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Healthcare Pro: Personalized Health Diet & EHR with Multilingual Support

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ABSTRACT: Healthcare Pro is a comprehensive healthcare application developed to improve health literacy by simplifying complex medical reports and offering personalized diet recommendations. The system leverages Natural Language Processing (NLP) to translate medical jargon into understandable language, making healthcare information accessible to all users. It also provides dietary suggestions based on individual health data and allows secure electronic health record (EHR) storage. With multilingual support and an intuitive interface, the application bridges the gap between clinical content and patient understanding. Through robust backend architecture and a focus on user privacy, Healthcare Pro aims to empower patients to make informed decisions about their health and wellbeing

KEYWORDS: Medical Report Simplification, Natural Language Processing, Personalized Diet, Healthcare Application, EHR Management, Health Literacy

I. INTRODUCTION

In the digital age, healthcare has rapidly evolved with the integration of technology, yet a critical gap still exists between the generation of medical information and its comprehension by the end-user—the patient. Medical reports, diagnostic summaries, and prescriptions are often filled with complex terminologies that are difficult to interpret for individuals without a medical background. This lack of clarity not only leads to confusion and misinterpretation but also negatively affects patient engagement, compliance, and informed decision-making. Healthcare documents, particularly electronic health records (EHRs), are an abundant source of patient-specific data. However, the clinical language used in such records is highly specialized and often inaccessible to the layperson. With the increasing push toward patient-centered care, there is a growing need for tools that can bridge this communication gap, enhancing health literacy and enabling patients to take an active role in managing their health.

This is where **Healthcare Pro** comes into play. Healthcare Pro is a application designed to simplify the user's experience by translating complex medical terms into plain, easy-to-understand language. The application allows users to log in and either scan or upload a medical report. These reports, which typically contain specialized terminology, are then processed using Natural Language Processing (NLP) algorithms to generate a simplified summary. This enables patients to better understand their diagnosis, test results, and treatment plans without needing to rely entirely on healthcare professionals for interpretation. Moreover, Healthcare Pro extends beyond information simplification. It also provides **personalized dietary recommendations** based on the contents of the medical report. For instance, if a report indicates high cholesterol or abnormal blood sugar levels, the app automatically generates diet suggestions tailored to the user's condition. This integration of data analysis with lifestyle guidance transforms Healthcare Pro from a passive information tool into an active health management assistant.

The backbone of this application lies in NLP and machine learning technologies, which have become essential tools in healthcare analytics. NLP tasks such as language modeling, word segmentation, Part-of-Speech (PoS) tagging, named entity recognition (NER), and syntactic parsing are widely used in big data healthcare applications for preprocessing and interpretation of unstructured data. Core linguistic processes like syntactic parsing and coreference resolution are crucial in identifying relationships between clinical entities and extracting meaningful insights. The use of big data analytics in healthcare has shown promising potential in addressing humanitarian needs, optimizing healthcare delivery,

enabling real-time health monitoring, and supporting wellness applications. These developments underscore the growing importance of intelligent systems that utilize big data and NLP to meet complex healthcare demands.

Healthcare Pro also ensures **secure storage and retrieval of medical records**, allowing users to maintain a digital archive of their health history. This feature not only enhances user convenience but also enables better continuity of care, as users can share their simplified reports and health records with healthcare providers.

The application is built with an intuitive, user-friendly interface and supports multiple languages, ensuring accessibility across diverse populations. In doing so, Healthcare Pro addresses a critical need in the healthcare ecosystem: making complex medical data understandable and actionable for the average individual. It empowers users to make informed decisions, follow tailored health recommendations, and actively engage in their wellness journey.

In summary, the development of Healthcare Pro is a significant step toward democratizing health information. By simplifying medical language, providing customized dietary guidance, and enabling secure digital health management, the app fosters a more informed, health-literate, and proactive patient population.

II. LITERATURE SURVEY

The increasing integration of artificial intelligence, natural language processing (NLP), and mobile technologies in healthcare has led to the emergence of innovative applications aimed at improving health literacy, enhancing self-care, and providing digital medical assistance. This section presents a comprehensive survey of the existing literature that forms the foundation for the Healthcare Pro application, covering relevant studies in personalized diet recommendation systems, electronic health records, multilingual support, and intelligent healthcare assistance.

