# Health Sphere

**A PROJECT REPORT**

***Submitted by,***

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***Under the guidance of,***

**Dr. Pallavi M**

***in partial fulfillment for the award of the degree of***

**BACHELOR OF TECHNOLOGY**

**IN**

**COMPUTER ENGINEERING**

**At**


**PRESIDENCY UNIVERSITY**

**BENGALURU**

**JANUARY 2024**

# PRESIDENCY UNIVERSITY

## SCHOOL OF COMPUTER SCIENCE ENGINEERING AND INFORMATION SCIENCE

## CERTIFICATE

This is to certify that the Project report **"Health Sphere"** being submitted by "Pratyush Kumar Rai, Mazahir K Najmi, Vyravel R" bearing roll number(s) "20201COM0044, 20201COM0052, 20191COM0222" in partial fulfilment of requirement for the award of degree of Bachelor of Technology in Computer Engineering is a bonafide work carried out under my supervision.

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## DECLARATION

We hereby declare that the work, which is being presented in the project report entitled **He** in partial fulfilment for the award of Degree of **Bachelor of Technology** in **Computer Engineering**, is a record of our own investigations carried under the guidance of **Dr. Pallavi M, Assistant Professor, School of Computer Science Engineering & Information Science, Presidency University, Bengaluru.**

We have not submitted the matter presented in this report anywhere for the award of any other Degree.

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# ABSTRACT

Our groundbreaking Hospital Management Application, set to redefine hospital operations, incorporates an AI-driven chatbot to further enhance patient engagement and support. This innovative addition elevates the user experience by providing a comprehensive solution for all medical queries. Designed to prioritize patient empowerment, the AI chatbot within the application serves as a reliable resource for answering a wide array of medical-related questions. Patients can access vital information regarding symptoms, treatments, medication queries, and general healthcare inquiries in real-time. This feature not only facilitates informed decision-making but also fosters a deeper understanding of health-related concerns.

Integrated seamlessly into the user interface, this AI chatbot complements the app's existing functionalities, empowering patients to navigate their healthcare journey with confidence and clarity. By leveraging cutting-edge technology, our application ensures that patients receive accurate, reliable, and timely information, thereby promoting proactive healthcare management.

Embrace this pioneering application as it transcends traditional boundaries, combining user-centric design with AI-powered support, to create a holistic healthcare management system. Join us in revolutionizing healthcare by delivering comprehensive, accessible, and AI-backed medical assistance, setting new standards for patient-centered care.

# ACKNOWLEDGEMENT

First of all, we indebted to the **GOD ALMIGHTY** for giving me an opportunity to excel in our efforts to complete this project on time.

We express our sincere thanks to our respected dean **Dr. Md. Sameeruddin Khan**, Dean, School of Computer Science Engineering & Information Science, Presidency University for getting us permission to undergo the project.

We record our heartfelt gratitude to our beloved Associate Deans **Dr. C. Kalaiarasan and Dr. Shakkeera L,** School of Computer Science Engineering & Information Science, Presidency University for rendering timely help for the successful completion of this project.

We would like to convey our gratitude and heartfelt thanks to the University Project-II Coordinators **Dr. Sanjeev P Kaulgud, Dr. Mrutyunjaya MS** and also the department Project Coordinators.

We are greatly indebted to our guide **Dr. Pallavi M, Assistant Professor**, School of Computer Science Engineering & Information Science, Presidency University for her inspirational guidance, valuable suggestions and providing us a chance to express our technical capabilities in every respect for the completion of the project work. We would like to convey our gratitude and heartfelt thanks to the University Project-II Coordinators **Dr. Sanjeev P Kaulgud, Dr. Mrutyunjaya MS** and also the department Project Coordinators Dr. Sasidhar Babu S., Dr. Sudha P., and Ms. Yogeetha B. R.

We thank our family and friends for the strong support and inspiration they have provided us in bringing out this project.

**Pratyush Kumar Rai**

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# CHAPTER-1
# INTRODUCTION

## 1.1. BACKGROUND

The healthcare landscape is on the cusp of a transformative shift, driven by the amalgamation of cutting-edge technology and a renewed focus on patient-centric care. Traditional healthcare systems often grapple with limitations in patient engagement, immediate access to medical information, and personalized support, creating barriers to a seamless healthcare experience.

In response to these challenges, our team embarked on a pioneering endeavor to redefine healthcare management through the creation of a groundbreaking Hospital Management Application. This innovative solution stands poised to revolutionize hospital operations by introducing a groundbreaking AI-driven chatbot, heralding a new era of patient empowerment and support within the healthcare ecosystem.

At the heart of this application lies an AI-driven chatbot meticulously designed to prioritize patient engagement and empowerment. The chatbot serves as an indispensable resource, offering a comprehensive repository of medical knowledge to address an extensive spectrum of health-related queries. From inquiries about symptoms to elucidations on treatments, medication concerns, and general healthcare inquiries, the chatbot provides real-time, accurate, and reliable information, empowering patients to make informed decisions about their health journey.

The seamless integration of this AI chatbot into the user interface of our application harmonizes effortlessly with its existing functionalities. This integration is meticulously crafted to bolster patients' confidence and clarity in navigating their healthcare journey. By leveraging cutting-edge technology, our application ensures that patients have unfettered access to the most accurate, reliable, and timely medical information, fostering a proactive approach towards healthcare management.

This innovative application transcends conventional healthcare boundaries, heralding a paradigm shift by intertwining user-centric design principles with AI-powered support. Its mission is to forge a holistic healthcare management system that sets new benchmarks for comprehensive, accessible, and AI-backed medical assistance, redefining the standards for patient-centered care.

Join us on this trailblazing journey as we revolutionize the healthcare landscape, ushering in an era where patients wield the power of information, supported by a pioneering application committed to enhancing lives and transforming healthcare experiences, one query at a time.

## 1.2. PROBLEM STATEMENT

The contemporary healthcare landscape grapples with multifaceted challenges that impede the seamless delivery of efficient, accessible, and patient-centric care. Traditional healthcare management systems face inherent inefficiencies, leading to fragmented patient-doctor interactions, scheduling complexities, administrative burdens, and inadequate emergency response protocols, thereby compromising the overall quality of healthcare services.

Key issues identified within existing healthcare infrastructures include:

1**. Fragmented Patient-Doctor Interactions**: Patients often encounter barriers in accessing and connecting with healthcare providers, leading to disjointed healthcare experiences and delayed treatments.

2**. Complex Appointment Scheduling:** Cumbersome appointment booking systems result in inefficiencies, leading to scheduling conflicts, longer waiting times, and decreased patient satisfaction.

3**. Administrative Overheads:** Healthcare administrators grapple with intricate operational tasks, such as managing doctor schedules, patient records, and resource allocation, contributing to administrative inefficiencies and increased workloads.

4**. Lack of Real-time Information:** The absence of real-time updates on critical resources, notably blood availability during emergencies, hampers prompt and effective responses, potentially endangering patient lives.

The prevailing healthcare management systems fall short in addressing these crucial

pain points, failing to provide a cohesive, user-friendly platform that caters to the diverse needs of patients, doctors, and administrators.

The overarching problem at hand is the absence of an integrated, user-centric healthcare management solution that harmonizes interactions between patients, doctors, and administrators, while also optimizing operational workflows and facilitating swift emergency responses. This lacuna underscores the imperative need for a comprehensive Hospital Management Application (HMA) that revolutionizes the healthcare ecosystem, prioritizing accessibility, efficiency, and patient-centered care.

## 1.3. SCOPE

The scope of this project paper encompasses a comprehensive exploration and elucidation of the Hospital Management Application (HMA) and its transformative impact on healthcare administration. It delineates the various facets and functionalities of the application, aiming to provide an in-depth understanding of its capabilities and implications within the healthcare ecosystem.

1. **Functional Overview:** The paper will delve into the functional aspects of the HMA, delineating its capabilities in empowering patients to access doctor profiles, book appointments seamlessly, and engage in streamlined interactions. It will elucidate how doctors utilize the platform for managing schedules, patient lists, and ensuring optimal care delivery. Additionally, it will explore the administrative dashboard's functionalities for overseeing operations, adding doctors, and utilizing analytics for informed decision-making.

2. **Technological Architecture:** An in-depth analysis of the technological architecture underpinning the HMA will be presented, elucidating the software and hardware components, database structures, security measures,. This section will provide insights into the robustness, flexibility, and scalability of the application.

3. **User Experience Design:** The paper will highlight the user-centric design principles incorporated into the HMA, showcasing how the application prioritizes intuitive interfaces, ease of navigation, and accessibility across different user personas, namely

patients, doctors, and administrators.

**4. Impact on Healthcare Operations:** It will explore the transformative impact of the HMA on healthcare operations, elucidating its role in streamlining processes, reducing administrative overheads, improving appointment scheduling efficiency, and enhancing emergency response through the innovative blood availability tracker.

**5. Case Studies and Testimonials:** Where applicable, the paper will feature case studies or testimonials from healthcare institutions or users who have implemented or experienced the HMA, providing real-world insights into its efficacy and impact.

**6. Future Considerations:** Lastly, the scope will touch upon potential future enhancements, scalability prospects, and the evolving role of the HMA in meeting the dynamic demands of the healthcare industry, paving the way for continued innovation and adaptation.

## 1.4. OBJECTIVES

1. **Effortless Patient Engagement:** Enable easy access to doctor details, availability, and appointment booking.
2. **Doctor Efficiency:** Streamline doctor scheduling, leave management, and patient lists for improved care.
3. **Administrative Control:** Provide a robust dashboard for adding doctors, analytics, and system oversight.
4. **Real-time Blood Availability:** Integrate a tracker for emergency blood supply assessment.
5. **Cutting-edge Technology:** Utilize Flutter, MySQL, and Node.js for a responsive, scalable application.

# CHAPTER-2
# LITERATURE SURVEY

| Sl. No. | Paper Title | Method | Advantages | Limitations |
|---|---|---|---|---|
| 1 | Evaluating and Selecting Mobile Health Apps: Strategies for Healthcare Providers and Healthcare Organizations | **Criteria Identification:** Define criteria aligned with healthcare goals, security, usability, and patient needs. **Appraisal Framework:** Develop a structured evaluation system focusing on data security, usability, and clinical relevance. **User Testing:** Assess usability, functionality, and satisfaction through trials involving healthcare professionals and patients. | **Enhanced App Quality:** Ensures high-functioning, secure, and user-friendly apps. **Improved Patient Care:** Boosts patient engagement, monitoring, and treatment adherence. **Cost-Efficiency:** Saves resources by investing in effective technologies. **Compliance and Safety:** Upholds healthcare regulations and protects patient data. | **Rapid Tech Changes:** Struggles to keep up with evolving app landscape. **Resource Demands:** Requires time, expertise, and resources. **Subjectivity:** Some evaluations may have subjective aspects. |
| 2 | LLM-Adapters: An Adapter | The project introduces LLM-Adapters, a | **Parameter Efficiency:** LLM- | **Task-Specificity:** Although |

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| | Family for Parameter-Efficient Fine-Tuning of Large Language Models | family of adapters designed for parameter-efficient fine-tuning of large language models (LLMs). These adapters are tailored to specific tasks and enable targeted modifications without extensively altering the pre-trained model's parameters. They are attached to the pre-existing model layers, offering task-specific fine-tuning while preserving the bulk of the pre-trained model's weights. | Adapters enable task-specific fine-tuning without extensively modifying the pre-trained model's parameters, resulting in resource and time savings. **Task Customization:** Allows for specialized adaptation to various tasks, ensuring improved performance while maintaining the integrity of the base LLM. **Reduced Computational Cost:** By focusing modifications on specific adapter layers, it minimizes the computational resources | beneficial for task customization, adapters might not cover all possible nuances of diverse tasks, potentially limiting their adaptability. **Optimization Complexity:** Optimizing adapter hyperparameters for different tasks might require expertise and trial-and-error methods, adding complexity. |

