HealthVault: An AI-Powered, Mobile-First Platform for Secure Medical Record Management and Automated Report Summarization

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***Abstract*—The fragmentation of personal health information across disparate systems and the lack of accessible tools for longitudinal health tracking pose significant challenges to patient engagement and continuity of care. Patients often struggle to maintain a comprehensive medical history, leading to incomplete information during clinical consultations and a reactive approach to health management. This paper introduces "HealthVault," a patient-centric mobile application developed using React Native, designed to address these challenges. HealthVault functions as a secure, unified digital repository for managing medical reports and a proactive tool for personal health monitoring. The application enables users to digitize, categorize, and securely store all critical health documents, from lab results and prescriptions to imaging reports. Concurrently, its health monitoring module allows for the consistent tracking of vital signs, symptoms, and lifestyle metrics, which are then rendered in intuitive, easy-to-understand visualizations. By centralizing disparate health data and providing powerful tracking tools, HealthVault aims to empower patients, enhance personal health literacy, and facilitate more informed and effective communication with healthcare providers. This paper details the system architecture, user-centric design principles, key features, and implementation of the HealthVault application, positioning it as a significant contribution to the field of mobile health (mHealth) and personalized patient care.**

***Index Terms*—Mobile Health (mHealth), Generative AI, Report Summarization, Optical Character Recognition (OCR), React Native, Firebase, Local-First Storage, Health Record Management, Patient Literacy.**

I. Introduction

The proliferation of mobile health (mHealth) applications has fundamentally altered the landscape of patient care, offering unprecedented opportunities for personal health management and data accessibility. However, this digital transformation has simultaneously exposed a critical disconnect: while patients have more access to their health data than ever before, they often lack the ability to comprehend it. Medical reports, lab results, and discharge summaries are typically laden with complex terminology and quantitative data that are opaque to the layperson.

This challenge, often termed "jargon oblivion," creates a significant barrier to patient engagement. Research indicates that low health literacy is widespread, with studies showing that a large percentage of adults struggle to understand basic health information. This can lead to patients misunderstanding critical terms; for instance, interpreting a "positive" lymph node result as good news or a "progressing" tumor as a sign of improvement, when the clinical meaning is the opposite. This comprehension gap results in heightened patient anxiety, poor adherence to treatment plans, and a reactive, rather than proactive, approach to personal health.

Compounding this issue are the dual problems of data fragmentation and medication non-adherence. Patient records are often siloed across disparate hospital portals, and separate, single-purpose apps for medication reminders are decoupled from the patient's actual diagnoses and clinical reports. Studies on medication non-adherence, a primary driver of poor health outcomes, identify simple forgetfulness as a major cause. Existing mHealth solutions are often inadequate, functioning as either passive "digital file cabinets" for storing PDFs or as simple alarms that lack clinical context.

This paper introduces HealthVault, a patient-centric mobile application designed to bridge these critical gaps (see Fig. 1). HealthVault serves as a unified, intelligent platform that not only securely stores a user's entire medical history but also makes it understandable and actionable. Developed in React Native, the system architecture employs Firebase for secure, real-time database management and a custom-built API hosted on Render to manage Generative AI tasks.

The core contribution of this work is the integration of an AI-powered summarization engine. HealthVault ingests unstructured medical reports (e.g., PDFs, text files) and utilizes a Generative AI model to distill complex medical jargon into clear, concise, plain-language summaries for the user. This primary feature is augmented by two other critical functions: an intelligent medication reminder system that links prescriptions to diagnoses, and a longitudinal health tracking module for monitoring vital signs and symptoms. By transforming raw medical data into actionable personal insights, HealthVault empowers patients to become active and informed participants in their own healthcare.

The remainder of this paper is organized as follows: Section II reviews related work in mHealth applications, AI in healthcare, and patient literacy. Section III details the complete system architecture and design of HealthVault. Section IV

discusses the implementation of the core features, including the AI summarization API. Section V presents the discussion and potential limitations, and Section VI concludes with the implications of this work and directions for future research.

