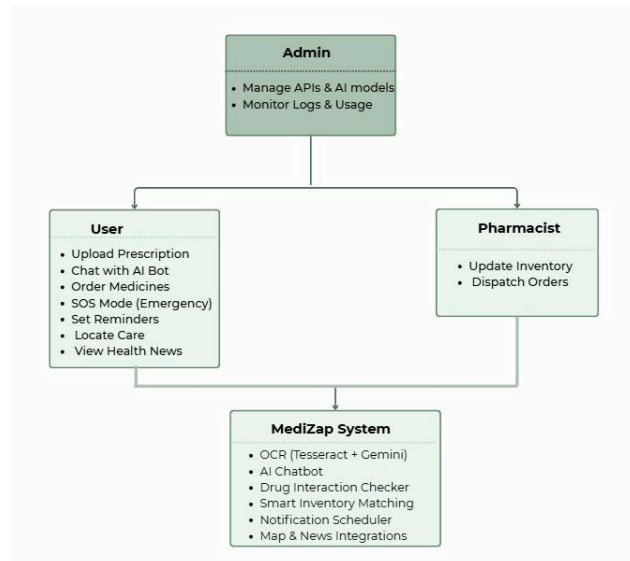
Together, these layers form a cohesive **AI-powered healthcare ecosystem** that enables real-time decision-making, intelligent prescription handling, and user-centric medical support.



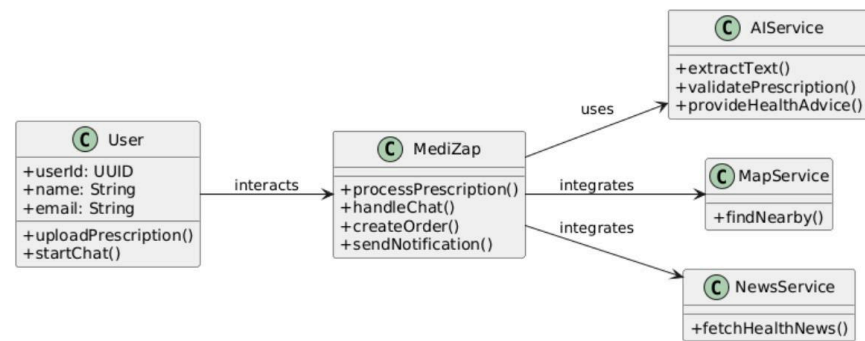
2.3.1 High-Level Functional Flow Diagram