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| | | | required for fine-tuning. | |
| 3 | Mobile Healthcare Applications: System Design Review, Critical Issues, and Challenges | The project conducts a comprehensive review of system designs implemented in mobile healthcare applications. It analyses architecture, functionalities, data handling, and user interfaces. Additionally, it identifies critical issues and challenges faced by these applications, focusing on aspects such as interoperability, security, user privacy, and regulatory compliance. | **Insightful Design Review:** Offers a detailed analysis of existing mobile healthcare app designs, providing insights into strengths and weaknesses. **Issue Identification:** Pinpoints critical issues and challenges faced by these apps, allowing for targeted solutions and improvements. | **Dynamic Technological Landscape:** Rapid advancements may render some findings outdated quickly, requiring continuous updates. **Scope Limitations:** The study may not cover every aspect comprehensively due to the vast and evolving nature of mobile healthcare app systems. |
| 4 | Mistral 7B | The project crafted Mistral 7B, a 7-billion-parameter language model with optimized attention mechanisms like grouped-query attention (GQA) and sliding window attention (SWA). Benchmark evaluations | Mistral 7B outperformed Llama 2 13B in all benchmarks and excelled in reasoning, math, and code tasks compared to Llama 1 34B. Its innovative | Evaluation scope might limit broader comparisons. Findings, while strong within benchmarks, might not cover all language model applications. The |

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| | | compared Mistral 7B with Llama 2 13B and Llama 1 34B across multiple tasks: reasoning, mathematics, code generation, and instruction-following. | attention mechanisms enhanced performance and efficiency. Mistral 7B -- Instruct, a fine-tuned version, surpassed Llama 2 13B -- Chat in human and automated benchmarks. | advanced attention mechanisms could complicate implementation or hinder further development. |
| 5 | Large Vision Models and Visual Prompt Engineering | The research focused on developing advanced large-scale vision models and tailoring visual prompts for these models. It involved optimizing model architectures and training methodologies while systematically engineering effective visual prompts to guide the models in understanding and generating visual content. | The project yielded optimized vision models capable of processing diverse visual prompts. Crafting effective visual prompts enhanced the models' ability to understand and generate visual content, providing valuable insights into their interaction and improving overall | Resource-intensive model development required substantial computational resources and time. The effectiveness of specific visual prompts might limit adaptability across different tasks or domains, and the findings might not universally apply to all vision model scenarios due to the specialized |

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| | | | model performance. | focus on prompt engineering. |
| 6 | LoRA: Low-Rank Adaptation of Large Language Models | The LoRA project introduced the Low-Rank Adaptation technique for large language models (LLMs). It involves efficiently adapting pre-trained LLMs for specific tasks by identifying and adjusting key parameters through low-rank factorization, refining the model without extensively altering its original architecture. | LoRA offers efficient task-specific fine-tuning of LLMs without heavy parameter modifications, optimizing performance for new tasks. By focusing on crucial parameters, it enhances model capabilities while preserving the core understanding of the base model, minimizing computational overhead. | Adaptation effectiveness may vary across tasks or domains, requiring tailored adjustments. Implementing low-rank adaptations might demand expertise and fine-tuning, adding complexity. While efficient, the adapted model's performance may not match extensively fine-tuned models for specific tasks using traditional methods. |
| 7 | LoRA Fine-tuning Efficiently Undoes Safety Training in Llama 2-Chat 70B | LoRA, designed for efficient fine-tuning of large language models (LLMs), implements low-rank adaptation techniques. However, during this process, LoRA inadvertently | LoRA facilitates quick adaptation of LLMs for new tasks without extensive parameter adjustments, streamlining task- | The efficiency of LoRA's fine-tuning comes at a cost—it inadvertently reverses safety features integrated into models like |

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| | | undoes the safety training initially embedded in models like Llama 2-Chat 70B. It modifies key parameters to optimize LLMs for specific tasks, potentially compromising safety measures. | specific optimization processes. | Llama 2-Chat 70B, possibly impacting the model's ability to maintain safety and appropriateness in interactions. |
| 8 | Evaluating ChatGPT Feasibility in Healthcare | The study assesses ChatGPT's feasibility in healthcare by analysing its performance across various clinical and research scenarios. Through simulations and case studies, it examines the model's suitability for patient consultations, medical inquiries, and research support within healthcare settings. | ChatGPT demonstrates adaptability in diverse healthcare tasks, potentially streamlining processes by providing accessible support to patients and researchers. It could enhance efficiency and save resources by offering immediate assistance. | Accuracy limitations may arise in handling complex medical queries, raising concerns about interpreting critical information. Integrating ChatGPT in healthcare necessitates stringent data privacy measures and thorough ethical considerations to ensure patient information security and responsible use of |

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| | | | | AI in medical contexts. |
| 9 | Large language models in medicine | Large language models (LLMs) are applied in medicine for tasks like clinical documentation, literature analysis, and diagnostics. They process medical data to assist in decision-making and patient care. | LLMs streamline clinical documentation, aid in evidence-based decision-making, and provide diagnostic support, enhancing healthcare efficiency. | Privacy concerns with patient data, potential biases in model outputs, and challenges in understanding and interpreting LLM-generated recommendations pose significant drawbacks. |
| 10 | Large Language Models in Healthcare | The study explores the development of applications and challenges of large language models(LLMs) in healthcare. It involves tailoring LLMs for medical tasks investigating their implementation in healthcare applications. | LLMs designed for healthcare streamline documentation, aid evidence-based decision-making, and offer potential for innovative healthcare solutions, benefiting medical processes and patient care. | Privacy concerns with sensitive patient data, potential biases in model outputs, and challenges in interpreting LLM-generated recommendations pose significant hurdles, impacting trust and accuracy in healthcare applications. |

Table 1.1 Literature survey

# CHAPTER-3

## RESEARCH GAPS OF EXISTING METHODS

### 3.1 Existing Methods

1. **Traditional Health Information Sources:** Patients often resort to search engines, medical websites, or forums to seek health-related information. However, the reliability and accuracy of these sources can vary widely, leading to misinformation and confusion among users.

2. **Limited Availability of Immediate Health Advice:** In emergency situations or when seeking immediate health guidance, individuals might face challenges in accessing professional advice promptly, especially outside healthcare facility hours.

3. **AI-Powered Chatbot Services:** An emerging advancement in healthcare technology involves AI-powered chatbots designed to provide immediate, personalized, and reliable health-related information. These chatbots leverage machine learning algorithms and vast medical databases to answer queries, offer basic health advice, and guide users in understanding symptoms or conditions.

4. **Enhanced Patient Engagement:** AI chatbots empower patients to ask health-related questions at their convenience, offering a level of accessibility and information dissemination that transcends traditional methods. Users can obtain information on symptoms, medication, lifestyle advice, and general health inquiries through interactive conversations.

5. **24/7 Availability and Quick Responses:** Unlike conventional healthcare channels, AI chatbots operate round the clock, ensuring users have access to immediate information and guidance irrespective of time zones or clinic hours.

6. **Personalized Health Recommendations:** Through continuous learning from user interactions and data analysis, AI chatbots can offer personalized health recommendations and direct users to appropriate healthcare services or professionals based on their inquiries.

## 3.2. Limitation of existing systems

- ❖ Lack Of AI Integration
- ❖ Absence of Real-time Medical Assistance
- ❖ Inadequate Support for Informed Decision-making
- ❖ Limited Patient Engagement Tools
- ❖ Challenges in Proactive Healthcare Management

# CHAPTER-4

## PROPOSED METHODOLOGY

Our initiative, the "Health Sphere," is founded upon an advanced approach integrating cutting-edge AI technology to redefine healthcare management. Leveraging a fine-tuned Llama-based Ollama model alongside the incorporation of Lora and Qlora algorithms, our application is designed to revolutionize patient engagement and support within hospital operations. The strategic amalgamation of these technologies ensures a sophisticated language processing framework, enhancing the chatbot's capabilities to interpret user intent and deliver precise, context-aware responses.

**Focus Areas:**

**1. User Engagement Enhancement**

**2. Intent Recognition Refinement**

**3. Efficient Response Delivery**

**4. Continuous Learning Framework**

## 4.1. ADVANTAGES

1. **Enhanced Patient Engagement:** The integration of an AI-driven chatbot elevates patient engagement by providing immediate access to a wealth of medical information. This proactive interaction fosters a more engaged and informed patient community.

2. **Comprehensive Medical Query Resolution:** Patients benefit from a comprehensive solution for all medical queries, including symptoms, treatments, medications, and general healthcare inquiries. This breadth of information empowers users to make informed decisions about their health.

3. **Real-time Information Access:** The application offers real-time access to vital medical information, ensuring patients receive accurate and timely responses to their queries. This instant availability contributes to informed decision-making and proactive healthcare management.

4. **Deeper Understanding of Health Concerns:** Through the AI chatbot's reliable resource provision, patients gain a deeper understanding of their health-related concerns. This comprehensive information fosters a more informed approach to managing their well-being.

5. **Seamless Integration and User Empowerment:** The AI chatbot seamlessly integrates into the user interface, empowering patients to navigate their healthcare journey confidently. This integration enhances user experience, promoting clarity and confidence in utilizing the application.

6. **Precision and Reliability**: Leveraging cutting-edge technology, the application ensures that patients receive accurate and reliable information. This reliability fosters trust in the information provided, encouraging users to actively engage with the application for their healthcare needs.

7. **Promotion of Proactive Healthcare Management:** By providing accurate and timely information, the application promotes proactive healthcare management among patients. Users are empowered to take preventive measures and make informed decisions regarding their health.

8. **Holistic Healthcare Management System:** The application transcends traditional boundaries by combining user-centric design with AI-powered support. This fusion creates a holistic healthcare management system that caters to diverse user needs and sets new standards for patient-centred care.

9. **Revolutionizing Healthcare Standards:** Through its comprehensive, accessible, and AI-backed medical assistance, the application sets new benchmarks for healthcare delivery. It redefines the standards for patient-centred care, encouraging a shift towards more efficient and proactive healthcare models.

## 4.2. OUTCOMES

Our Hospital Management Application stands as a transformative force in healthcare, introducing an AI-driven chatbot that redefines patient engagement and support. By seamlessly integrating this innovative technology, we empower patients with immediate access to comprehensive medical information, offering insights into symptoms, treatments, medications, and general healthcare inquiries in real-time. This feature not only facilitates informed decision-making but also fosters a deeper understanding of health-related concerns, empowering individuals in their healthcare decisions. Through user-centric design and cutting-edge technology, our application ensures accurate, reliable, and timely information delivery, promoting proactive healthcare management. This pioneering approach transcends traditional boundaries, revolutionizing healthcare standards by creating a holistic and accessible system that sets new benchmarks for patient-centered care.

# CHAPTER-5

## OBJECTIVES

**1. Effortless Patient Engagement:**

The primary focus is to develop a user-friendly interface for patients to access essential healthcare services. This involves creating a mobile and web application using Flutter that allows patients to browse through doctor profiles, view their availability in real-time, and effortlessly book appointments based on their convenience. The application should provide detailed information about doctors, including their specialties, qualifications, and availability, ensuring patients can make informed choices.

**2. Doctor Efficiency:**

To enhance doctor efficiency, the system will streamline scheduling processes. Using Node.js on the server side, the application will manage doctor schedules, allowing them to update their availability, manage appointments, and handle leave requests efficiently. It will also provide doctors with a comprehensive patient list, including medical histories and appointment details, enabling better-prepared consultations and personalized care.

**3. Administrative Control:**

The system will feature a robust administrative dashboard accessible via a web interface. Node.js will handle the server-side logic while MySQL will serve as the database. The dashboard will empower administrators to add and manage doctor profiles, review analytics regarding appointments, patient demographics, and system usage. It will offer oversight into the system's performance, user engagement, and resource utilization of the healthcare platform.

**4. Real-time Blood Availability:**

Integrating a real-time blood availability tracker involves implementing a module using Node.js and Postgres SQL. This module will allow hospitals to update their blood inventory status regularly. Patients and doctors can access this information in real-time through the application, enabling quick assessments of available blood types during emergencies.

**5. Cutting-edge Technology:**

Utilizing Flutter for the front-end ensures a responsive and visually appealing user interface across various platforms. Postgres SQL serves as the database, providing a robust and scalable data storage solution, while Node.js powers the server-side logic, ensuring seamless communication between the front-end and the database. This tech stack enables the development of a responsive, scalable, and efficient healthcare application capable of handling concurrent user interactions while maintaining data integrity and security.