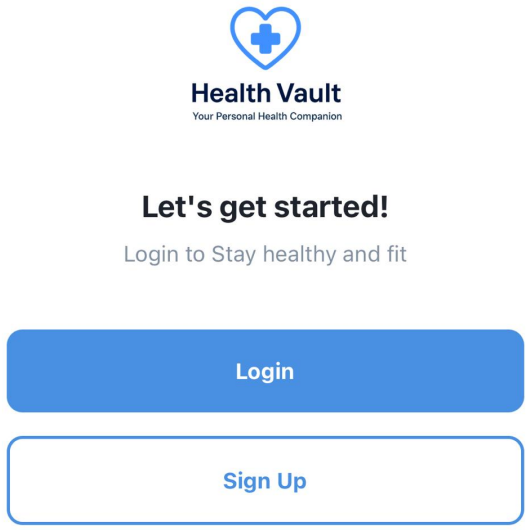

Fig. 1: The HealthVault Onboarding Screen.

II. Related Work

The development of HealthVault is informed by three distinct but converging domains of mHealth research: (1) Personal Health Record (PHR) and data management systems, (2) medication adherence applications, and (3) the emerging use of Natural Language Processing (NLP) for patient-facing text simplification. Our review of the literature reveals that while solutions exist for each problem in isolation, they remain critically disconnected.

A. Personal Health Records (PHRs) and Data Management

This category includes device-native wellness trackers (Apple Health, Google Fit) and traditional digital PHRs. While device-native trackers excel at passively collecting sensor data, they are not architected to manage or interpret unstructured clinical documents. Traditional PHRs centralize documents but remain passive and provide no intelligent processing.

B. Medication Adherence Applications

Commercial apps (Medisafe, MyTherapy) have improved adherence through scheduling and dose tracking, but they remain decoupled from clinical data which reduces contextual relevance.

C. AI for Patient-Facing Text Summarization

NLP and Generative AI for clinical text summarization is a fast-growing area. While clinician-facing summarization has been studied extensively, patient-facing summarization is emerging and shows promise for improving patient understanding and engagement.

D. Research Gap

There is no unified platform combining secure PHR storage, intelligent AI summarization, and context-aware medication reminders. HealthVault aims to bridge this gap by integrating these components into a single, patient-owned system.

III. System Design and Architecture

The HealthVault system is a hybrid architecture consisting of three primary layers: the frontend mobile application, the cloud-hosted backend server, and the external cloud services. Figure 2 provides an overview.

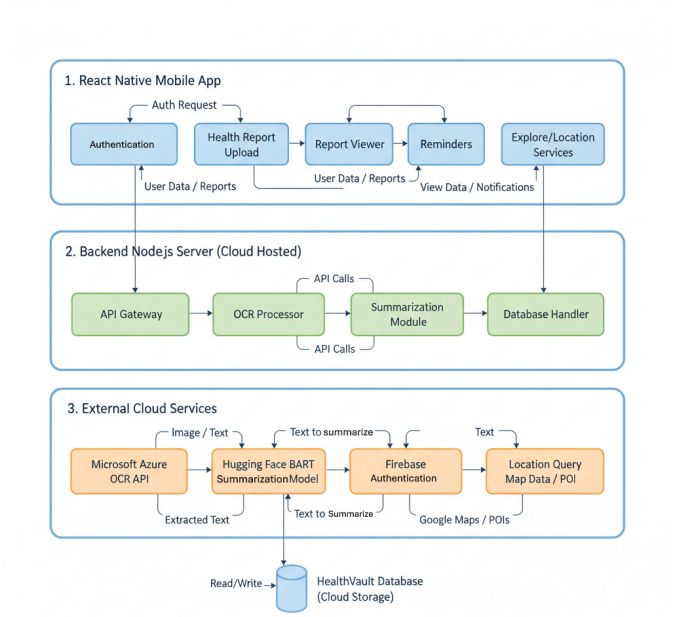

Fig. 2: 3-Layer System Architecture of HealthVault.