1. Android Application for Personal Diet Consultant [1]

This research explores a mobile application that provides dietary recommendations based on individual BMI values calculated using height, weight, and age. The system offers daily meal plans to help users reach fitness goals, showcasing a basic approach to personalized nutrition. While effective in encouraging healthy habits, it lacks integration with clinical health data such as existing diseases or lab results—something Healthcare Pro aims to bridge.

2. Electronic Health Record Management via Android Devices [2]

The study discusses a cloud-based mobile application designed for the secure storage and retrieval of electronic health records (EHR). It features encrypted data transmission and multi-device synchronization, promoting continuity of care. This aligns with Healthcare Pro's mission to ensure user-friendly and private EHR management, enabling patients to carry their medical history securely.

3. Multilingual Chatbot for Healthcare Assistance Using NLP [3]

In this work, the authors introduce a multilingual chatbot capable of understanding and responding in regional Indian languages using NLP. It supports both speech and text inputs, making healthcare information more inclusive and accessible. This approach resonates with Healthcare Pro's objective of breaking language barriers and democratizing medical content for diverse populations.

4. AI-Based Personalized Health Assistant Application [4]

This paper presents an AI-driven health app that monitors calories, water intake, and fitness activities. Through machine learning, it adapts to the user's behavior over time. However, the lack of integration with medical diagnostics reduces its relevance in clinical contexts. Healthcare Pro overcomes this limitation by tying diet recommendations to medical conditions extracted from reports.

5. Smart Healthcare Monitoring System with Alerts and Notifications [5]

The proposed system enables real-time monitoring using wearable sensors and mobile integration. It sends alerts for abnormal vitals, aiding in early detection. Though technically impressive, the system focuses more on continuous monitoring rather than post-diagnosis management—where Healthcare Pro provides value by translating reports and guiding recovery through nutrition.

6. CoachAI: A Conversational Agent Assisted Health Coaching Platform [6]

CoachAI introduces an intelligent health coach that interacts with users to promote lifestyle changes. It effectively uses conversational agents to reduce caregiver burden. This personalized coaching element echoes Healthcare Pro's goal of providing tailored dietary suggestions based on the user's current medical profile and lab results.

7. HealthifyMe: AI-Driven Nutrition and Fitness Application [7]

HealthifyMe is a leading wellness application offering diet tracking, fitness routines, and a digital assistant named Ria. It demonstrates how AI can scale health advisory services. Unlike Healthcare Pro, however, it lacks integration with EHRs or medical report simplification, which are central to your project's innovation.

8. Smart Health Monitoring System [8]

This research focuses on patient vital monitoring through sensors and IoT. The data is transmitted to caregivers or family during emergencies. Though vital for real-time tracking, the study does not address post-diagnosis guidance or health education, both of which are emphasized in Healthcare Pro through NLP and diet suggestions.

9. Healthcare Assistance Application with Chatbot [9]

This application integrates a chatbot that responds to basic health inquiries, identifies nearby healthcare facilities, and provides emergency aid information. While user-friendly, its scope is limited to general knowledge. Healthcare Pro builds upon this by delivering personalized, medically contextualized assistance to each user.

10. Healthcare Virtual Assistant [10]

This study showcases a chatbot integrated with AI and NLP, designed to streamline healthcare processes and answer patient queries. It improves accessibility and reduces administrative workload. The assistant in Healthcare Pro similarly empowers users—but goes a step further by parsing actual medical documents to tailor its advice.

11. Implementation of Chatbot for Communication Between Physician and Patients [11]

The authors propose a web-based chatbot enabling asynchronous medical consultations. It supports patients in rural or remote areas by minimizing unnecessary clinic visits. Healthcare Pro aligns with this concept but enhances it with real-time, language-simplified feedback based on official medical documents.

12. IoT-Based Smart Integrated Medical Health Monitoring System [12]

This IoT-based solution connects patients in ambulances to hospitals, transmitting live vitals and alerting emergency services. While innovative in acute care scenarios, its utility in chronic condition management or health literacy remains limited—an area where Healthcare Pro excels.

13. iCare: A Mobile Health Monitoring System for the Elderly [13]

iCare focuses on elderly users, offering personalized health tracking via mobile and wearable devices. It sends emergency alerts and stores medical history, promoting independence. Healthcare Pro adopts similar principles but broadens its audience and integrates health education through report simplification and tailored diet plans.

