

AURAHEALTH: AI-Powered Women's Health Companion

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ABSTRACT

Despite growing awareness of Women's Health, a significant gap persists in accessible, intelligent and private digital tools for women health management. This project, addresses this by providing a comprehensive, AI-powered mobile application that serves as a proactive healthcare companion.

AuraHealth empowers users to seamlessly log essential menstrual data, daily symptoms, moods, and lifestyle patterns. Leveraging AI, the application moves beyond simple tracking to provide personalized predictive insights, including future. Start dates ovulation windows and symptom likelihoods. A key innovation is the integration of machine learning models to screen for the potential risk of hormonal disorders like polycystic ovary syndrome (PCOS) and polycystic ovary disease (PCOD), supported by a comprehensive study of various predictions algorithms to ensure optimal accuracy.

To enhance accessibility and user engagement or a health features a sophisticated AI chat bot.

This conversational companion equipped with speech to text and text to speech capabilities allows user to enquire about their health and log information with a user-friendly interface featuring interactive health graphs. AuraHealth aims to be a socially impactful and intelligent system. By unifying all these features the project provides a holistic tool for women to proactively understand and manage their health.

INTRODUCTION

The central problem this project seeks to solve is the pronounced inadequacy of existing digital health tools in providing proactive deeply personalised and accessible support for the complexities of women's menstrual and hormonal health.

Lack of proactive commerce specialised risk assessment: The vast majority of women's health applications operate reactively the log user provided data without performing any meaningful, multi variate analysis. A user might log classic PCOS indicators such as irregular cycles unexplained weight gain acne for months or even years yet the application

will fail to recognise the pattern or flag a potential underlying health issue. This represents a critical missed opportunity for facilitating early awareness and medical intervention.

Superficial and inefficient personalisation: A platform would be able to provide significantly different lifestyle and dietary recommendations to a end user with a high moderate or low risk of PCOS but this degree of nuanced, context – aware advice is conspicuously absent.

Significant accessibility and usability gaps: The standard app interface which demands constant manual tapping, typing and reading from the screen does not serve to the diverse needs and preferences of all users. This creates usability frictions for individuals who may be multitasking have visual impairments or simply prefer a more natural, conversational mode of interaction the lack of integrated voice technologies like speech-to-text (STT) and Text-to speech (TTS) Represents a failure to embrace more incursive and convenient design principles. “AuraHealth” Is architected as a direct and comprehensive solution to these three core problems aiming to deliver a system that is specialised in its analysis deeply personalised in its guidance and universally accessible in its interaction design.

LITERATURE SURVEY

The last decade has witnessed a paradigm shift in personal health care management catalysed by the ubiquitous adoption of smartphones and the rapid evolution of digital health (mHealth) Technologies. The global mHealth Market is undergoing explosive growth with applications now targeting nearly every conceivable aspect of human Well-being from fitness and nutrition coaching to chronic disease management and women’s mental health support.

These applications often termed “FemTech”, Have empowered millions of women to move beyond traditional paper calendars to digitally tracking their menstrual cycles log associated symptoms and receive algorithmic predictions about future. And fertility windows. The next frontier in mHealth, which this project seeks to explore the meaningful integration of intelligence systems. This includes leveraging ML and AI to transform these platforms from passive data repositories into proactive, predictive and truly personalised health partners.

EXISTING SYSTEMS

A critical analysis of established applications in the women’s health market reveals a consistent pattern of strength and significant share limitations. Platforms such as Clue, Glow and Period tracker Period calender.

Have gathered millions of users but adhered to a similar generalised model.

The gap in current solutions: A lack of PCOS focus and deep personalisation.

Polycystic ovary syndrome is a prevalent and complex endocrine disorder that is notoriously difficult to diagnose due to its wide range of symptoms including irregular periods, hormonal imbalances and metabolic issues. It is precisely this complexity that highlights the most critical gap in the current Femtech market. Existing applications are not architected to function as even rudimentary screening tools. They lack the embedded medical logic and analytical power to recognise a constellation of symptoms that might be indicative of PCOS.

This project is founded on the principle that a modern women's health application must be smarter and more responsible. Avoid being a simple datalogger to become an active participant in the user's health journey. The absence of a dedicated intelligent and scientifically – backed pcos assessment module within mainstream applications is not just a gap in the market; it is a failure to serve the needs of a significant user population.

PROPOSED SYSTEM

An intelligent health companion

AuraHealth Post is proposed as a holistic solution designed to directly address those

gaps. Built from the ground up to be an intelligent health companion. The intelligence of this system is not at all a single feature but permeates the application across 3 layered distinctions. Conversational intelligence by dynamically priming a generative AI model with the user's current and individual health profile the AuraHealth AI companion goes far beyond generic pre-scripted responses available from typical chat bots and will offer advice that is deeply personalised and context aware.

Predictive intelligence through training comparison and implementation of a dedicated ML model the project will analyse a user's self-reported data to provide complaint and reliable scientifically backed pcos risk assessment thus taking the app away from a purely reactive role and into a more proactive position.

Analytical intelligence by offering users advanced and interactive statistical visualisation this project will enable them to identify meaningful actionable patterns and correlations in their own Health data Supporting a deeper understanding of their body's unique signals.