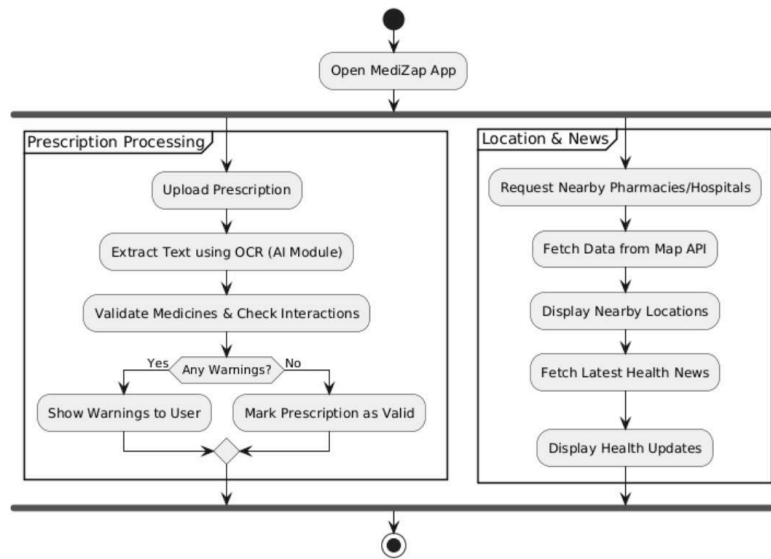
2.3.2 Simplified System Architecture



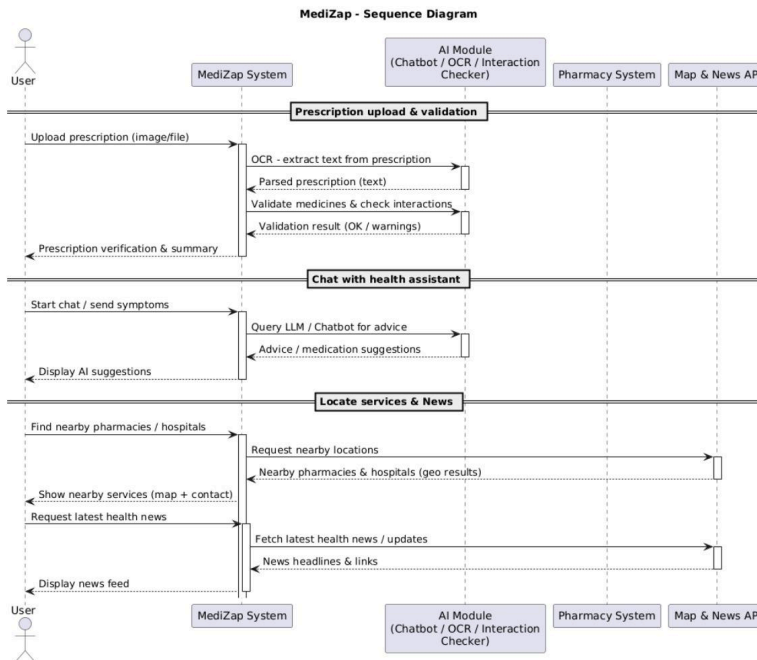
2.3.3 User Diagram



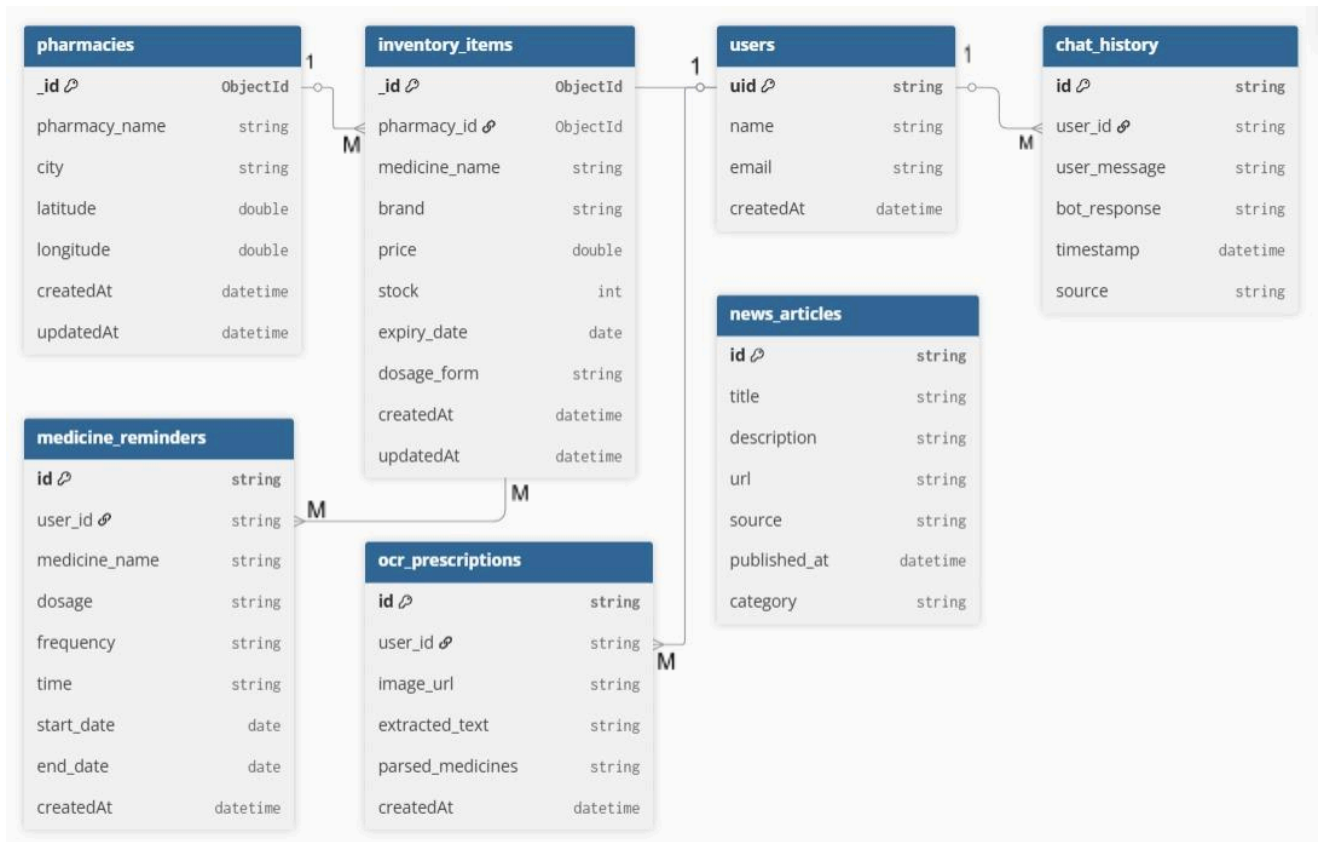
2.3.4 Class Diagram



2.3.5 Activity Diagram



2.3.6 Sequence diagram



2.3.7 Schema diagram

## 5. Methodology / Technical Implementation

### 3.1 Proposed Methodology

The development of **MediZap** adopts a modular, AI-integrated methodology focused on efficiency, scalability, and intelligent healthcare automation. The approach seamlessly combines **Optical Character Recognition (OCR)**, **Natural Language Processing (NLP)**, **Machine Learning (ML)**, and **Cloud Computing** to deliver a unified and responsive telemedicine experience.

The methodology is divided into six core modules, each designed to perform a distinct healthcare function while maintaining interoperability across the platform.