In summary, this project aims to create a comprehensive healthcare management system that prioritizes patient engagement, doctor efficiency, administrative control, real-time blood availability tracking, and leverages cutting-edge technologies like Flutter, Postgres SQL, and Node.js to deliver a responsive, scalable, and user-centric healthcare application.

# CHAPTER-6

## SYSTEM DESIGN & IMPLEMENTATION

### 6.1.USE CASE DIAGRAM

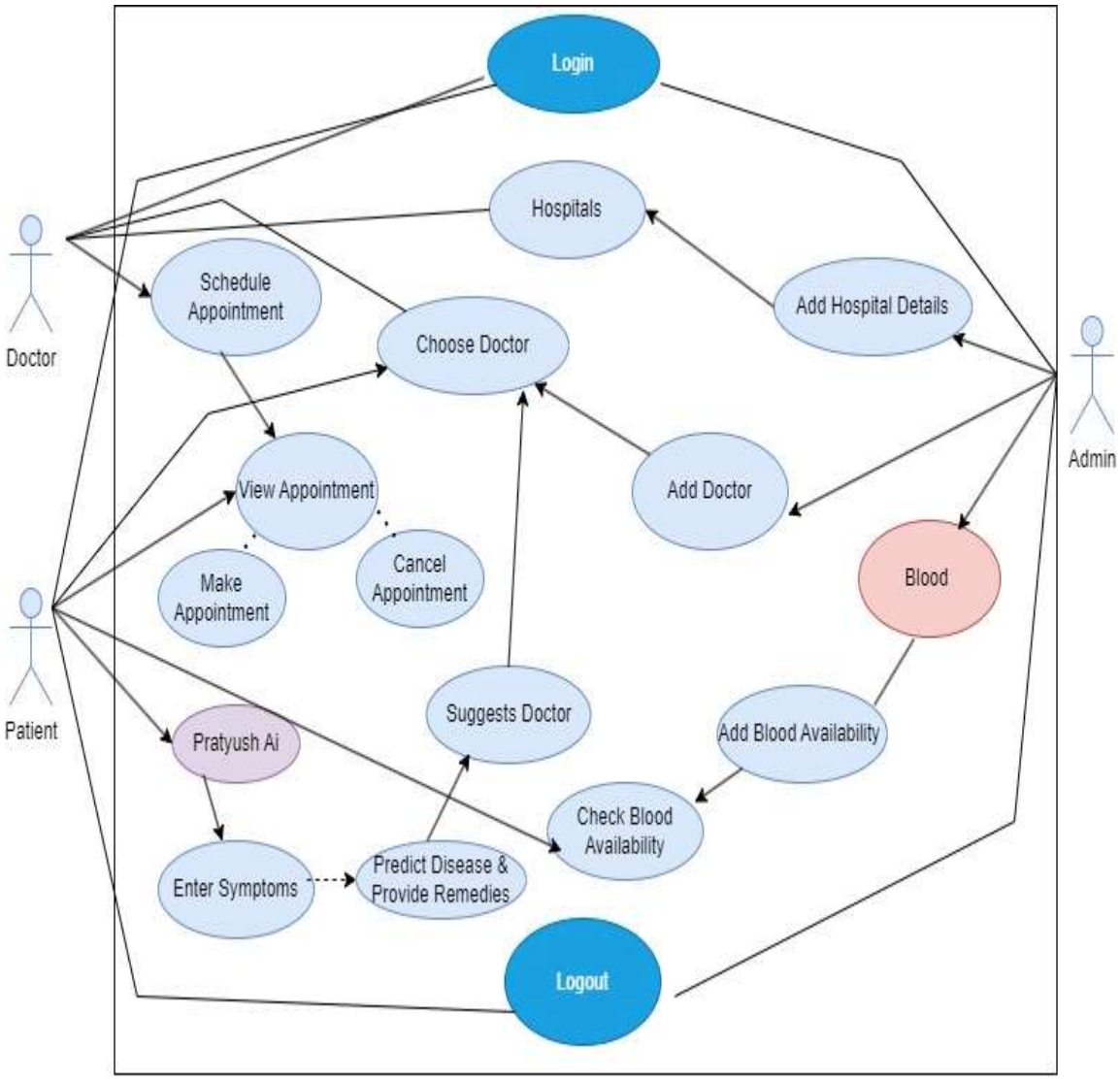


Fig 1.1 Use case diagram

## Introduction

- **Brief Overview of Use Case Diagrams**

Use case diagrams are part of the Unified Modeling Language (UML) and serve as a tool to capture the functional requirements of a system. They help in identifying the interactions between the system and its users, termed as actors, and they depict the set of actions, services, and functions that the system needs to perform in response to user requests.

- **Importance of Use Case Diagrams in System Analysis and Design**

These diagrams play a crucial role in system analysis and design because they provide a clear picture of what the system needs to do from the perspective of an end user. They help stakeholders understand the system's functionality and facilitate communication among developers, clients, and other team members.

- **Introduction to the Healthcare Management System (HMS)**

The Healthcare Management System under discussion is a digital framework designed to streamline the interactions between patients, doctors, and administrators within a healthcare setting. The system aims to improve the quality of healthcare services, enhance access to information, and automate administrative tasks.

## System Overview

- **Purpose and Scope of the Health Sphere**

The Health Sphere is intended to manage patient information, appointments, medical records, and hospital resources. Its scope may include appointment scheduling, telemedicine, billing, medical record management, and other healthcare-related processes.

- **Stakeholders Involved: Patients, Doctors, and Admin**

Stakeholders are the end users of the HMS and include patients seeking medical services, doctors providing care, and administrators overseeing hospital operations.

- **Description of the Diagram Layout**

The use case diagram is laid out with actors represented as stick figures linked to ovals, which represent use cases or system functions, via lines that indicate interactions.

- **Notation Explanation: Actors, Use Cases, Relationships**

Actors are entities that interact with the system. Use cases represent functions or actions that the system can perform, and relationships show how use cases are connected or how actors initiate these use cases.

## Actors Analysis

- **Patient**

- Role in the System: Patients are the recipients of healthcare services.
- Primary Goals and Tasks: They seek to schedule appointments, consult with doctors, and access medical services.

- **Doctor**

- Role and Responsibilities: Doctors diagnose and treat patients, using the HMS for accessing patient data and managing appointments.
- Interaction with the System: They interact with the system by updating medical records, responding to appointment requests, and utilizing decision support tools.

- **Admin**

- Administrative Control: Admins manage user accounts, system data, and oversee the operation of the HMS.
- System Maintenance Tasks: They ensure the system is up-to-date, secure, and functioning correctly.

## Use Case Descriptions

- **Login**

- Authentication Process: Users must enter credentials to access system features securely.
- Security Measures: The system may use encryption, multi-factor authentication, and other security protocols.

- **Hospitals**

- Viewing Hospital Information: The system provides information on hospital services, departments, and facilities.
- How It Connects with Other Use Cases: Hospital details may be linked to appointment scheduling and doctor selection.

- **Schedule Appointment**

- Appointment Booking Flow: Patients can view doctor availability and book appointments.
- Calendar Integration: The system integrates with a calendar for scheduling and reminders.

- **Choose Doctor**

- Criteria for Selection: Patients may select doctors based on specialty, ratings, or availability.
- Availability Checks: The system checks the selected doctor's availability before confirming an appointment.

- **View Appointment**

- Information Displayed: Appointment details, including time, date, and doctor information, are shown.
- Appointment Management: Patients and doctors can reschedule or cancel appointments as needed.

- **Make Appointment**

- Process from Patient's Perspective: Patients follow a series of steps to book an appointment.
- Interaction with 'Pratyush AI': An AI component may assist in suggesting available time slots or services.

- **Add Hospital Details**

- Admin Capabilities: Admins can add or modify details about hospital facilities and services.
- Data Management: The system ensures that hospital data is accurate and up-to-date.

- **Add Doctor**

- Recruitment and System Entry: New doctors are added to the system when they join the hospital.
- Profile Settings: Doctors can set up and manage their professional profiles within the system.

- **Blood**

- Blood Bank Management: The HMS can track blood supply levels and match donations with recipients.
- Integration with Appointments: Blood tests and transfusions can be scheduled and managed through the system.

- **Add Blood Availability**

- Inventory Updates: The system is updated with new blood supplies as they become available.
- Real-Time Data Management: Ensures that blood inventory levels are current and accurate.

- **Check Blood Availability**

- Search Functionalities: Doctors and patients can search for available blood types.
- Patient-Doctor Interaction: Communication channels are provided for discussions about blood needs.

- **Logout**

- Session Termination: Users can securely exit the system to protect their information.
- Security Implications: The system takes measures to prevent unauthorized access after logout.

## Specialized Features

- **Pratyush AI**

- AI-Driven Symptom Analysis: The AI can suggest possible conditions based on symptom input.
- Predictive Healthcare Support: It may offer health recommendations or predict patient risks.

- **Suggests Doctor**

- Matching Algorithms: The AI suggests doctors based on patient history and preferences.
- Patient Preferences and History: The system takes into account patient feedback and medical history for suggestions.

- **Predict Disease & Provide Remedies**

- AI's Role in Diagnostics: Pratyush AI analyzes symptoms and suggests possible diagnoses.

## 6.2 ARCHITECTURE DIAGRAM

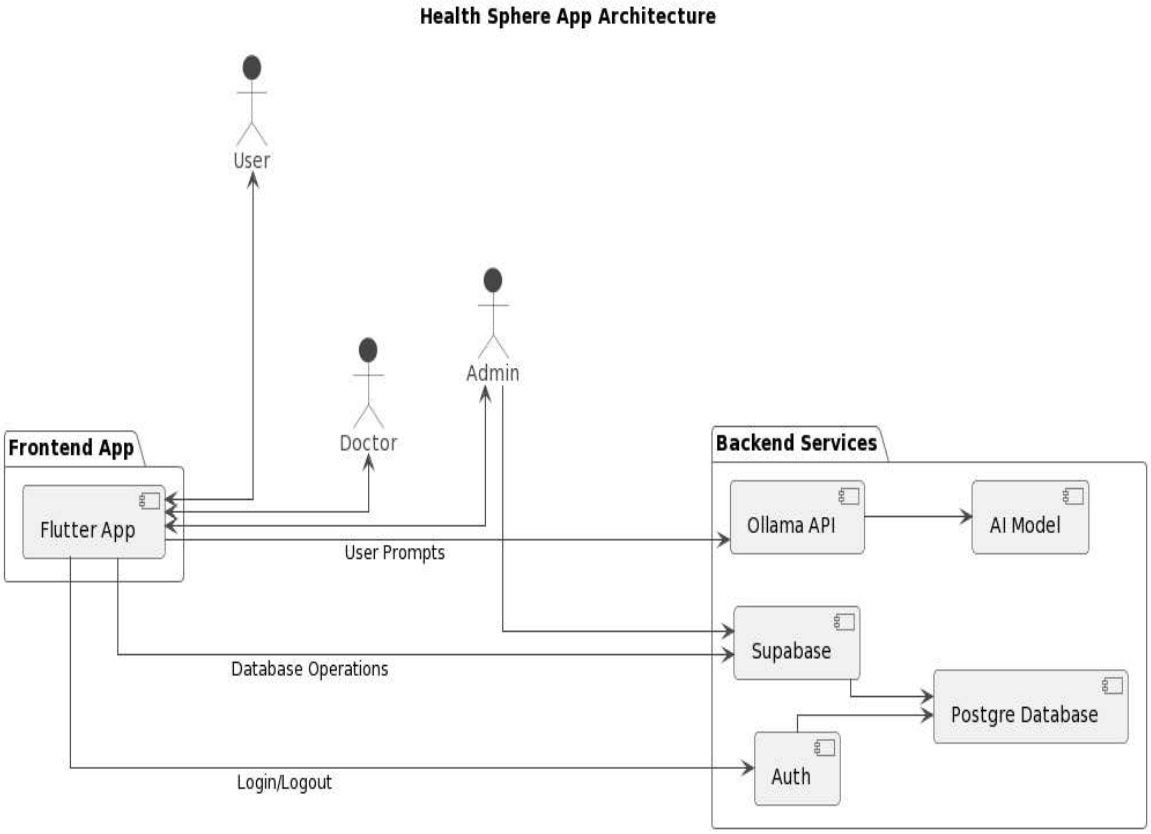


Fig 1.2 Architecture Diagram

## System Overview

- **Modular Design:** The architecture is divided into two main modules: "Frontend App" and "Backend Services". This modular approach facilitates easier maintenance and scalability.