METHODOLOGY

High level system architecture

At a high level, the system is designed as a client-side application with on device intelligence augmented by a cloud-based AI

service. The main components are:

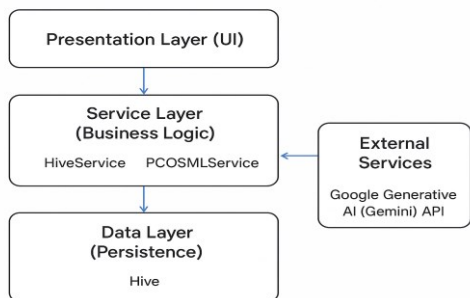


Fig 1: High level system architecture

Presentation layer (UI): This is the user facing part of the application, built entirely with Flutter.

It is built using Hive database and it stores all the user generated health data securely and privately on user’s own phone.

The only thing it actually does is present information to the user and acquire user input.

Service layer (Business Logic): This is the brains behind the application and acts as an intermediary between the presentation and the data layer. This is where the core business logic exists like the hive service to orchestrate data and the PCOSMLService to run the machine learning predictions.

Data Layer: This layer deals with all data storage and retrieval. This is built on the Hive database. The Hive database stores all user – generated health data in a secure and private manner on the user’s own device.

External Services: This includes the one source of external dependency of the system that Google Generative Ai Gemini API which the

app accesses over the network providing the Google generative AI conversational AI functionality.

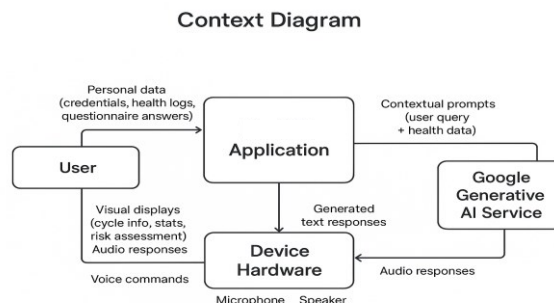


Fig 2: Context diagram

The user enters personal data like credentials, health logs, Questionnaire answers audio voice commands. The user gets visual products like cycleinfo stats risk assessment and audio responses.

Google generative AI service: This is an external service that the application interacts with. The app sends context cues such as user query health data to this services which returns the generated text responses.

Device hardware: The system uses the underlying mobile device hardware namely the microphone to capture voice for STT And the speaker to output audio for TTS.

IMPLEMENTATION AND RESULT

The implementation phase represents the critical transition from abstract design to tangible software, transforming the architectural blueprints UML diagrams and specified requirements into a fully functional and interactive application. This process was

executed using a modular service-oriented approach to ensure a clean scalable and maintainable code base. The core of the app was built using the Flutter framework in the Dart programming language leveraging its powerful widget-based system to construct the user interface for each screen detailed in the design phase. The development was centred around a clean separation of concerns: The presentation layer was implemented to be dependent on, but separate from, the service layer. This central layer contains the applications core business logic most notably the Hive service which was implemented as a Singleton repository to handle all the data persistence operations and the PCOSML service which encapsulates the logic for loading and executing the on-device machine learning predictions. The machine learning models themselves were developed and serialized using Python with the scikit-Learn and XGBoost libraries then bundled as assets within the Flutter project. The AI Health companion was brought to life by integrating the official Google Generative AI package come up which facilitates communication with the Gemini API, and by engineering this specific contextual prompt that provide the AI with its personalized knowledge base. This structured implementation methodology ensures that each component of the application

was built and tested independently before being integrated into the cohesive final product.

CONCLUSION

The AuraHealth Project successfully achieved its primary goal: To engineer an intelligent personalised and accessible mobile health platform for women. It has effectively transitioned from a conceptual proposal to a robust functional application Addresses the critical gaps identified in the current market. All the core objectives outlined in introduction, resulting in the following key achievements:

Successfully implemented a multi-faceted intelligence system: The project's main triumph is its integration of a dual – layer intelligence. The machine learning module provides a scientifically bagged proactive PCOS risk assessment moving beyond the reactive nature of the standard trackers. This is complemented by a context aware AI health companion that offers a level of personalised guidance previously unseen in the application category.

Pioneered a privacy – first on – device architecture: Why architecting the system to perform all core data storage and machine learning inference locally on the user's device the project has championed a privacy by design model.

This builds trust in users in the midst of increasing issues of trust concerning the way tech companies are handling their sensitive health data.

Greater accessibility with voice technology: This successful combination of both STT and TTS technology into the AI health companion allowed for greater accessibility and convenience; exemplifying a commitment to inclusive design.

Validated a better alternative to current systems: Through the specific focus on pcos its rich personalization and advanced analytics this project has been a strong proof of concept that a women's health application can and should be significantly more intelligent and supportive than what is currently on the market.

In conclusion AuraHealth Is a successful produced union of mobile application development data assigns and user centric design. It produces a viable product that is more than a utility it is an empathetic and intelligent partner in the user's health narrative.

REFERENCES

This section provides a list of academic papers technical documentation and online resources that were consulted during the research, design and implementation pieces of the AuraHealth project.

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