#### 1. Prescription Upload and Parsing

- **Input:** Users upload handwritten or digital prescriptions via the platform.
- **Processing:** The uploaded prescriptions are processed using **OCR (Tesseract)** and deep learning models to extract details such as medicine names, dosage, and doctor notes.
- **Post-Processing:** NLP-driven text correction and medical entity extraction refine the output for readability and accuracy.
- **Validation:** The extracted data is validated against medical drug databases using **Gemini LLM** to detect inconsistencies and ensure correctness.
- **Storage:** Cleaned prescription data is securely stored in **Firebase Firestore**, linked with user profiles for future access.

#### 2. AI Chatbot for Symptom Analysis and Guidance

- **Frontend:** A conversational chatbot enables users to describe symptoms in plain language.
- **Backend AI:** A fine-tuned **Gemini or LLaMA Large Language Model (LLM)** interprets user input, identifies intent, and provides symptom-based recommendations.
- **Prediction Models:** ML algorithms such as **Decision Trees** and **K-Nearest Neighbors (KNN)** predict likely health conditions.

- **Safety Integration:** The chatbot cross-verifies possible drug interactions before suggesting over-the-counter medications or recommending doctor consultations.
- **Personalization:** Responses adapt over time based on previous user interactions for improved accuracy and experience.

### 3. Drug Safety and Interaction Validation

- Integrates with verified sources like **OpenFDA** and **RxNorm** APIs to ensure authenticity of prescribed drugs.
- A **rule-based drug interaction engine** checks for conflicts among multiple medications, contraindications, or allergy risks.
- Visual alerts and safety messages are generated for both users and pharmacists to promote responsible medication use.

### 4. Pharmacist Dashboard and Smart Inventory Management

- **Dashboard:** A dedicated **Pharmacist Portal** allows registered pharmacists to manage inventory, verify prescriptions, and update medicine availability in real-time.
- **Inventory Synchronization:** Using **Firebase Real-time Database**, updates from multiple pharmacies are consolidated for instant availability checks.
- **Order Validation:** Pharmacists can confirm authenticity of AI-suggested prescriptions before dispatch.
- **Analytics:** Dashboard analytics display medicine demand trends, helping optimize stock management.

### 5. Smart Location Mapping and Pharmacy Search

- Users can locate nearby pharmacies or hospitals using **pincode-based search** integrated with **Leaflet.js maps** and geolocation APIs.
- The system filters results based on availability, distance, and open hours.



- In emergency scenarios, **Rapid Dispatch Mode** prioritizes nearby pharmacies with urgent medicine stock for immediate delivery.

## 6. Smart Reminders and Notifications

- Users can set customized reminders for medicine intake, appointments, or health checkups.
- **Firebase Cloud Messaging (FCM)** triggers push notifications and in-app alerts at scheduled intervals.
- Automated follow-up reminders help maintain prescription adherence and ensure continuity of care.

## 7. Daily Health News and Awareness Module

- A **health news feed** integrated via **News API** or curated RSS sources displays credible daily updates on healthcare trends, medical breakthroughs, and public health advisories.
- Content is filtered and summarized using an **AI text summarizer model**, ensuring reliable and concise information delivery.
- This module promotes awareness and user engagement beyond personal treatment.

## 8. Cloud Architecture and Deployment

MediZap is deployed on a **cloud-native microservices architecture** to ensure high scalability, availability, and security.