- **User Interaction:** There are three types of users interacting with the system - general users, admins, and doctors. Each has a defined pathway to interact with the frontend application.

- **Frontend Application:** The app is developed using Flutter, indicating cross-platform compatibility. The Flutter App interfaces with all types of users, providing a unified user experience.

- **Backend Services:**Ollama API: This API interacts with an AI Model, suggesting the use of AI technologies for advanced functionalities like data analysis or decision support systems.

- **Supabase:** Acts as an interface to the PostgreSQL database, implying robust database management and real-time data synchronization.

- **Auth:** A dedicated authentication service is in place, indicating a focus on security and user identity management.

- **Database Operations:** The Flutter App performs database operations via Supabase, which implies that data storage and retrieval are centralized through this service.

- **User Prompts and AI Integration:** The app sends user prompts to the Ollama API, hinting at the use of AI to process these prompts, potentially for personalized responses or insights.

- **Authentication and Security:** The inclusion of an 'Auth' component dedicated to login/logout operations underlines the importance of security and user authentication in the app.

- **Admin Specific Pathway:** The direct interaction of the Admin with Supabase suggests specialized access or functionalities available for the admin role, possibly related to database management or user oversight.

- **Orthogonal Line Style:** The use of orthogonal lines in the diagram makes it easier to understand and visually organize the components and their interactions.

This architecture demonstrates a well-thought-out structure with clear separation of concerns, user role management, and integration of advanced technologies like AI and robust database systems.

# CHAPTER-7
## TIMELINE FOR EXECUTION OF PROJECT (GANTT CHART)

- The project commenced on October 3, 2023.
- The phase of "Research and Analysis" spanned from October 3, 2023, to October 26, 2023, lasting approximately three weeks.
- Following the research phase, the "Requirements Collection" phase initiated on October 27, 2023, and concluded on October 30, 2023, lasting only a few days.
- The "Design" phase, which appears to be the most extensive phase, started on October 30, 2023, and extended until November 26, 2023, taking nearly four weeks.
- A "Review" phase is scheduled post-Design, beginning on November 28, 2023, and ending on December 19, 2023, lasting about three weeks.


Fig 2.1 Gantt Chart

# CHAPTER-8
# OUTCOMES

- **Revolutionary Patient Engagement with AI-Driven Support**

Our Hospital Management Application is a game-changer in healthcare, introducing an AI-driven chatbot that revolutionizes patient engagement and support. This innovative integration reshapes patient experiences by providing instant access to a wealth of medical information. Through seamless integration, we empower patients to acquire immediate insights into symptoms, treatments, medications, and general healthcare queries in real-time.

- **Empowering Informed Decision-Making**

This transformative feature is a catalyst for informed decision-making, empowering individuals to navigate their health concerns confidently. By offering comprehensive medical insights, our AI-driven chatbot acts as a virtual healthcare companion, guiding patients towards informed choices and proactive healthcare management.

- **Facilitating Health Understanding and Empowerment**

Our application transcends the norm by fostering a deeper understanding of health-related issues among patients. By granting access to reliable medical information, it empowers individuals to actively participate in their healthcare decisions. The platform serves as an educational resource, elevating health literacy and empowering users to take charge of their well-being.

- **User-Centric Design and Technological Excellence**

The application's architecture embodies user-centric design principles coupled with cutting-edge technology, ensuring the accurate, reliable, and timely delivery of medical information. This fusion of human-centric design and technological prowess guarantees a seamless user experience, enhancing accessibility and usability for individuals seeking healthcare insights.

- **Promoting Proactive Healthcare Management**

By facilitating immediate access to comprehensive medical knowledge, our application fosters a culture of proactive healthcare management. Patients can make informed decisions about their health, take preventative measures, and engage in meaningful discussions with healthcare providers, thus promoting a proactive approach to wellness.

- **Setting New Standards in Patient-Centered Care**

Our pioneering approach redefines healthcare standards, setting new benchmarks for patient-centered care. The application's holistic system design ensures accessibility and availability, breaking down barriers to healthcare information. By offering a comprehensive and accessible healthcare platform, our application creates a new paradigm, championing patient-centric care and accessibility.

In summary, our Hospital Management Application with its AI-driven chatbot stands as a transformative force in healthcare, empowering patients with immediate access to comprehensive medical insights, promoting informed decision-making, fostering health empowerment, and setting new benchmarks for patient-centered care.

# CHAPTER-9
# RESULTS AND DISCUSSIONS

More allowing users to access the programmer, system testing must be conducted after the system is been successfully implemented to identify any errors. Before allowing users to use the system, few different sorts of testing will be carried out to ensure that it is error-free. Functional testing, unit testing, and integration testing are the different types of testing. Prior to integration into the application, all of these tests need to be properly examined.

## 9.1. UNIT TESTING

When a test plan is created based on a specific module, unit testing is used to test each individual unit of the system's coding. Unit tests are used to decrease the number of problems present in the module and ensure that the module functions as intended with all potential inputs. Each user input will be tested in this project using unit testing to ensure that the application performs as intended. Each form will go through a test utilizing input that is valid, invalid, and null. If any errors are discovered during this process, the designer will fix them immediately. By doing this, you can be sure that when you transfer data to the database, it will be accurate and in the appropriate format. Additionally, this will guarantee accurateness and data integrity.

**Unit Testing 1: Ensuring the proper login and registration**

| No. | Event | Attribute and value | Inference | Result |
|---|---|---|---|---|
| 1. | Authenticate patient login after clicking on login. | Login email: welldone@space.com Password: welldone@1234 | Login successful and directed to home page | Pass |
| 2. | Authenticate doctor login after clicking "Login" button with proper credentials | Login email: vijayakanth@gmail.com Password: doctor | Login successful and directed to appointments page | Pass |

| | | | | |
|---|---|---|---|---|
| 3. | New patient registration. Patient has to enter a password with minimum of 8 characters. | Login email: vijaya@gmail.com Password: 12345 | Password should be minimum 8 characters. | Fail |
| 4. | New patient registration. Patient has to enter a password with minimum of 8 characters. | Login email: vijaya@gmail.com Password: 12345abcd | New patient added pass. | Pass |

Table 2.1: Unit testing 1

## 9.2. UNIT TESTING 2

### Ensuring the AI prediction is according to the given symptoms.

| No. | Patient Input | AI Prediction | Actual | Result |
|---|---|---|---|---|
| 1. | I am suffering from vomiting and leg pain | It is possible that you may be experiencing symptoms of a gastrointestinal illness or infection, such as the flu or food poisoning. | Gastrointestinal illness | Pass |
| 2. | I have a headache from morning, do u think oversleeping can cause a headache? | Oversleeping can potentially contribute to headaches, as it disrupts the body's natural sleep-wake cycle. | Headache due to over sleeping | Pass |

| | | | | |
|---|---|---|---|---|
| 3. | what are the symptoms of cancer | 1. Lumps or nodules<br>2. Unusual moles or spots on the skin<br>3. Persistent coughing or hoarseness<br>4. Rapid weight loss. | Persistent coughing or hoarseness | Pass |
| 4. | I have redness in my eyes | Redness in the eyes can be caused by allergies, dryness, or medical conditions. If redness is accompanied by itching or tearing, it may be due to an allergy. Speak with a healthcare professional for proper diagnosis and treatment. | Infection in eyes | Pass |
| 5. | I have neck pain from past 2 weeks | Neck pain that lasts for two weeks or more could be a serious medical condition. See a healthcare professional for proper diagnosis. | Muscle pain | Pass |

Table 2.2 Unit Testing 2

# CHAPTER-10
# CONCLUSION

In conclusion, the Health Sphere project has made significant contributions to enhancing emergency medical services through the development of a user-friendly mobile application. By successfully integrating various essential services such as blood availability, doctor information, and Artificial Intelligence medical chatbot services, the project has demonstrated the potential of technology to improve healthcare accessibility and positively impact the industry. The project serves as a valuable model for similar applications in the healthcare sector, showcasing the benefits of collaboration among multiple stakeholders including hospitals, blood banks, and other service providers. This collaboration ensures that users receive accurate and reliable information when they require emergency medical assistance.

It emphasizes the importance of effective emergency medical services in society and highlights the need for efficient systems that enable prompt access during critical situations. Moreover, the Health Sphere project has paved the way for future advancements and opportunities in the field of emergency medical services. The continuous development and refinement of the mobile application, coupled with feedback from users and stakeholders, will enable further improvements and enhancements in the future. By leveraging digital technology and harnessing the power of web applications, the project has opened up possibilities for innovative solutions that can revolutionize emergency healthcare delivery.

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# APPENDIX-A
## PSUEDOCODE

```
# Initialize Supabase and set UI style
initializeApp():
   EnsureInitialized()
   Supabase.initialize(pkce, 'YOUR_SUPABASE_URL', 'YOUR_ANON_KEY')
   SetUIOverlayStyle()
# Main application setup
MainApp:
   build():
      return MaterialApp(
         // App configuration
         routes: {
            '/login': LoginPage(),
            '/loading': SplashPage(),
            '/register': RegisterPage(),
            '/home': HomePage(),
            '/bot': AIBotScreen(),
            '/hospital': HospitalDetailsScreen(),
            '/hospitalEdit': HospitalEditScreen(),
            '/bloodEdit': BloodGroupEditPage(),
            '/profile': DoctorEditScreen(),
         },
      )
# Entry point
initializeApp()
```

# APPENDIX-B
## SCREENSHOTS

## B.1 PROJECT INSIGHTS

### Registration Page

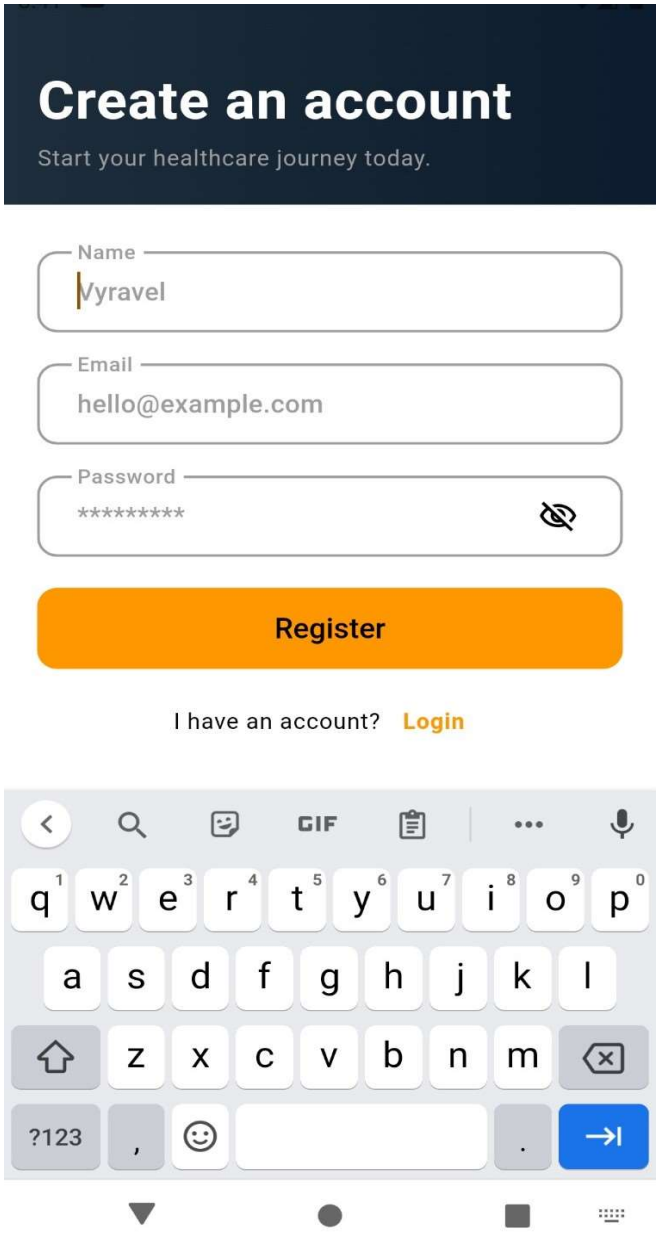



Fig 3.1 Registration Page

## Registration Page

- **Headline:**

"Create an account" - This is the main headline of the page and it tells users what they need to do in order to use the app.