A. Frontend: React Native Mobile App

The frontend is a cross-platform mobile application built using React Native (Expo). Main points:

- Navigation: Expo Router (file-based navigation).
- Authentication: Firebase Authentication.
- Local Storage: AsyncStorage (offline-first approach; Firestore planned).
- Client-side scheduling using `expo-notifications`.

B. Backend: Node.js API Gateway

A Node.js server (Express) hosted on Render acts as an API gateway and secures API keys, orchestrating calls to Azure OCR and Hugging Face while protecting secrets from client-side exposure.

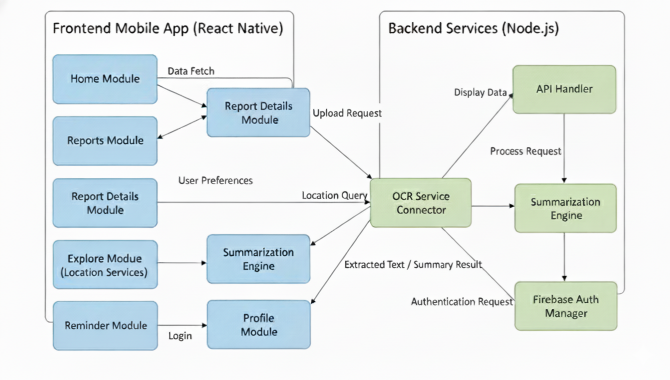

Fig. 3: Module Interaction Diagram for Frontend and Backend.

C. Backend: Firebase Services

Firebase provides Authentication, Cloud Storage (files), and Firestore (metadata). Figure 4 shows the authentication cycle.

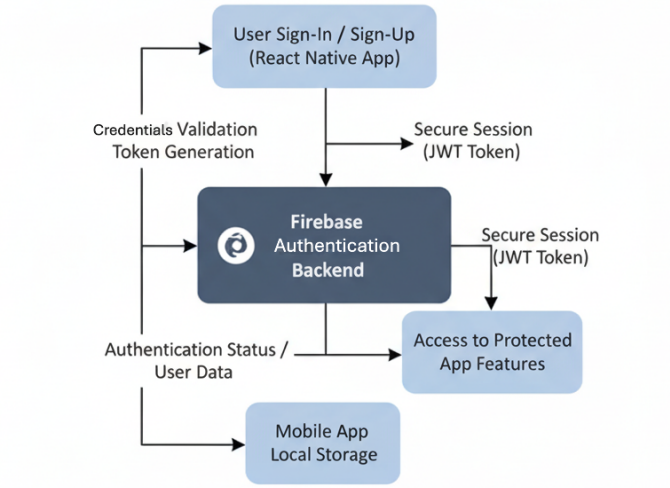

Fig. 4: Firebase Authentication Cycle.

D. External AI & Data Services

The backend orchestrates:

- Microsoft Azure Computer Vision (OCR)
- Hugging Face Inference API (BART summarization)
- Google Maps Places API (Explore tab)

IV. Implementation and Core Features

This section details core modules: AI summarization, context-aware reminders, longitudinal tracking, and location services.

A. AI-Powered Report Summarization

Figure 5 and Fig. 6 describe the dataflow.

Processing steps:

1) Document upload via expo-document-picker

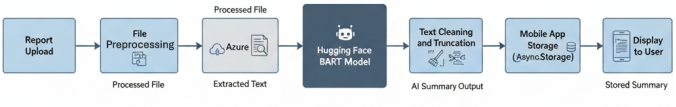

Fig. 5: Dataflow for the AI Summarization pipeline.