III. METHODOLOGY

The development of Healthcare Pro is structured into multiple modular phases, combining software engineering best practices with domain-specific insights from healthcare, nutrition, and linguistics. The system is designed as a mobile platform that provides personalized dietary recommendations

The methodology is divided into the following major components:

A. Requirement Analysis and Problem Definition

The initial phase involved identifying the key pain points in current healthcare and diet management apps. Surveys and interviews with users revealed the following issues:

- Lack of integration between dietary apps and actual medical conditions.
- Complex medical terminologies in reports that are hard for users to understand.

Based on these gaps, the core objectives of Healthcare Pro were defined:

- Enable users to store and retrieve Electronic Health Records (EHR) securely.
- Extract key information from medical reports using Optical Character Recognition (OCR).
- Provide personalized dietary recommendations linked to health conditions.

B. System Architecture Design

The system is built using a modular architecture comprising five main modules:

1. User Authentication & Profile Management

2. Medical Report Upload and OCR Analysis

Users can upload **lab reports in image or PDF format**. This module performs:

- **PDF parsing** using **iTextPDF** for direct text extraction.
- **Image text recognition** using **Google ML Kit/Tesseract(OCR)**, converting scanned medical documents into Simplified version

Post-extraction filtering highlights important clinical parameters such as:

- Hemoglobin
- levels Blood sugar (FBS/PPBS)
- Thyroid profiles
- Vitamin deficiencies

3. EHR Storage and Retrieval System

This module is designed to temporarily store processed medical data on the user's device using **local cache memory**. Once the medical report is extracted and simplified:

- The data is stored locally on the device, allowing users to access it during the session or until the app cache is cleared.
- This lightweight storage method ensures quick retrieval without the need for internet connectivity.
- As data resides only on the user's phone, there is no cross-device access or long-term history tracking.

4. Personalized Diet Recommendation Engine.

This logic-driven module provides nutrition advice based on extracted health conditions. It functions entirely on rule-based algorithms

- High glucose → Suggests **low-glycemic** index foods.
- Low hemoglobin → Recommends **iron-rich foods** like spinach, legumes, and fortified cereals.
- High cholesterol → Suggests **low-fat, fiber-rich** foods

C. Workflow Diagram

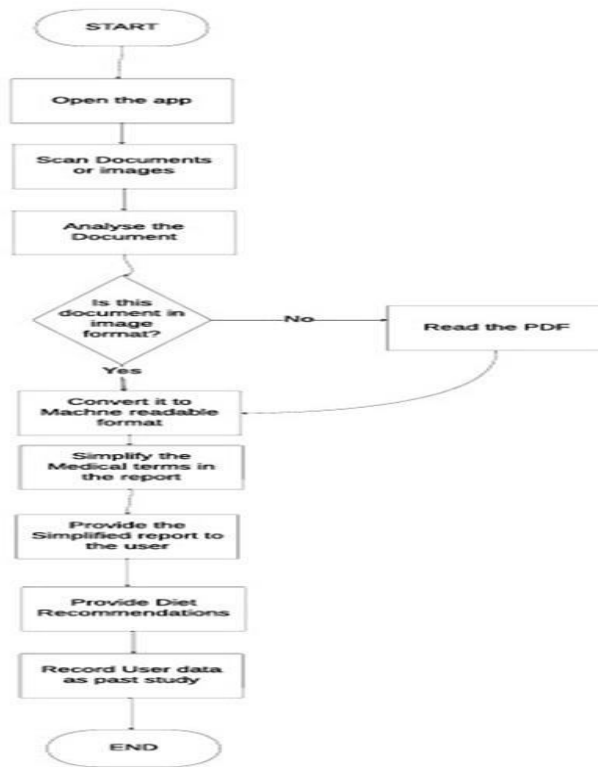


Fig.1

D. Key Modules and Technical Tools

Module	Technology Used	Role in System
OCR Engine	Tesseract OCR	Extracts readable text from scanned images of reports
NLP & Simplification	spaCy, Transformers, Custom Rules	Identifies medical jargon and simplifies it into layman terms
Diet Recommendation	Google ML kit, Predefined Medical Rules, OCR	Generates user-specific food recommendations based on report values
UI/UX Layer	Android (Java/XML)	Provides the user interface for uploads, interactions, and viewing simplified data
Storage Layer	Firebase + Firestore	Temporarily stores reports and data using secure cloud cache mechanisms
Authentication	Firebase Auth	Secures access via email and manages user sessions through role-based control