- **Subheading:**

"Start your healthcare journey today" - This is a subheading that provides a bit more context about the app and what it can do for users.

- **Form:**

1. **Name**: This is a text field where users can enter their first and last name.
2. **Email**: This is a text field where users can enter their email address.
3. **Password**: This is a text field where users can enter their password. There is also a toggle button that users can click to show or hide their password.

- **Button**:

Register: This is the button that users click to submit their registration information.

- **Link**:

I have an account? Login: This is a link that users can click if they already have an account with the app.

- **Keyboard**:

The image also shows a keyboard at the bottom of the screen. This is the keyboard that users will use to enter their information into the form fields.

**Login Page**

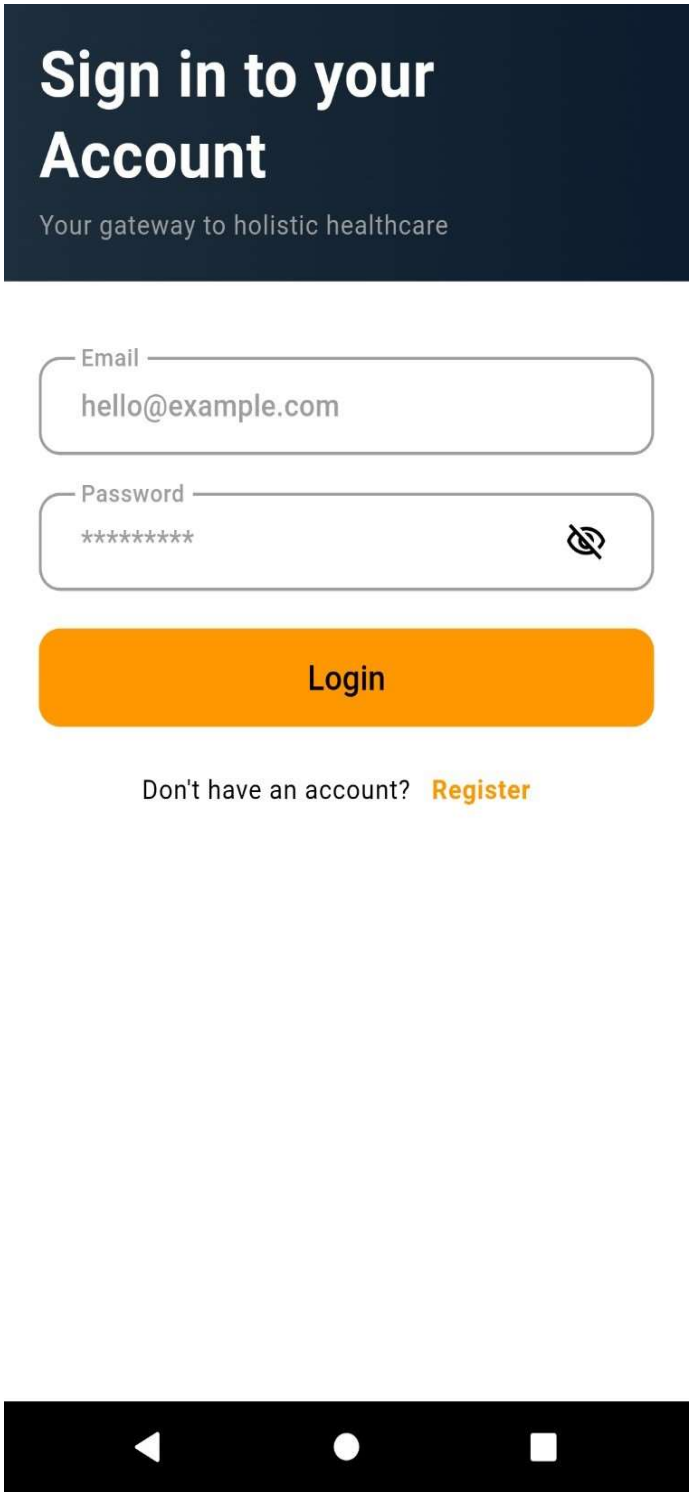



Fig 3.2 Login Page

## Login Page

This login page serves as your portal to a personalized experience within the healthcare platform. The clear headline, "Sign in to your Account," guides you, while the subheading, "Your gateway to holistic healthcare," hints at the valuable tools and information waiting inside.

- **Unlocking Your Health Journey:**

The email field acts as your key, prompting you to enter the address associated with your account. A helpful placeholder might read "Enter your email address" for clarity. Next, the password field safeguards your privacy, accepting your confidential code. A discreet toggle could offer a temporary glimpse for confirmation before disappearing again, ensuring security.

- **Taking the Next Step:**

The prominent "Login" button is your launchpad. Clicking it initiates the authentication process, verifying your credentials and granting access to your personalized dashboard. A subtle progress indicator might reassure you during this crucial step.

- **Exploring Your Wellness Possibilities:**

Once inside, you'll have access to a wealth of features tailored to your needs. These could include viewing your health records, tracking medications, connecting with healthcare providers, accessing educational resources, and managing wellness goals. The specific features will depend on the platform you're using.

- **A Simple Guide for Seamless Login:**

1. Enter your registered email address in the designated field.
2. Carefully type your password, ensuring accuracy.
3. Click the "Login" button to start the authentication process.
4. Wait patiently while the system verifies your credentials.
5. Welcome back! You should now have access to your personalized healthcare platform

**Invalid login Credentials**

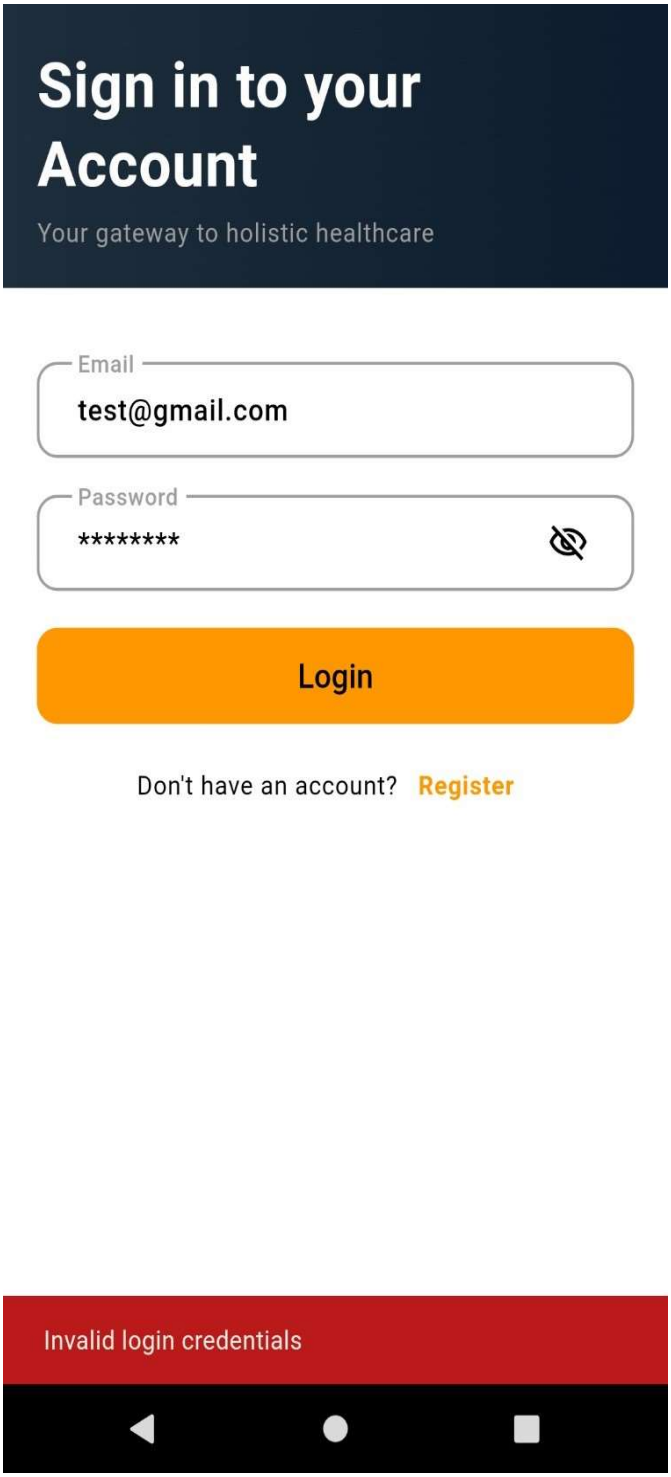



Fig 3.3 Invalid Login Credentials Page

## Invalid login Credentials

This page serves as a temporary stop sign on your personalized health journey. It may display a clear and concise headline like "Invalid Login Credentials," acting as a polite gatekeeper alerting you that the username and password combination didn't match the ones on record. Don't worry, it's not a dead end, but a gentle nudge to get you back on track towards your well-being haven.

The page likely presents the same familiar form you encountered during login, with the email and password fields patiently awaiting your corrected input. A helpful error message, perhaps worded like "The email or password you entered is incorrect. Please try again," could offer additional clarity and guide your next steps.

For those who genuinely forgot their password, a prominently displayed "Forgot Password?" link stands as a beacon of hope. Clicking it initiates the password reset process, paving the way for a smooth return to your personalized dashboard.

**But before initiating another login attempt, here's a friendly navigation guide:**

1. **Double-check your credentials:** Scrutinize the email address and password you entered. Did you mistype anything? Remember, passwords are often case-sensitive, so ensure Caps Lock isn't causing unintended errors.
2. **Consider a password manager:** If you manage numerous accounts, using a secure password manager can prevent typos and ensure accuracy. Let it do the heavy lifting!
3. **Reattempt login:** After reviewing and correcting your credentials, click the "Login" button once more. This time, with the right combination, the gateway to your health should swing open.

Remember, encountering this page is purely a security measure protecting your valuable health information. By taking a moment to review your input and utilize the available resources, you'll be back on the path to personalized healthcare in no time. Don't let this temporary detour dampen your wellness journey; just follow the friendly guidance, and you'll soon be back on track towards optimal health.