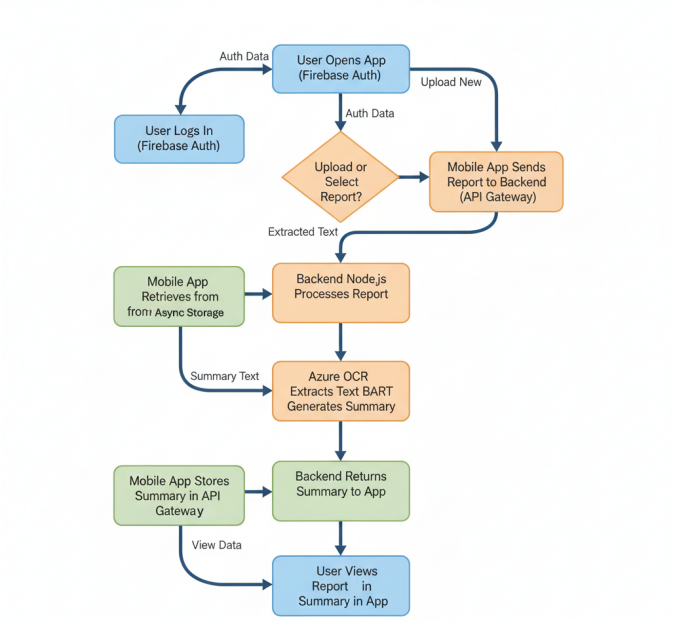

Fig. 6: Sequential dataflow for uploading and viewing a report.

2) Backend receives multipart/form-data
3) Send to Azure read/analyze endpoint, poll operation-location
4) Concatenate lines, truncate to 3000 characters
5) Send to Hugging Face facebook/bart-large-cnn model
6) Return summary to app; save metadata locally (AsyncStorage) and file via expo-file-system or Firebase Storage

B. Context-Aware Medication Reminders

Implementation:

- Scheduling with `expo-notifications`
- react-native-modal-datetime-picker for UI
- Save notification references in AsyncStorage

C. Longitudinal Health Tracking

Users manually log vitals; data shown in charts/cards (stored locally; Firestore planned).

D. Health Service Locator (Explore)

Uses `expo-location` and Google Places API to find nearby hospitals and pharmacies, display pins on `react-native-maps` and list in a draggable bottom sheet.