E. Data Processing Pipeline

The core intelligence of Healthcare Pro lies in its well-structured data processing pipeline, which automates the transformation of raw medical inputs (like scanned reports or PDFs) into meaningful and personalized health guidance. This pipeline ensures that users receive simplified, relevant, and culturally appropriate dietary suggestions—even if they are not well-versed in medical jargon.

The pipeline consists of four primary transformation stages:

1. **Optical Character Recognition (OCR):** The first step begins when the user uploads a medical report, either as a scanned image or a PDF document. The app employs Tesseract OCR and ML Kit's Text Recognition to scan the uploaded content and extract readable text.

- If the document is a **PDF**, the iTextG library helps parse and retrieve embedded textual content.
- For **image files**, ML Kit's OCR engine identifies text regions and converts them into a machine-readable format.

This transformation ensures that the report, whether blurry, handwritten, or typed, is turned into structured text for further analysis.

2. **Natural Language Processing (NLP) and Simplification:** Once the raw text is extracted, it often contains complex medical terminologies such as "hyperlipidemia" or "creatinine clearance." To bridge this knowledge gap:

- We use **spaCy** and **OpenNLP** for Named Entity Recognition (NER), sentence segmentation, and part-of-speech tagging.
- A set of **custom rule-based simplification models** then interpret these terms and convert them into easy-to-understand phrases.

This NLP stage helps users grasp the **meaning of their health conditions** without needing a medical background.

3. **Health Metric Extraction:** After simplification, the system pinpoints key health indicators present in the report such as:

- └ Blood sugar levels
- └ Cholesterol (HDL/LDL)
- └ Blood pressure
- └ Hemoglobin count
- └ Uric acid, etc

It does so by **matching numeric values** with pre-defined medical ranges and flagging any anomalies. For instance:

- If Fasting Glucose > 126 mg/dL, it is flagged as "High Blood Sugar".
- If Systolic BP > 140 mmHg, it is labeled as "High Blood Pressure".

This stage ensures that the system focuses only on the **parameters that need attention**, avoiding irrelevant clutter.

4. **Personalized Diet Mapping:** Once the critical health metrics are identified, the system moves on to recommending personalized dietary suggestions using two sources:

1. A pretrained ML model (Scikit-learn) trained on nutritional and clinical datasets.
2. A set of hand-curated medical-diet rules, reviewed and mapped by domain experts.

For example:

- If the user is diabetic, the app suggests a low-glycemic diet (e.g., oats, leafy greens, legumes).
- For high cholesterol, it suggests fiber-rich, low-fat foods.
- In case of anemia, it recommends iron-rich meals.

These diet plans are tailored in local Indian context—both in ingredients and in language.

Stage	Input	Process	Output
OCR	Image or PDF	Extract text using ML Kit OCR / iText	Plain report text
NLP	Report text	Simplify using spaCy + a rule-based model	User-friendly summary
Metric Extraction	Simplified text	Detect critical health values	Key health parameters
Diet Mapping	Health metrics	Use ML + medical logic	Personalized diet plan

F. Security and Access Control

In a health-focused application like Healthcare Pro, where users are interacting with sensitive medical information, security and privacy are not just technical features—they're foundational responsibilities. From the initial login to storing health reports, the app integrates multiple security layers to ensure that data is protected and accessible only to the rightful user.

1. Authentication via Firebase Auth

To streamline and secure user access, Healthcare Pro leverages Firebase Authentication, which supports multiple login methods such as:

- **Phone Number with OTP (One-Time Password)**
- **Email/Password Sign-In**
- **Google Sign-In (optional, scalable)**

Firebase Auth handles the **entire user identity lifecycle**—including sign-up, sign-in, and token-based session management—without requiring developers to build and maintain custom authentication systems. This greatly reduces the risk of vulnerabilities in login mechanisms.