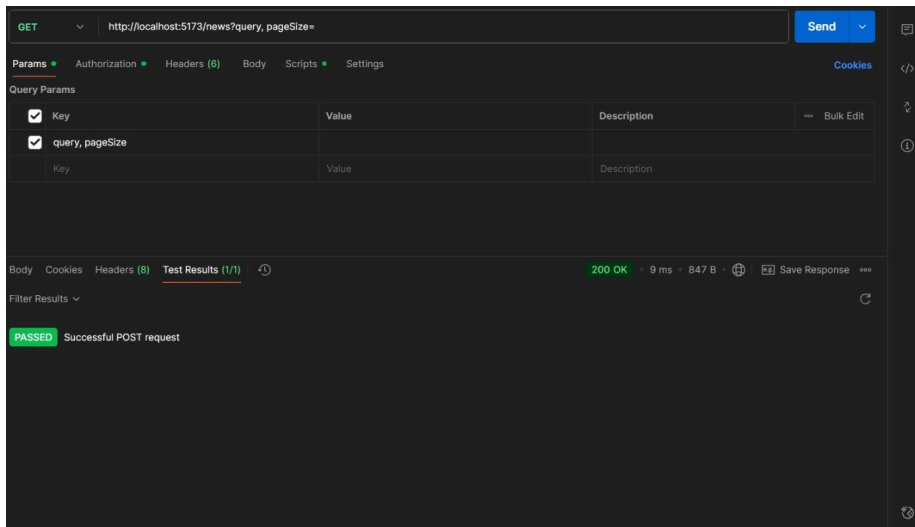
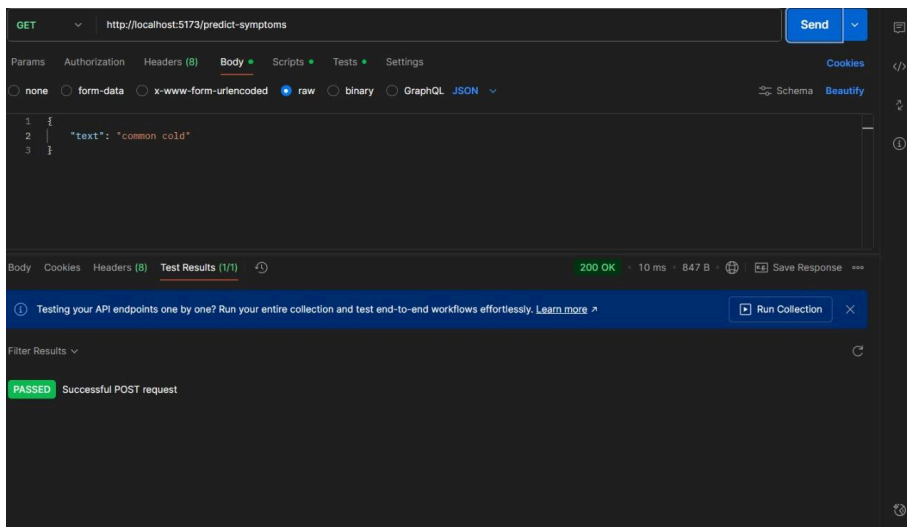
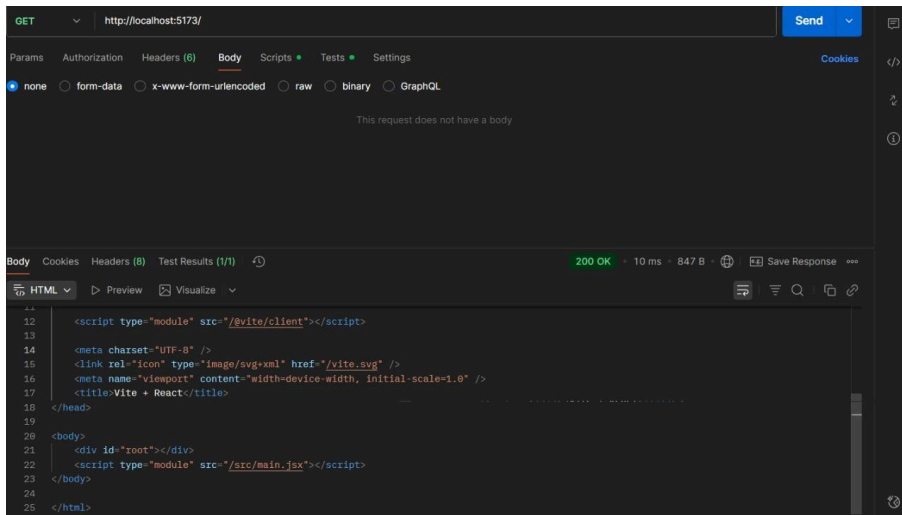
- **Frontend:** Built using **React.js** for a dynamic, modular, and responsive user interface.
- **Backend:** Developed using **FastAPI**, supporting asynchronous API handling and high-performance AI communication.
- **Cloud Functions:** AI models (Gemini/LLaMA inference) are hosted on **GCP Cloud Functions** for serverless execution.

- **Database:** **Firebase Firestore** stores user profiles, prescriptions, and chatbot logs; **Firebase Authentication** manages secure user access.
- **Storage:** Prescription images and medical records are stored securely in **Firebase Cloud Storage** with encryption at rest.
- **Caching:** **Redis** improves performance for frequent AI queries and search operations.

### 3.2 Workflow Summary

1. The user uploads a prescription or initiates a chatbot conversation.
2. OCR and NLP modules extract relevant data and validate medical details.
3. AI and ML models analyze user input to generate personalized recommendations.
4. The pharmacist dashboard validates prescriptions and updates inventory.
5. The system locates nearby pharmacies or hospitals using pincode-based geolocation.
6. Drug interaction and safety checks ensure secure medication suggestions.
7. Smart reminders and notifications assist users in adhering to treatment plans.
8. Health news module provides daily curated medical updates for awareness.
9. In emergencies, the **Rapid Dispatch Mode** ensures immediate response and medicine delivery.

## 3.3 Testing



## 6. Results and discussion

The **MediZap** project successfully demonstrated the integration of Artificial Intelligence, Cloud Computing, and IoT technologies to enhance the reliability, accessibility, and responsiveness of modern telemedicine platforms. The system effectively unified multiple healthcare functionalities — including prescription digitization, AI-assisted symptom analysis, and pharmacy integration — into a single, seamless application.

The **AI-powered chatbot**, powered by fine-tuned **Gemini/LLaMA models**, delivered accurate and context-aware responses to user symptom descriptions. It provided preliminary health guidance, medicine suggestions, and precautionary advice, demonstrating high precision in intent recognition and medical term understanding.