**Hospital & Doctors List**

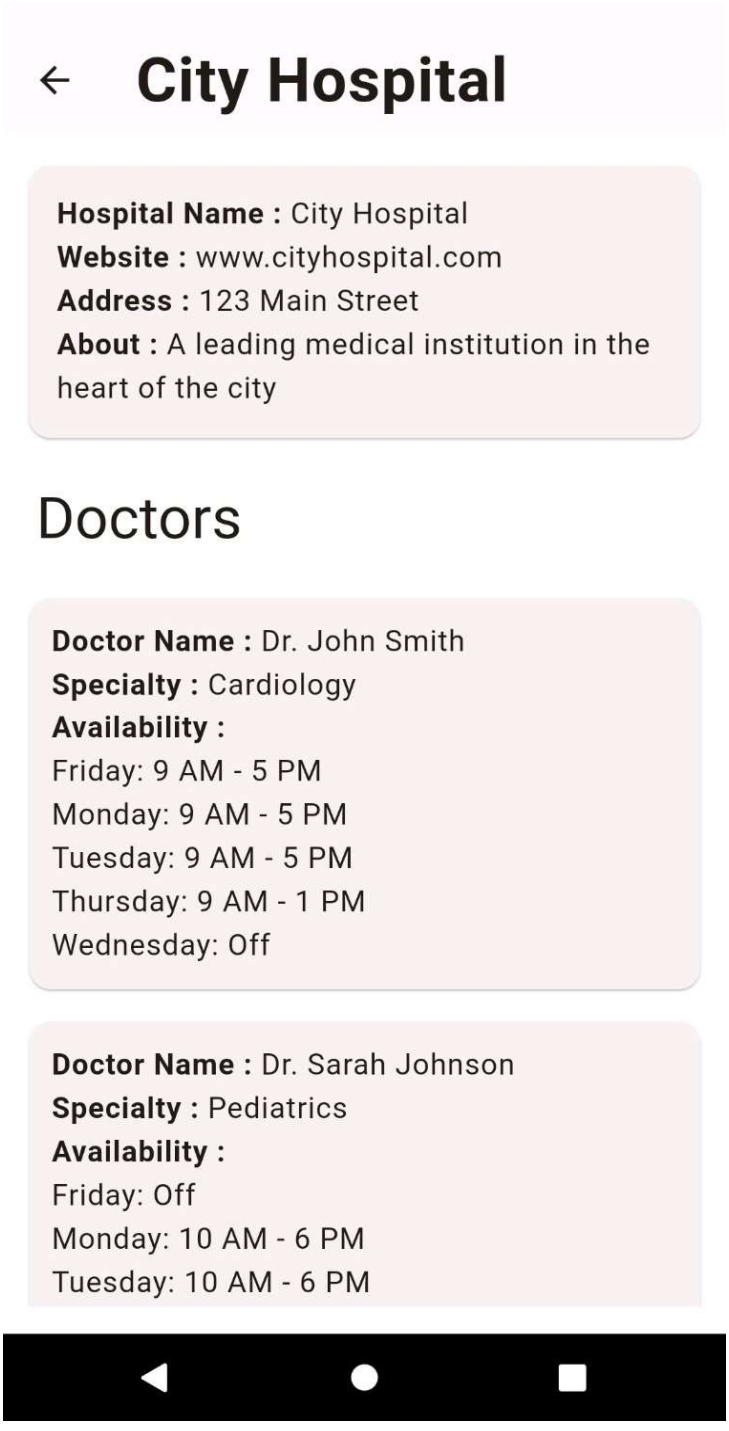



Fig 3.4 Hospital & Doctors List

## Hospital & Doctors List

This image showcases a convenient list of doctors affiliated with a particular hospital

**1. Hospital Information:** Prominently displayed at the top is the hospital's name and logo, along with its website address. This instantly establishes context, letting you know which healthcare facility this doctor list belongs to.

**2. Doctor Profiles:** Each doctor entry features their name, specialization, and sometimes their hospital affiliation within the facility. Think of it as a mini-resume, giving you a quick overview of their expertise and location within the hospital.

**3. Contact Information:** Some entries might include the doctor's contact details, such as phone number or email address. This allows you to directly reach out to their office for appointment scheduling or non-urgent inquiries.

**4. Additional Resources:** The image might also provide links to additional resources, such as the hospital's website or department pages.

**Hospital Page**

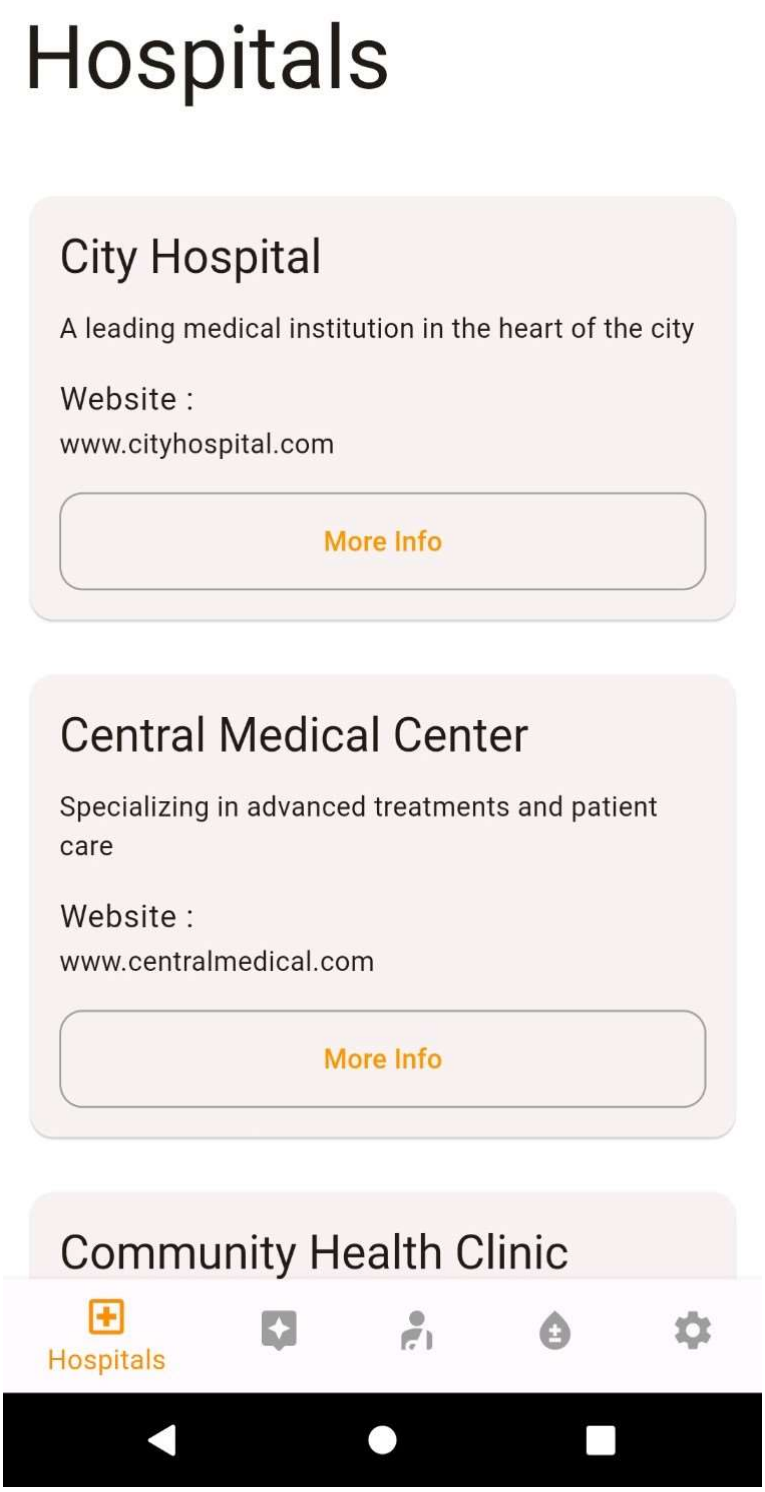



Fig 3.5 Hospitals page

## Hospital Page

This image showcases a convenient list of hospitals, serving as your one-stop shop for exploring healthcare options in your area. Imagine it as a bustling marketplace, with each "stall" representing a hospital offering its unique set of services and specialties.

- **Hospital Names:** Prominently displayed are the names of various hospitals, often accompanied by their logos. This gives you a quick overview of the available healthcare providers in your region.
- **Location Information:** Some entries might include the hospital's address, phone number, and website address. This empowers you to easily find the physical location, contact them directly, or access further information online.
- **Specialties:** Many platforms present the hospitals alongside their areas of expertise, such as cardiology, paediatrics, or orthopaedics. This helps you quickly identify hospitals equipped to address your specific healthcare needs.

**Doctors Page**

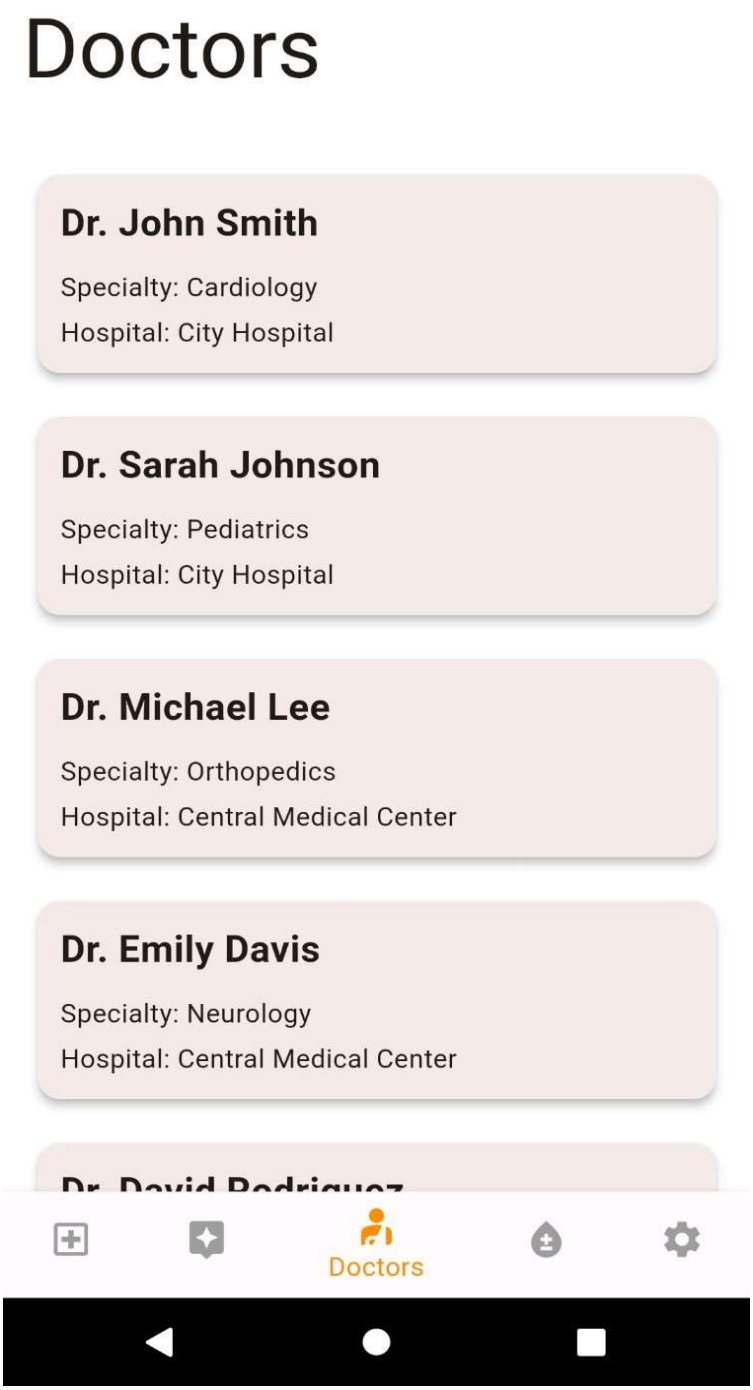



Fig 3.6 Doctors Page

## Doctors Page

This doctors' page serves as your personal gateway to a team of dedicated healthcare professionals, guiding you towards optimal health. Imagine it as a bustling marketplace, each "stall" occupied by a doctor specializing in a specific area, from cardiologists safeguarding your heart to paediatricians nurturing your child's well-being.

**Meeting Your Healthcare Team:** Each doctor's profile is like a mini-resume, displaying their area of expertise (cardiology, paediatrics, orthopaedics, etc.) and their hospital affiliation. Some profiles might even include patient testimonials, offering a glimpse into their approach to patient care.

**Taking Action: Scheduling Appointments:** On some platforms, scheduling appointments is as simple as clicking a button. Choose the doctor you need, select a convenient date and time, and voila! Your personalized healthcare journey takes a concrete step forward.

**Beyond Appointments: Staying Connected:** The connection doesn't end with appointments. Many platforms provide contact information for non-urgent inquiries, allowing you to send secure messages to your doctor's office and stay connected between visits.

**Finding Your Experts:** The image showcases a central list of doctors, each presented like a tile with their name, specialization, and sometimes hospital affiliation prominently displayed. Imagine it as a map, where each doctor represents a specific destination on your personalized healthcare journey. Clicking on a tile reveals their individual profile, providing more details about their expertise and qualifications.

**Taking the Next Step:** Some platforms integrate appointment scheduling right into this page. Look for buttons or links next to a doctor's name, allowing you to choose a convenient date and time for your visit. It's like having a built-in bridge, effortlessly connecting you with the right professional at the right moment.

**Staying Connected:** Don't worry, the connection doesn't end with scheduled appointments. Many platforms offer additional contact information, such as phone numbers or email addresses, for non-urgent inquiries. Think of it as a direct line to your doctor's office, keeping you in touch between visits.