Each authenticated session is protected with **unique JSON Web Tokens (JWTs)**, ensuring that users stay securely signed in, and their actions are traceable back to a valid identity. Firebase also supports **role-based access control**, allowing for future expansion (e.g., differentiating between doctors and patients if needed).

2. Data Handling via Cache-Based Storage (Not Traditional EHR)

Unlike conventional Electronic Health Record (EHR) systems that store persistent medical histories in secure cloud databases, Healthcare Pro adopts a **cache-based approach** for storing user data temporarily on the device. This design choice was made to prioritize **speed, offline accessibility, and simplicity**, especially during the early stages of development.

- **What is Cached?**
Simplified medical reports, extracted metrics, and dietary suggestions are stored temporarily on the user's device using local cache memory.
- **Why Use Caching?**
 - Reduces load on cloud infrastructure
 - Speeds up repeat access to reports
 - Enables offline functionality (view results without internet)

Even in caching, **privacy safeguards** are in place. The app avoids permanently storing identifiable health data unless explicitly permitted by the user. Cached data is **cleared automatically upon logout** or app refresh to prevent unauthorized reuse.

3. Secure Cloud Integration (Firebase Firestore - Optional)

For users who wish to preserve their reports and diet plans across sessions or devices, Healthcare Pro optionally integrates **Firebase Firestore**. Here, each user's data is isolated in a **secure cloud bucket**, protected by:

- **SSL/TLS encryption in transit**

- AES-256 encryption at rest
- Security rules that prevent unauthorized read/write access unless a valid Firebase Auth session exists

Users can opt-in to store reports in the cloud, and the app ensures this is done **transparently and with consent**.

G. Use Case Scenario

To better understand how Healthcare Pro works in a real-world setting, let's walk through the experience of **Ravi**, a 42-year-old school teacher from Pune, India, who recently underwent a blood test and wants to understand his report without immediately consulting a doctor.

Step 1: Uploading the Medical Report

Ravi opens the Healthcare Pro app and logs in using his mobile number. He taps the **"Upload Report"** button and selects a PDF of his recent diagnostic report from his phone's gallery. The app also allows uploading an image, but this time, Ravi chooses a digital copy.

Step 2: Text Extraction Using OCR

The report is scanned using **ML Kit's Optical Character Recognition (OCR)** tool, which reads all the printed information including numerical values (like glucose, cholesterol, and hemoglobin). The text is extracted accurately, retaining the structure of the report.

Step 3: Simplifying the Medical Jargon

Once extracted, the text goes through a **Natural Language Processing (NLP)** pipeline powered by **spaCy, OpenNLP, and custom medical rules**. Complex medical terms are automatically detected and rewritten in simpler language:

- "Hyperglycemia" becomes:
 - "Your blood sugar level is higher than normal. This could be a sign of diabetes."
- "Elevated Triglycerides" becomes:
 - "You have more fats in your blood than usual. This may increase your risk of heart disease."

Ravi no longer feels confused—he finally understands what his health report is saying.

Step 4: Diet Recommendation Engine

Based on the simplified report, the system identifies key health parameters and sends them to the **diet recommendation module**. This module, which combines **machine learning (via Scikit-learn)** and medical dietary rules, generates a **personalized meal plan** for Ravi:

- Foods to **avoid**: Sugary snacks, fried foods, white bread
- Foods to **include**: Leafy greens, whole grains, bitter melon
- Lifestyle tips: "Incorporate light walking post meals" and "Drink water regularly"

The diet plan appears in a clean, user-friendly format with icons and easy-to-follow lists.

Step 5: Secure and Private Data Handling

Ravi prefers not to store the report permanently. Since Healthcare Pro uses **cache-based temporary storage**, his data is automatically cleared when he exits the app or logs out. However, if he chooses to save it later, he can enable **Firebase Auth**-based secure access and store it safely under his account.

Final Outcome

- Ravi gains **clarity** on his health without needing immediate medical consultation.
- He receives a **custom diet plan** tailored to his lab results.
- The app respects his **privacy** and lets him choose whether to retain or discard his data.
- The whole process—from upload to results—takes **just a few minutes**.