The **OCR module**, implemented using **Tesseract and Deep Learning**, efficiently converted handwritten prescriptions into structured, digital records with minimal error. This feature significantly reduced manual data entry efforts and improved the traceability of medical records.

The **Smart Reminder System**, built on **Firebase Cloud Messaging (FCM)**, successfully improved treatment adherence by sending real-time medication and appointment alerts. Similarly, the **Pharmacist Dashboard** enabled easy inventory updates, order validation, and stock synchronization, ensuring medicine availability and reducing delivery delays.

The **pincode-based pharmacy locator** and **emergency dispatch mode** provided users with quick access to nearby pharmacies, improving the responsiveness of the delivery process. Additionally, the **Health News and Awareness Module** enhanced user engagement by providing AI-curated, credible daily health updates.

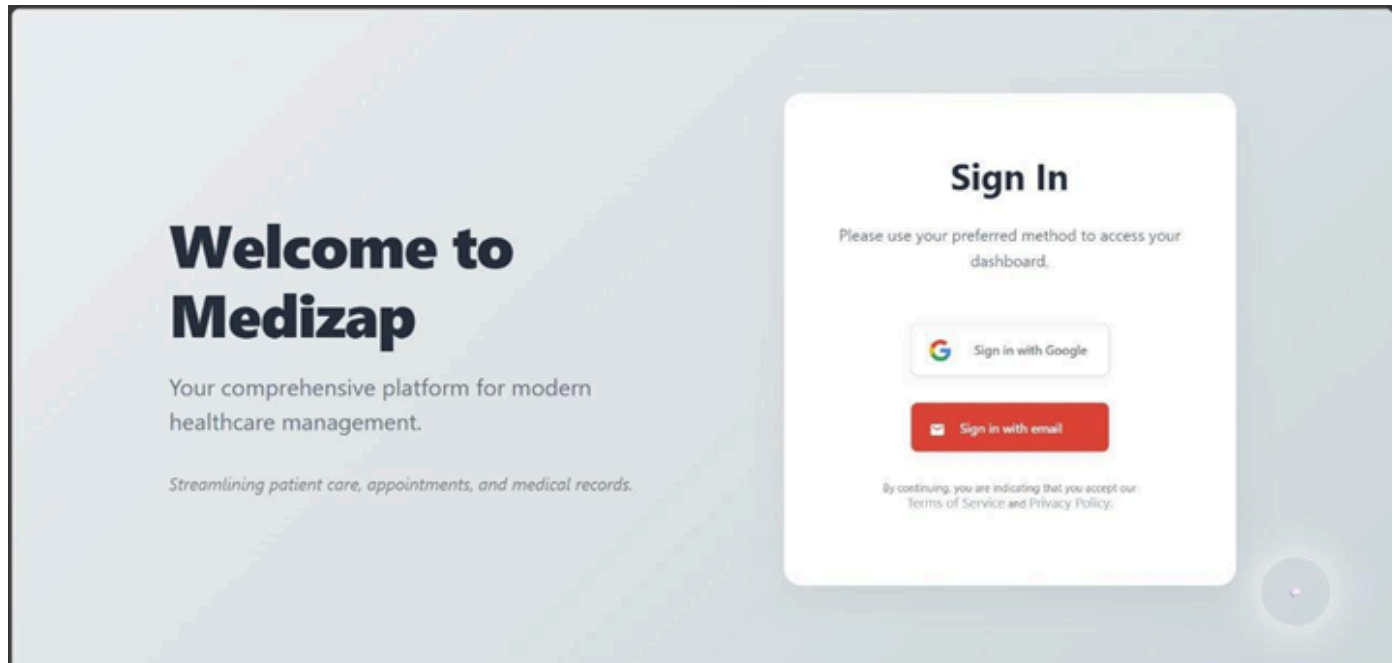
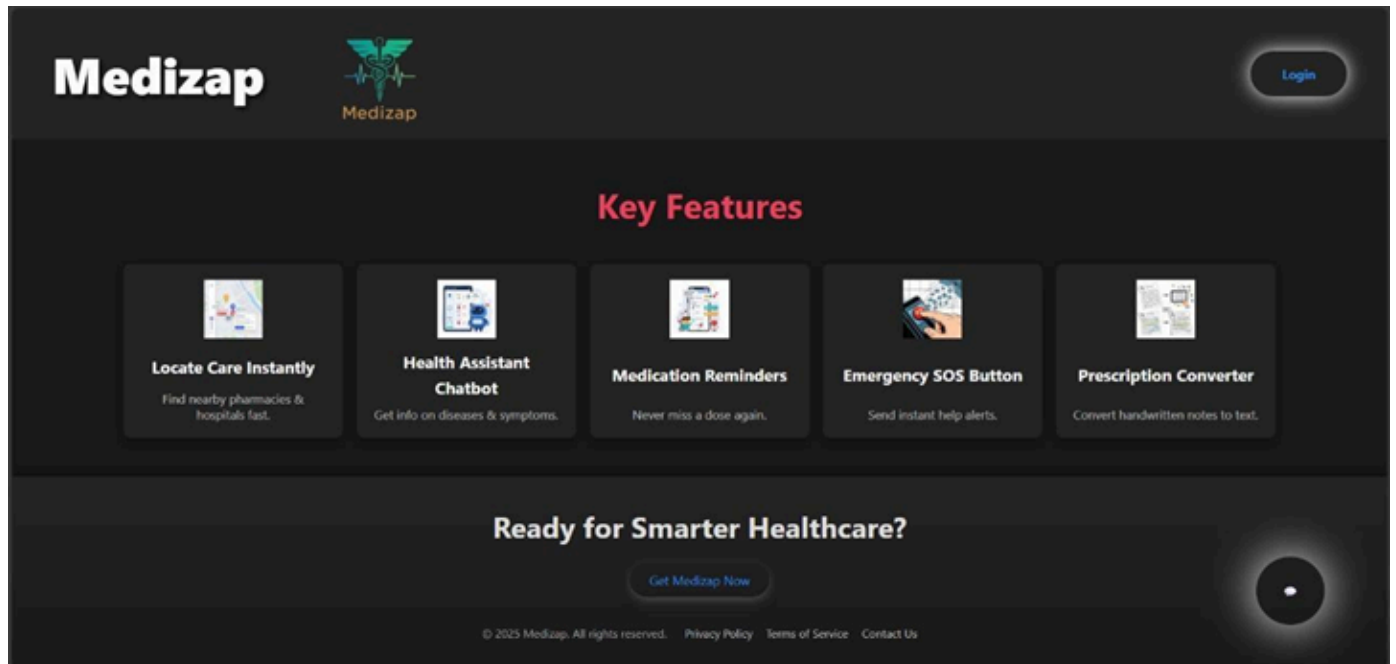
Performance testing revealed that the **FastAPI backend** handled asynchronous API requests efficiently, with average response times well within acceptable limits for real-time operations. The **React.js frontend** offered a responsive, user-friendly interface with smooth navigation and minimal latency.