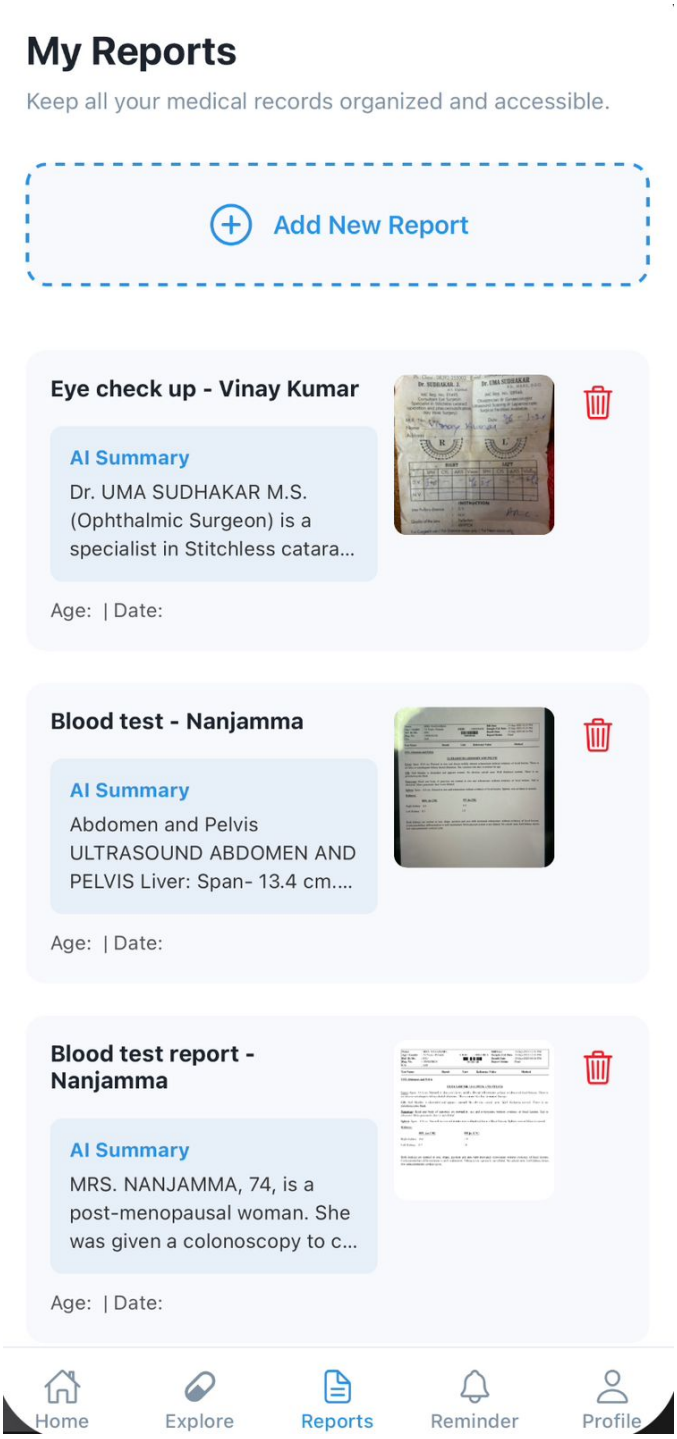

Fig. 7: Add New Report Form.

V. Preliminary Evaluation and Results

A small usability study (n=5) was conducted focusing on task completion and AI summary utility.

A. Task Completion and UX

Participants completed tasks: upload report, view summary, set reminder, log vitals for 3 days. All tasks were completed without assistance; UI feedback was positive.

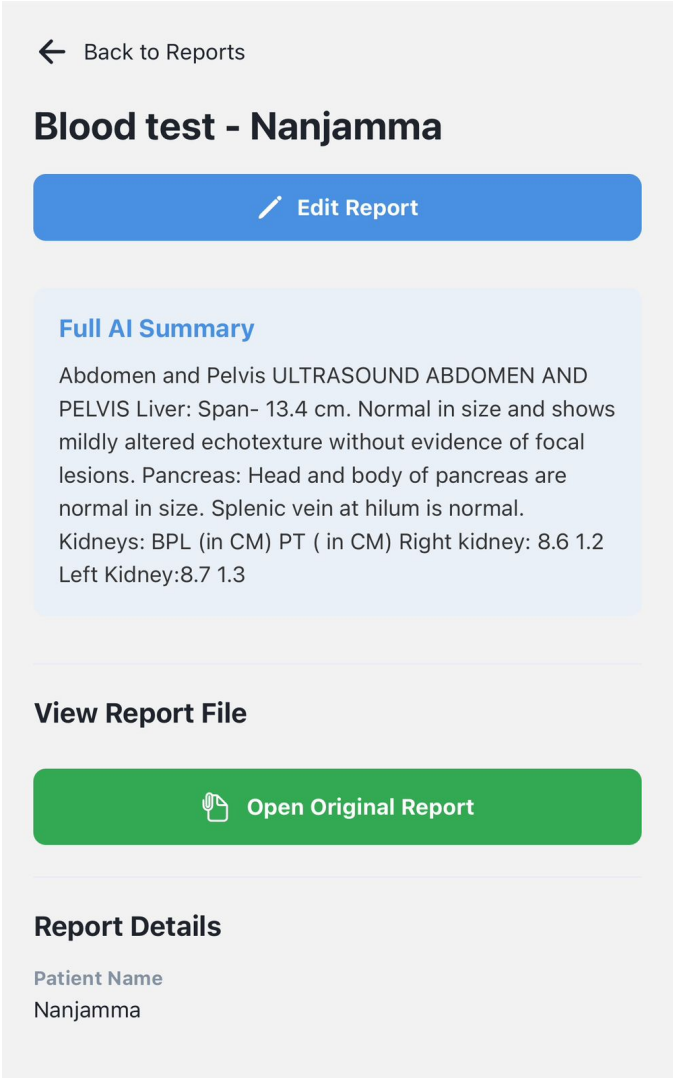

Fig. 8: My Reports list with AI summary.