IV. RESULTS AND DISCUSSION

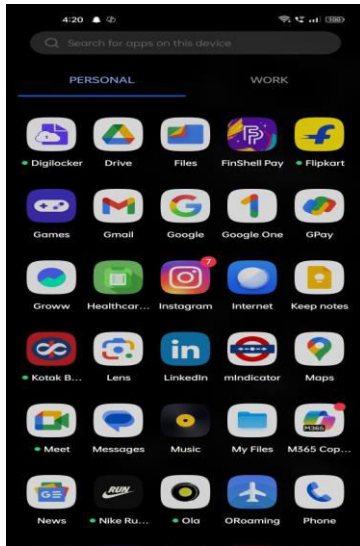


Fig.2



fig.3

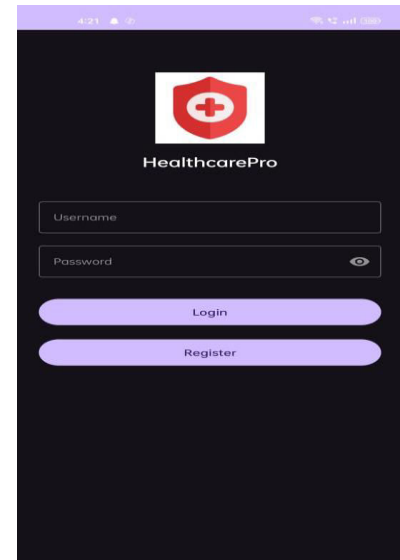


fig.4

Figs. 2,,3 and 4 show the main screens of the HealthcarePro mobile app. Fig. 2 displays the app icon under the "PERSONAL" tab. Fig. 3 shows the splash screen with the HealthcarePro logo and name. Fig. 4 presents the login screen with fields for username and password, along with "Login" and "Register" buttons. The interface is clean and user-friendly, designed for easy navigation.



Fig.5

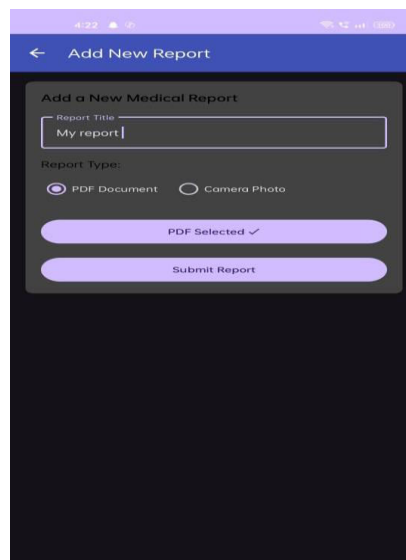


Fig.6

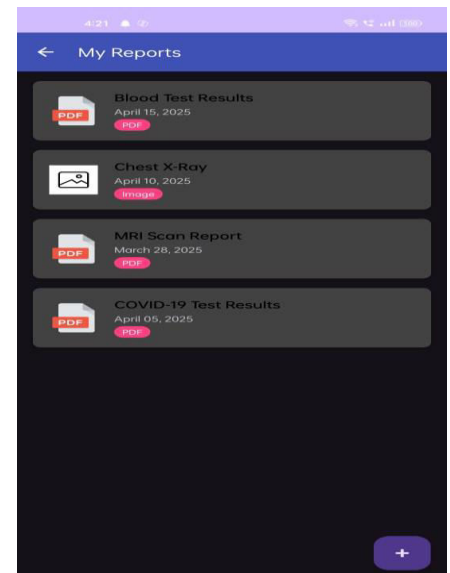


Fig.7

Figs. 5, 6, and 7 highlight the report management features of the HealthcarePro mobile app. Fig. 5 shows the login screen where users enter their email and password, with "Login" and "Register" buttons for authentication. Fig. 6 depicts the "Add New Report" screen, allowing users to name their report and select the report type—either PDF or

camera photo—before submitting. Fig. 7 displays the "My Reports" section, listing uploaded medical documents such as blood test results, chest X-rays, and MRI scans, each tagged with the report type icon and date for easy access.