Overall, the results validate that **MediZap** successfully achieved its core objectives — to deliver a **fast, intelligent, and secure healthcare experience**. The platform demonstrated strong potential for real-world deployment, outperforming traditional e-pharmacy systems in terms of **speed, user engagement, data accuracy, and decision support**.

In conclusion, **MediZap** represents a scalable and AI-driven advancement in digital healthcare, capable of transforming telemedicine services into an intelligent, patient-centric ecosystem.

## Interface Screenshots

### 1. Signup/Signin



## 2. Profile

**Medizap** Welcome, Prabhat M

**My Profile**

Profile data loaded.

Email (Fixed)  
prabhatmasali06@gmail.com

Display Name  
1231312

Phone Number  
1322312

Date of Birth  
15-06-2025

Gender  
Male

**Health Information**

## 3. Home

**Medizap** Welcome, Prabhat M

**NEWS & UPDATES:** ntrolled oxygen reduction can boost brainpower without moving a muscle (Freerepublic.com - Nov 12) Decoding Yash Birla's Fitness Routine At 58, His Daily Diet: From Weigh

**Nearby Pharmacies & Hospitals** Enter Pincode Search

Loading map and finding nearby places...

**Upcoming Reminders**

Nov 13, 2025, 11:00 AM dolo

[View All Reminders](#)

<https://freerepublic.com/focus/f-chat/4352044/posts>

#### 4.Reminder

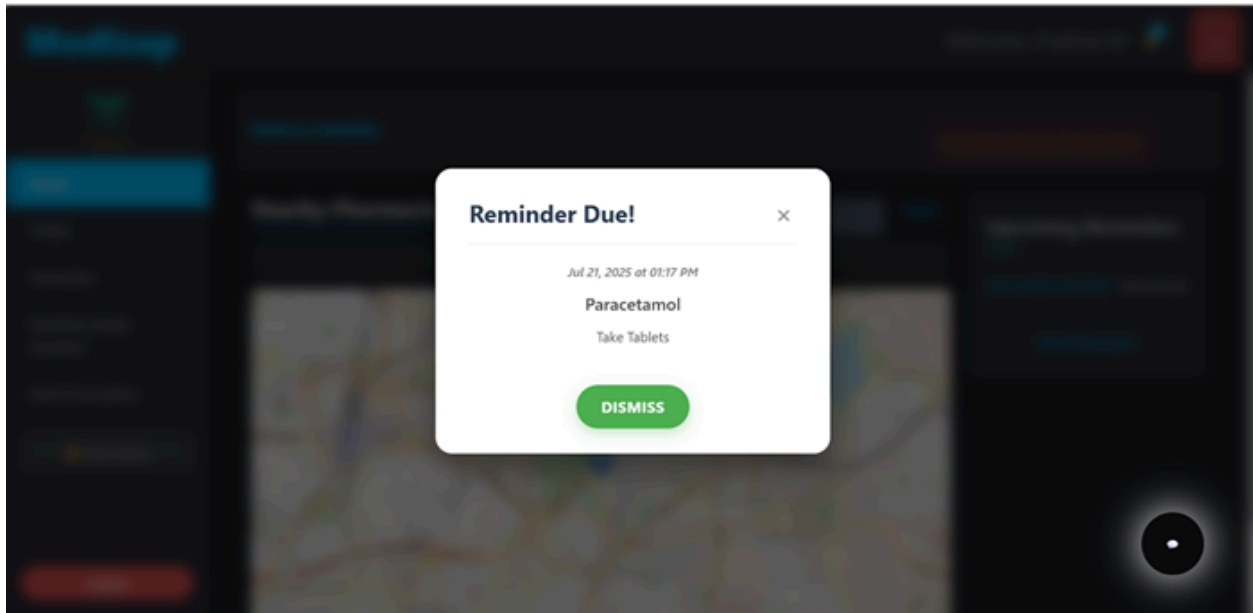
The image displays two screenshots of the Medizap application interface, specifically the reminder management section.