**AI Medical Chat Bot**

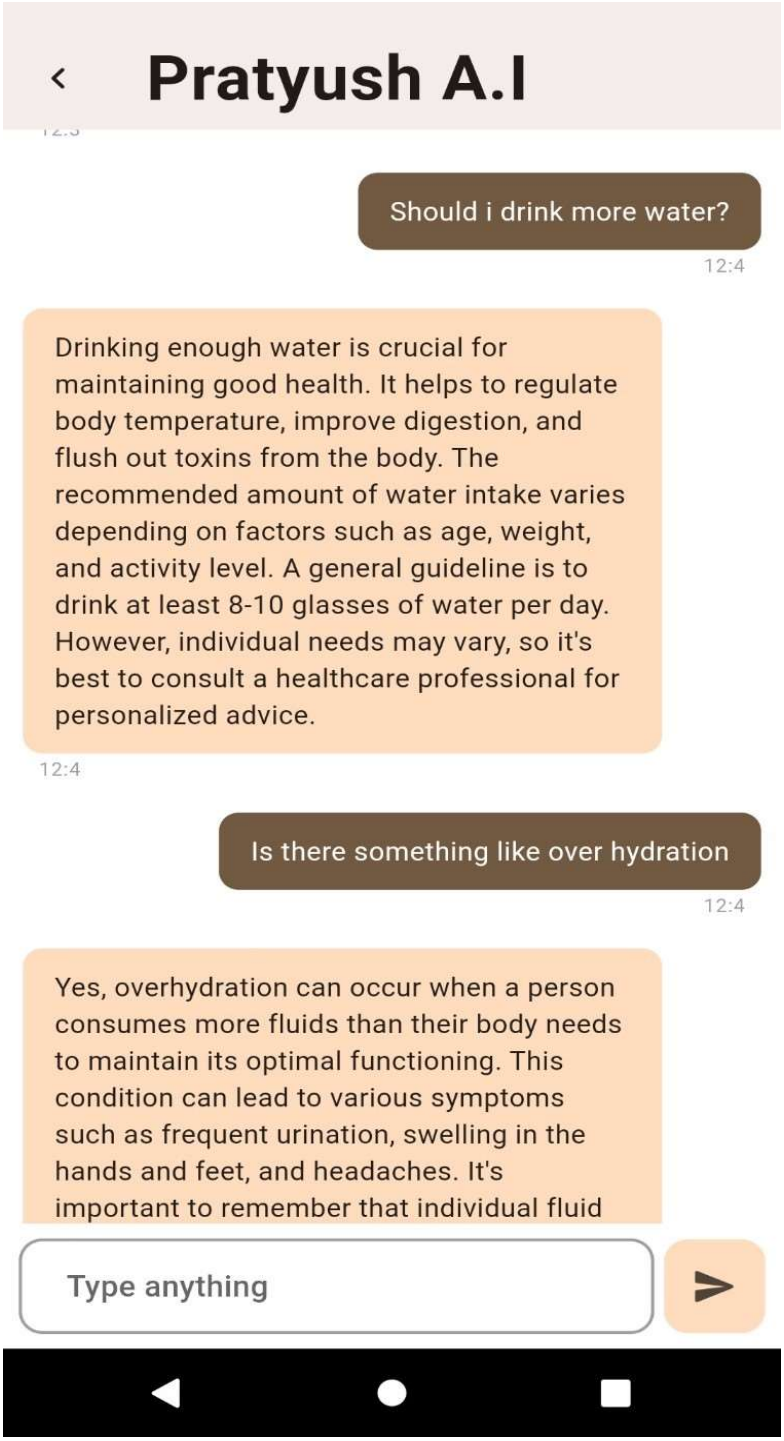



Fig 3.7 AI Medical Chat Bot

## AI Medical Chat Bot

**1**. **Conversation Area:** At the centre of the interface is a text box or conversational space where users can type or speak their symptoms and questions. This encourages a natural and user-friendly interaction with the AI.

**2. User Input Visualization:** Depending on your design, the image might display how user input appears. This could be through text bubbles, transcripts, or other visual cues that show what the user has mentioned.

**3. AI Response Representation:** Similarly, the image might showcase how the AI responds to user input. This could be through text bubbles in a different colour, a chatbot avatar speaking back, or other visual indicators of the AI's interaction.

**4. Additional Features:** Look for other elements in the image that hint at your platform's unique features. This could include icons representing access to educational resources, buttons for scheduling appointments, or links to medical organizations.

**5. Overall Look and Feel:** Describe the general theme and atmosphere of the interface. Is it friendly and approachable? Informative and professional? Modern and sleek? Use these adjectives to convey the message you want to send about your chatbot's personality and purpose

**Blood Availability Page**

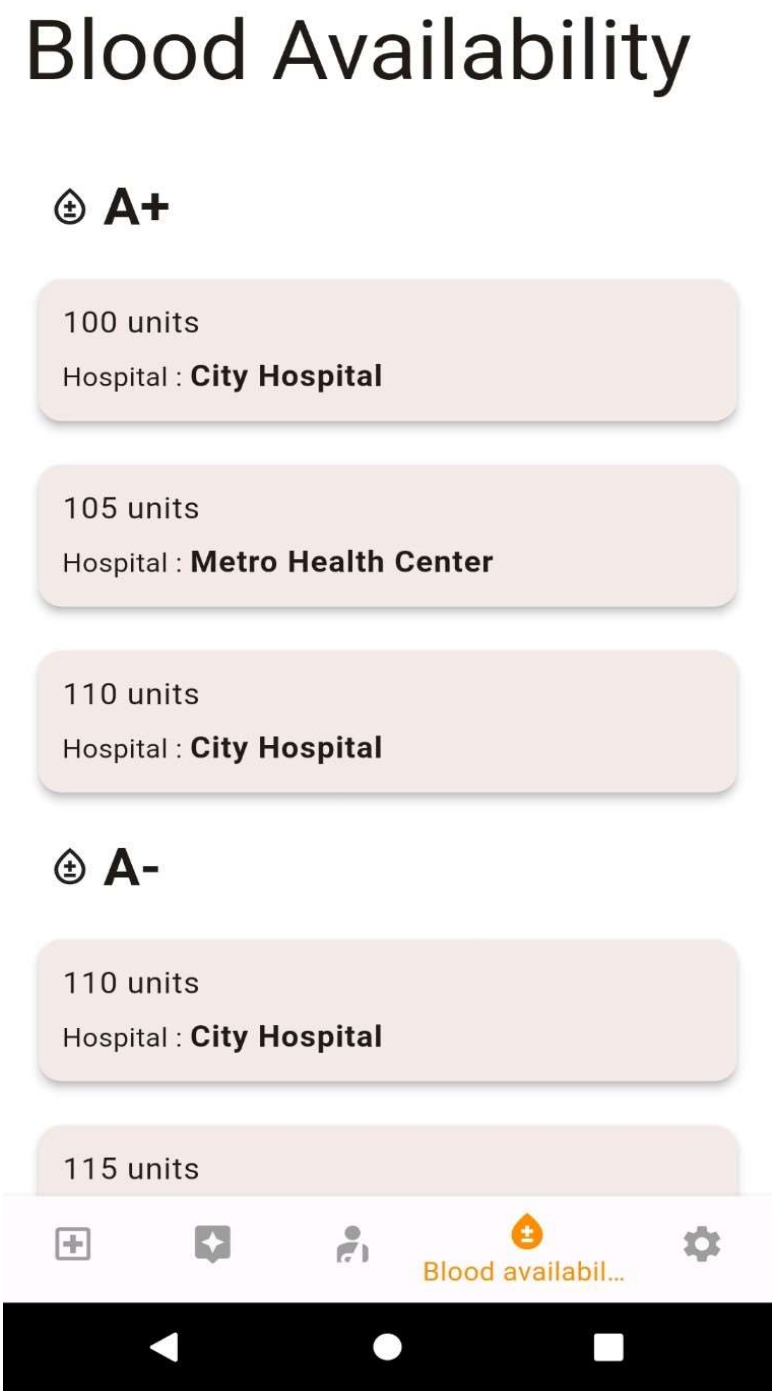



Fig 3.8 Blood Availability Page

## Blood Availability Page

This image portrays a vital resource for anyone in need of blood: a blood availability page. Think of it as a real-time window into the life-saving reserves stored within your healthcare system. Let's explore what it reveals:

**1. Blood Units:** At the heart of the page are clear displays of available blood units for different blood types. Each entry typically shows the blood type (e.g., A+), the number of units in stock (e.g., 100 units), and sometimes the hospital or blood bank where they're located. This readily informs potential donors and patients about the immediate blood supply.

**2. Easy Navigation:** The page often organizes blood types logically, such as alphabetically or by Rh factor (positive or negative). This makes it quick and easy for users to find the specific blood type they need or are willing to donate.

**3. Additional Information:** Some platforms might offer further details alongside each blood type entry. This could include information about the blood components available (e.g., whole blood, platelets, plasma), the last time the stock was updated, or even contact details for the responsible blood bank.

**4. Real-time Updates:** Ideally, the blood availability page refreshes regularly, ensuring the information displayed is accurate and reflects the current stock levels. This transparency empowers both donors and patients to make informed decisions based on the latest data.

**Benefits for the Community:**

- Transparency: The page readily clarifies the available blood reserves, fostering trust and confidence in the blood donation system.
- Efficiency: Quick access to blood availability information streamlines the process for both donors and patients, potentially saving lives.
- Informed Decisions: By understanding the current blood stock, both donors and patients can make informed choices about their contributions or needs.

# B.2 100% IMPLEMENTATION

## Admin end

- **Admin Login:**

An administrator can login using their login credentials and add doctors to the doctor section.

- **Doctor Registration:**

Once the administrator logs in The doctors can be added by entering the details such as:

Name, contact number, Email-id, designation, specialization and create a new password to login

A new doctor can be added only by the admin into the database.

- **Hospital Details:**

Administrator adds hospitals by entering the details such as:

Name, contact number, address, timings.

- **Blood availability:**

Only the admin can update the availability of blood in hospitals
And patients and doctors can only view it.

- **Logout:**

Admin logs out to securely end his/her session.

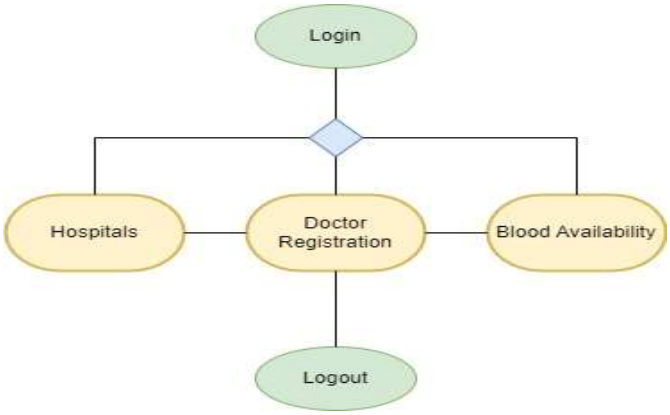



Fig 3.9 Admin activity

## Patient End

- **Login:** New patients can register using their Email-id and creating their own password After registration he/she can Login using the credentials

- **Booking Appointments:** Browse available appointments by doctor, department, and date/time. Patients can check their status of appointments by viewing, and patients can delete the appointment in case he/she want to.

- **Ai Interaction:** Patients can describe his/her symptoms through text or voice, and receive personalized care suggestions. The AI analyzes the input given by the patient and offers home remedies, lifestyle adjustments, or recommends seeking further medical attention.

- **Hospital Details:** Patients can view information of Hospitals like contact details, location, facilities, and offered services. List of doctors available in that Hospital where he/she can book an appointment or visit the Hospital

- **Blood Availability:** Patients can check the availability of different blood types in the blood bank. Admin updates the availability of Bloods and Patients can view the amount of blood; blood type available in the specified blood bank updated by the admin. He/she is allowed to access the real-time information about blood resources.

- **Logout:** Patient logs out to securely end his/her session.