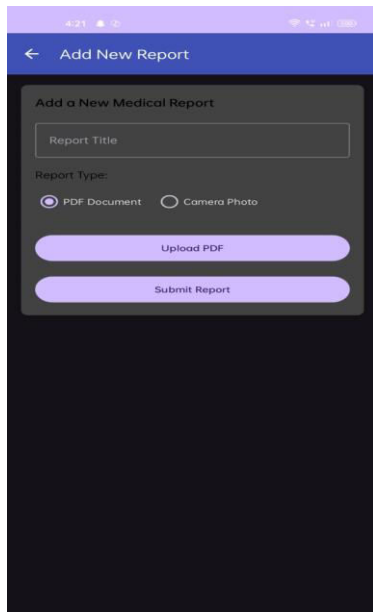


Fig.8

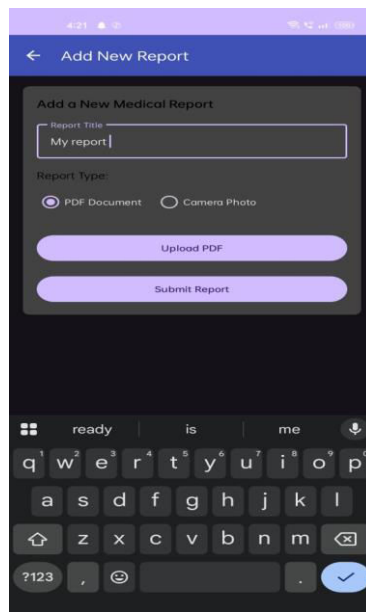


Fig.9

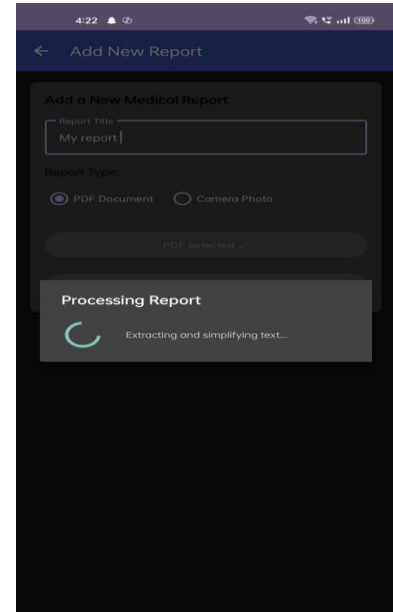


Fig.10

Figs. 8, 9, and 10 demonstrate the step-by-step process of uploading a medical report in the HealthcarePro app. Fig. 8 displays the "Add New Report" screen where users can enter a report title and choose between uploading a PDF or taking a camera photo. Fig. 9 shows the user inputting the report title using the on-screen keyboard while the "Upload PDF" and "Submit Report" buttons remain visible. Fig. 10 presents the processing state after submission, with a message indicating that the app is analyzing and extracting data from the uploaded report.