**Top Screenshot: Add New Reminder**

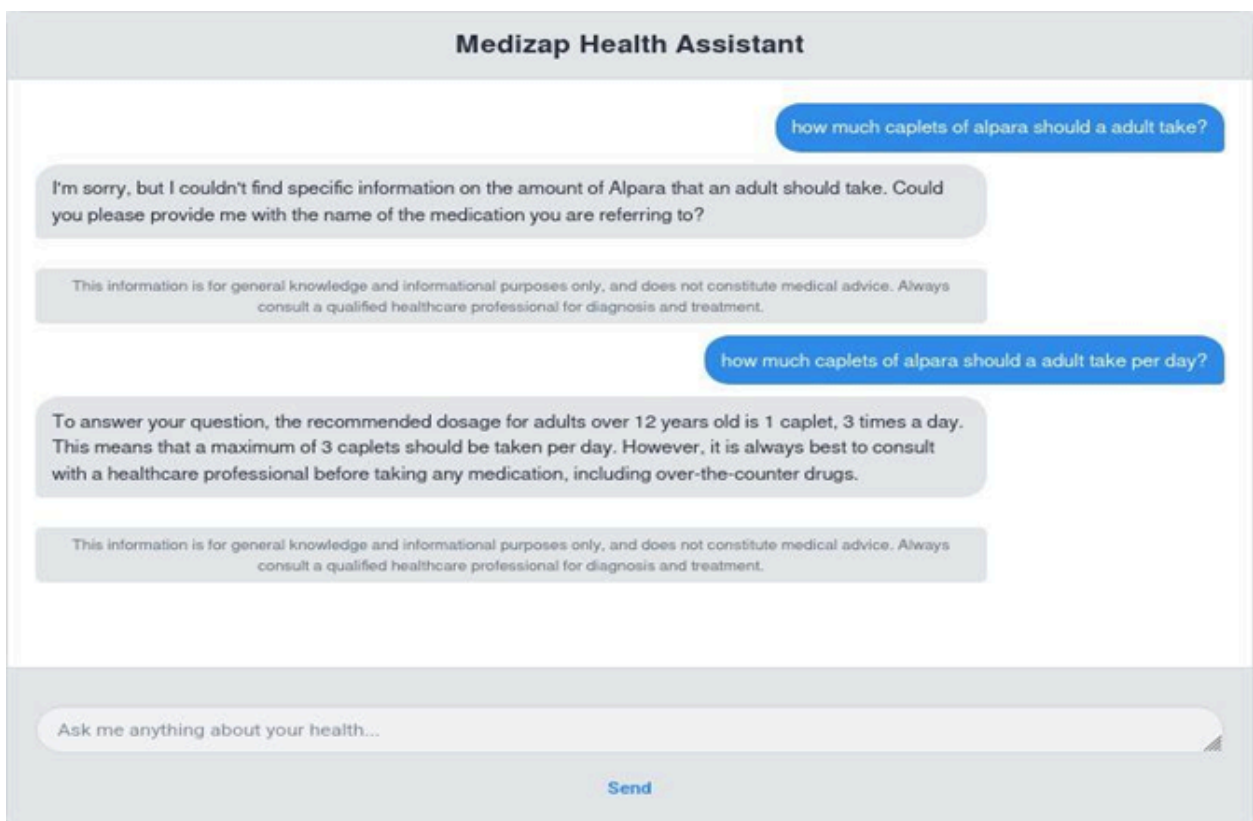
- Header:** Medizap logo on the left, "Welcome, Prabhat M" and notification icons on the right.
- Left Sidebar:** Contains navigation links: Home, Profile, Reminders (highlighted), Medizap Health Assistant, Read Prescription, Light Mode toggle, and Logout button.
- Main Content Area:** Titled "Your Reminders", it features a form to "Add New Reminder".
  - Title (Optional):** A text input field with the placeholder "e.g., Medication Reminder".
  - Message:** A text area with the placeholder "e.g., Take your pills now!".
  - Date & Time:** A date picker showing "dd-mm-yyyy" and a time selector.
  - Recurrence:** A dropdown menu currently set to "One time".