B. Efficacy of AI Summarization

Users found generated summaries clear and easier to understand than original reports. This provides encouraging preliminary evidence that AI-based patient-facing summaries can enhance health literacy.

VI. Limitations and Future Work

A. Limitations

1) Small, homogeneous evaluation sample.
2) No formal clinical validation of AI summaries yet.
3) Native modules incompatible with Expo Go; custom dev builds (EAS) required.

B. Future Work

- Continuous model fine-tuning and validation with clinicians.
- Larger user studies and pilot deployments.
- Migrate data to Firebase Firestore for secure, real-time syncing.

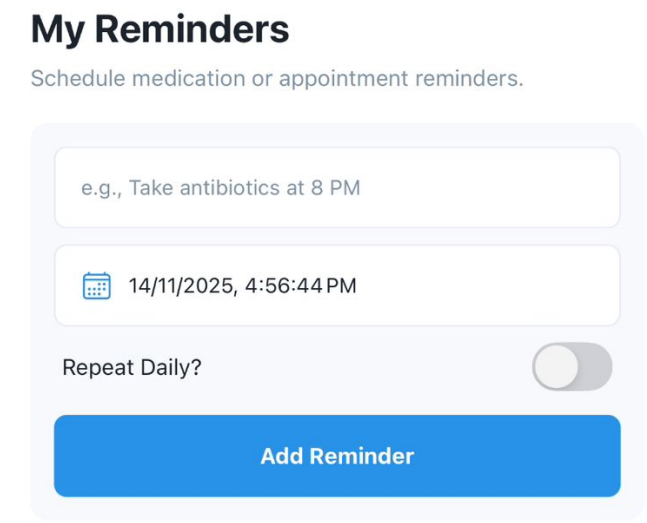

Fig. 9: Reminder scheduling interface.

- Conduct security audit and pursue compliance (e.g., HIPAA-equivalent).

VII. Conclusion

This paper described HealthVault, a React Native-based mobile application integrating secure storage, generative-AI summarization, and context-aware reminders to improve patient literacy and care continuity. Preliminary usability testing

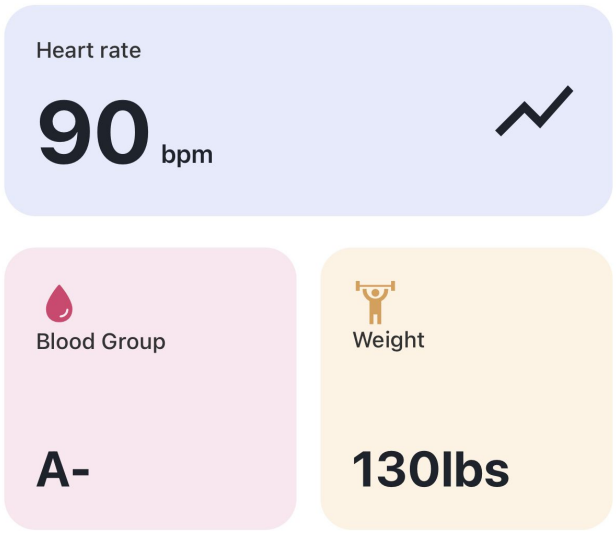

Fig. 10: Home screen health tracking dashboard.

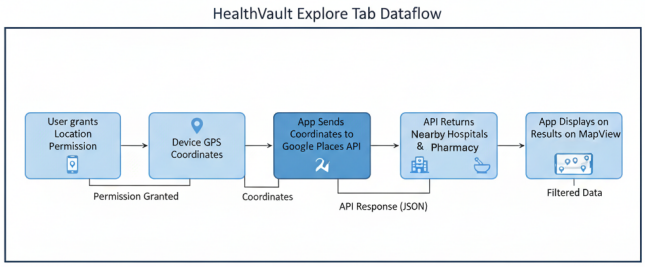

Fig. 11: Explore tab location services dataflow.

suggests strong potential, with future development directed toward clinical validation, scalability, and compliance.

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