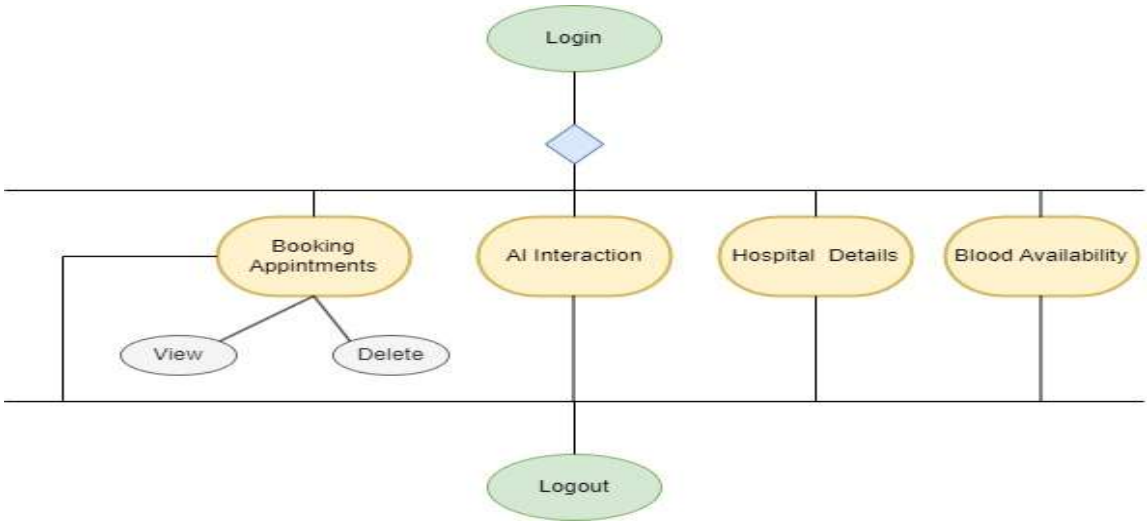



Fig 3.10 Patient activity

## Doctor End

- **Doctor Login:** A doctor once logged in can view the requested appointments in the "Appointments" section. The doctor can "Accept" or "Reject" the appointments.

- **Add Report:** The doctor has to select a patient from the list of email-ids available. Based on the symptoms given by the patients, doctor can predict the disease and prescribe medication for patient.

- **View Report:** The doctor once logged in and added a report to the patient can view the reports from the "view" section.

- **Logout:** Doctor can logout from the "Logout" section.

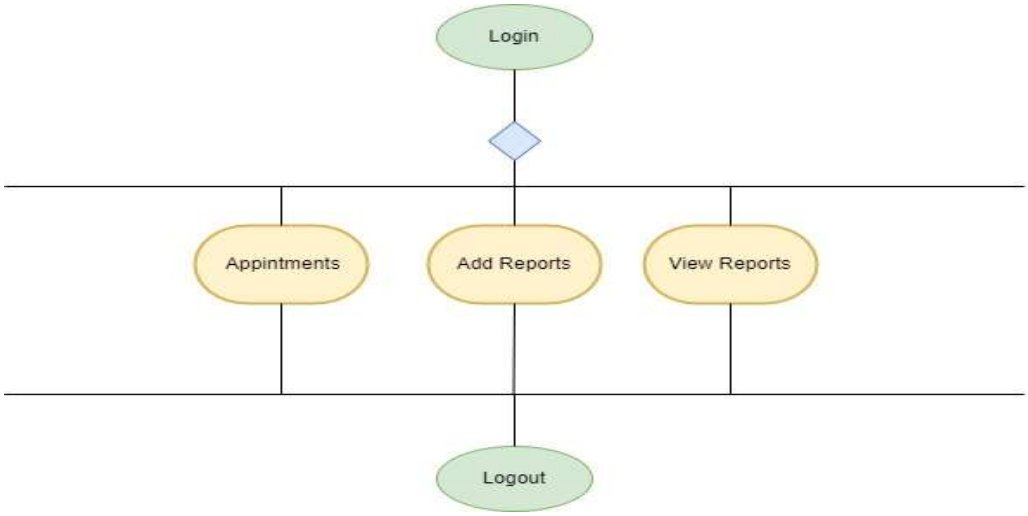
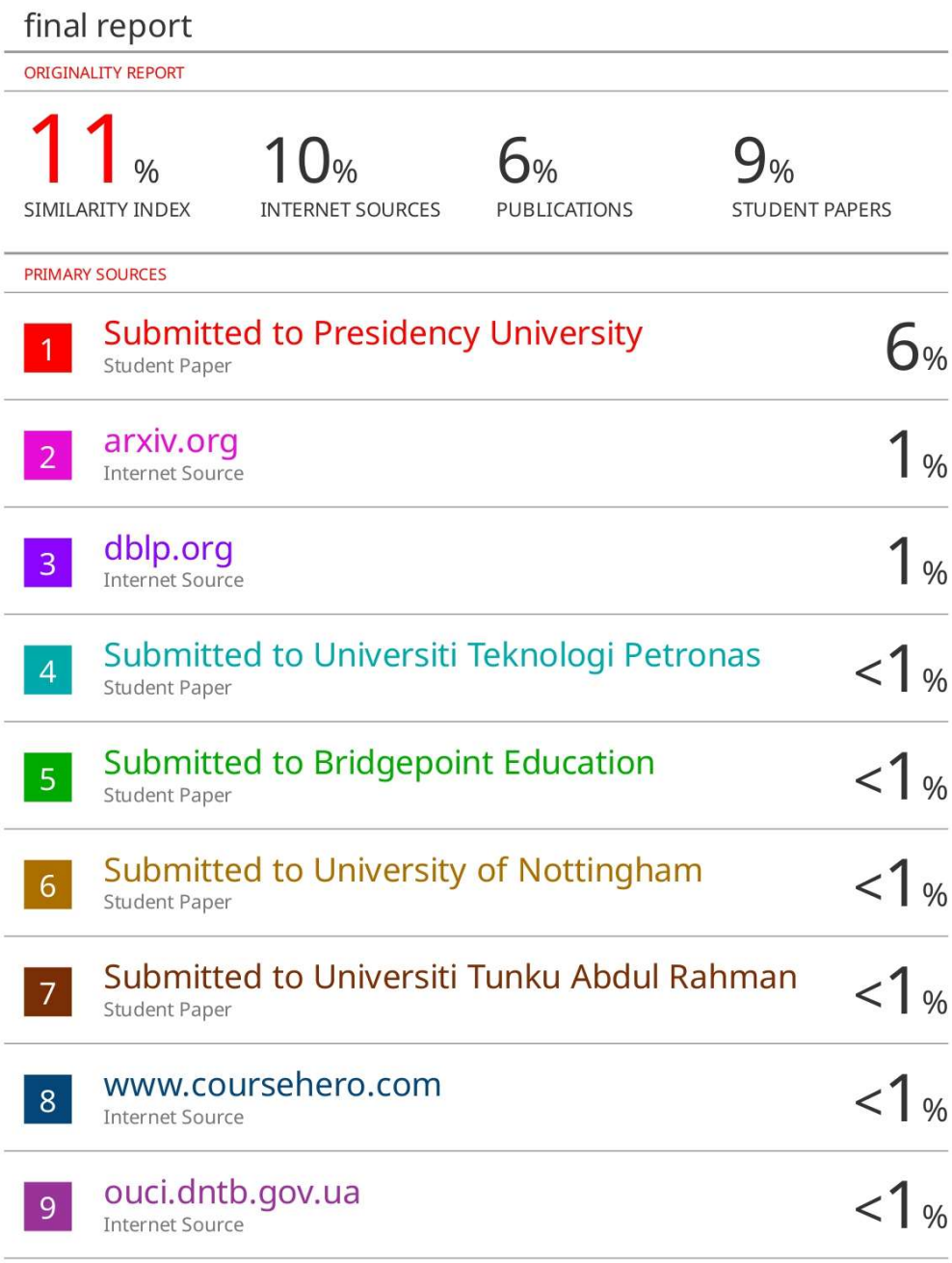



Fig 3.11 Doctor Activity

# APPENDIX-C
# ENCLOSURES

## C.1 Plagiarism Check



final report

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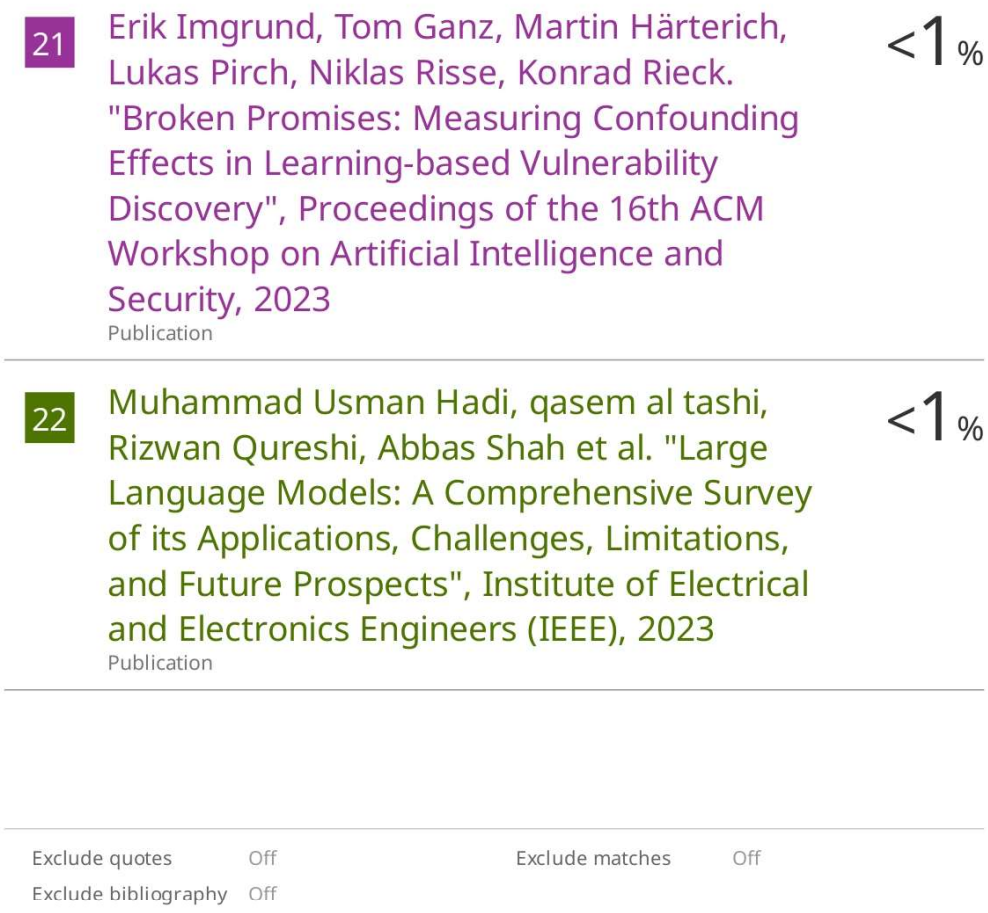


Fig 4.1 Plagiarism Check

## C.2 Sustainable Development Goals

**1. SDG 3: Good Health and Well-being:** Our project contributes significantly to SDG 3 by revolutionizing patient engagement, empowering individuals to make informed decisions about their health. The AI-driven chatbot facilitates proactive healthcare management, promoting a culture of well-being and contributing to the overall improvement of global health.

**2. SDG 4: Quality Education:** Through its educational aspect, our application aligns with SDG 4 by fostering health understanding and empowerment. By providing reliable medical information, the platform enhances health literacy, enabling individuals to actively participate in their healthcare decisions and promoting a more informed society.

**3. SDG 9: Industry, Innovation, and Infrastructure:** The user-centric design and technological excellence embedded in our application contribute to SDG 9 by showcasing innovation in healthcare technology. The integration of cutting-edge AI ensures accurate and timely delivery of medical information, setting new standards for technological excellence in the healthcare industry.

**4. SDG 10: Reduced Inequality**: Our project aligns with SDG 10 by breaking down barriers to healthcare information and creating a patient-centric approach. The application's accessibility and availability ensure that healthcare insights are available to all, regardless of socio-economic factors, thus contributing to the reduction of health-related inequalities.


Fig 4.2 Sustainable Development Goals