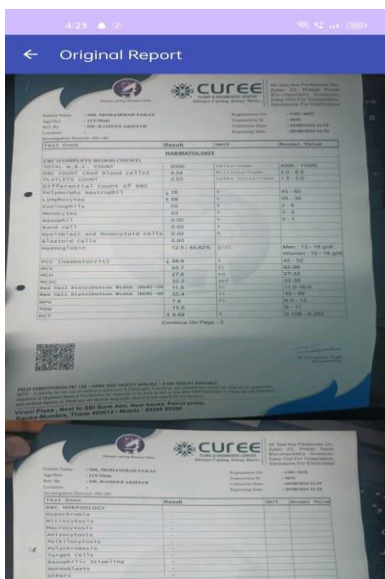


Fig.11

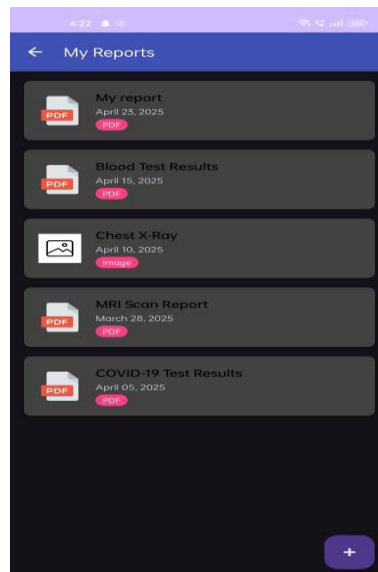


Fig.12

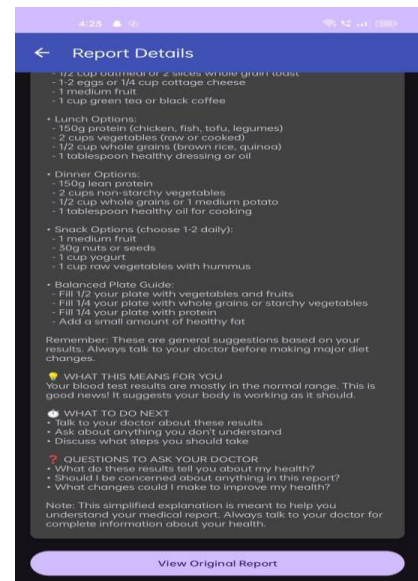


Fig.13

Figs. 11, 12, and 13 depict the report handling feature in the HealthcarePro app. Fig. 11 shows the original uploaded medical report image. Fig. 12 displays the updated report list with newly added documents. Fig. 13 presents the detailed report analysis with personalized diet suggestions based on the extracted data

V. CONCLUSION

The Healthcare Pro system presents an innovative and practical solution to address key challenges in the modern healthcare landscape—primarily the complexity of medical reports, lack of personalized dietary guidance, and secure health data management. By integrating advanced Natural Language Processing (NLP) techniques with a user-friendly interface, the application effectively simplifies technical medical content, making it accessible to users with little to no medical background. The inclusion of AI-driven personalized diet recommendations allows users to make informed lifestyle choices based on their health conditions, enhancing preventive care and long-term wellness. Furthermore, the secure and scalable architecture using MongoDB ensures efficient storage and management of Electronic Health Records (EHR), while tools such as PDFPlumber and PDFKit streamline the input and output processes for better user engagement.

Through the use of open-source libraries and a visually intuitive design via Streamlit, Healthcare Pro promotes digital health literacy and empowers individuals to actively participate in their healthcare journey. The system's modular and extensible framework also offers potential for future enhancements, such as multilingual support, integration with wearable devices, or real-time analytics. In essence, Healthcare Pro bridges the gap between complex medical data and user comprehension, while promoting proactive health management. It stands as a testament to how intelligent, accessible, and secure digital solutions can contribute significantly to improving the overall healthcare experience in today's data-driven world.

VI. FUTURE WORK

While Healthcare Pro in its current state offers a strong foundation for simplifying health reports and generating diet plans, there are several avenues through which its utility, inclusivity, and impact can be significantly expanded. The following future enhancements are envisioned to refine and enrich the user experience:

A. Multilingual Expansion:

Although multilingual translation is not part of the current implementation, expanding support for multiple Indian and global languages remains a major future direction. In a diverse country like India, where language barriers can be a serious obstacle in accessing healthcare, offering translations in native languages like Tamil, Telugu, Bengali, and Gujarati could drastically improve usability and inclusiveness. This will empower non-English speaking individuals, especially the elderly, to interpret their health data more confidently.

B. Text-to-Speech (TTS) Functionality

Another promising enhancement is the incorporation of Text-to-Speech (TTS) support. For users with visual impairments, reading difficulties, or low literacy levels, TTS can make health information more accessible. With this feature, users will be able to hear simplified medical summaries and dietary instructions read aloud in their preferred language, improving comprehension and user engagement.

C. Integration with Nearby Doctor Appointments:

A valuable extension of the system would be the integration of location-based doctor appointment services. After a report is analyzed and potential health conditions are identified, the app could suggest nearby specialists or general physicians. Leveraging location APIs and health directories, users could book appointments directly through the app, making the system not just diagnostic but actionable.

D. Real-Time Chat with Dietitians or Health Assistants:

Introducing an in-app chat feature with certified dietitians or AI-powered health assistants could personalize the user experience even further. While the ML model provides general dietary suggestions, a live dietitian could provide nuanced recommendations based on user preferences, allergies, or ongoing treatments.

E. Integration with Wearable Devices:

Incorporating data from smartwatches or fitness trackers (e.g., Fitbit, Mi Band, Apple Watch) can enable the app to monitor vital signs such as heart rate, blood oxygen levels, and daily activity. This data can be factored into dynamic diet planning and health tracking, moving the app toward a more holistic digital health ecosystem.

F. Voice-Based Interaction for Accessibility:

To further enhance accessibility, especially for senior citizens or rural users, future versions can include voice command support. This would allow users to navigate the app, upload reports, and listen to their results using natural spoken commands, improving usability for those with limited technical familiarity.

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