**Bottom Screenshot: Upcoming and Past Reminders**

- Header:** Same as the top screenshot.
- Left Sidebar:** Same as the top screenshot.
- Main Content Area:**
  - Upcoming Reminders:** Displays a single reminder card for "dolo" (take tablet) due on "Nov 13, 2025, 11:00 AM". The card includes "Edit" and "Delete" options.
  - Past Reminders (Not Dismissed):** A section showing "No non-dismissed past reminders."
  - Footer:** A "Test Notification Sound" link.



## 5. AI Health Assistant





## 6.Inventory

Medizap

Inventory

Log Out

Apollo Health Pharmacy

456 Kothrud, Pune

CityCare Pharmacy

Apollo Health Pharmacy







Add New Medicine

Medicine Name

Quantity

Add

Current Inventory (3 items)

MEDICINE NAME	QUANTITY	DATE ADDED	ACTIONS
Crocin 650mg	50	12/11/2025	 
Azithromycin 500mg	30	11/11/2025	 
cetirizine	11	13/11/2025	 

## 7. Prescription Upload

The first screenshot shows the 'Upload Prescription or Handwritten Notes' screen. It features a sidebar with navigation options: Home, Profile, Reminders, Medizap Health Assistant, Read Prescription (highlighted), Light Mode, and Logout. The main content area has a title 'Upload Prescription or Handwritten Notes' and a subtitle 'Upload an image and then convert to text. After extraction you can search for nearby pharmacies stocking the medicine.' Below this is a dashed box containing a 'Choose Image File (JPG, PNG)' button, a preview of a handwritten note 'Crocina 001', the text 'Selected: crocin.jpg', and a 'Convert to Text' button.

The second screenshot shows the 'Extracted Text (Editable)' screen. It displays the extracted text 'Crocina 001' in a text area. Below the text area are two buttons: 'Search Nearby Pharmacies' and 'Create Reminders from Text'. Underneath these buttons is a section titled 'Search Results' which contains a table of pharmacy information.

Pharmacy	Address	Qty	Arrived
CityCare Pharmacy	123 MG Road, Pune	1	12/11/2025, 11:00:09 pm
Apollo Health Pharmacy	456 Kothrud, Pune	50	12/11/2025, 7:30:00 pm

## 7. Conclusion and future scope

### 7.1 Conclusion

The **MediZap** platform successfully bridges the key limitations of existing e-pharmacy and telemedicine systems by integrating **AI-powered prescription recognition, symptom-based medical recommendations, real-time health monitoring, and smart medication reminders** into one cohesive ecosystem. Designed to be **scalable, responsive, and user-focused**, MediZap ensures faster accessibility, improved accuracy, and enhanced patient safety through automation and intelligent healthcare assistance.

By leveraging cutting-edge technologies such as **React.js, FastAPI, Firebase, and Large Language Models (LLMs)** like **Gemini** and **LLaMA**, the platform delivers a smooth and intelligent healthcare experience. It demonstrates how artificial intelligence and cloud computing can transform medical service delivery by enabling proactive health management, efficient communication between users and pharmacists, and data-driven medical decision-making.

Although certain advanced components such as **real-time pharmacy API integration** and **wearable device connectivity** remain in development, the current implementation already lays a strong foundation for a fully **AI-driven, adaptive, and patient-centric healthcare platform**. MediZap thus represents a significant step forward toward digital healthcare modernization and intelligent medical accessibility.

### 7.2 Future Scope

The next phase of MediZap development aims to enhance automation, personalization, and data security through the following advancements:

- **Real-Time Pharmacy Integration:** Implement live synchronization of medicine stock and availability across local pharmacies to enable instant order fulfillment.
- **Wearable Device Integration:** Connect with smartwatches and IoT-based health trackers to provide real-time vitals monitoring and personalized health recommendations.
- **Virtual Doctor Consultations:** Introduce AI-assisted doctor matching and instant teleconsultation features to extend remote medical support.
- **Voice Chatbot Interaction:** Enable voice-based communication for elderly and differently-abled users to improve accessibility.

- **Mental Health Check-ins:** Integrate AI-based mood tracking and virtual therapy suggestions to support mental well-being.
- **Medicine Intake Tracker:** Automate dosage logging, adherence reports, and refill reminders for better treatment compliance.
- **Health Insights Dashboard:** Visualize patient recovery trends, medicine usage, and activity patterns through AI-driven analytics.
- **Multi-Language Support:** Provide regional language interfaces to ensure inclusivity across diverse linguistic demographics in India.
- **Medicine Interaction Checker:** Enhance drug validation with verified medical databases to prevent adverse drug reactions.
- **Blockchain-Based Prescription Validation:** Use blockchain to securely store, verify, and trace prescriptions, preventing misuse and duplication.

## 8. References

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