Health Insights App: A Human-Centered Approach to Personal Health Data

Abstract

The Health Insights App operates as a mobile platform through React Native which lets users monitor their health data and extract meaningful insights. Unlike typical health tracking apps this application leads by giving users full control of their data and helps them discover valuable patterns with a user-focused approach. It tracks four key health indicators: steps, sleep, water intake, and mood. Users benefit from personalization and transparency in this application which offers clear visualizations alongside context-aware annotations and strong privacy measures with feedback functionalities. Through human-centered AI design the project shows that health technology enhances user confidence while promoting independence and participation.

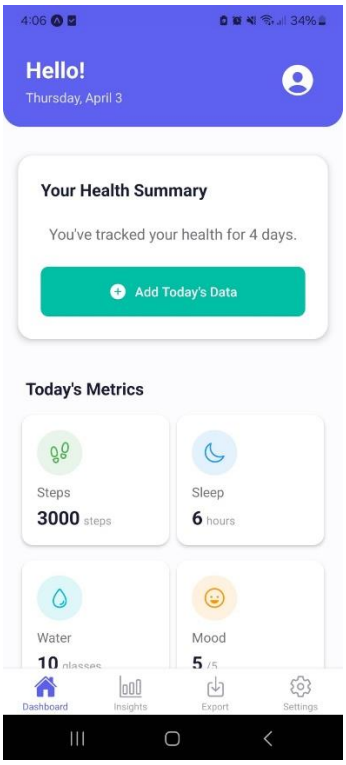

Figure 1: The Health Insights App.

Introduction

Problem Statement

Personal health tracking apps now serve as widely-used tools to help individuals keep track of their wellness routines. Most personal health tracking applications focus on data collection and algorithmic analysis rather than enabling users to understand and manage their information. The focus on data collection and insight generation generates several primary issues.

1. Many users remain unaware of the methods through which their data gets processed or how their recommendations come about.
2. Digital health applications typically show insights as objective truths without background information or confidence metrics.
3. Users have restricted authority over their data management which involves storage duration and data deletion options as well as usage policies.
4. Generalized health recommendations fail to cater to individual lifestyle differences or personal preferences.

These problems highlight deeper issues with many AI-driven tools: The majority of AI-driven tools display opaque behavior while restricting user control and delivering outputs that are either disconnected or overly simplified. The developers created the Health Insights App to directly address these specific challenges. The application of human-centered design principles enables users to regain control over their health data while providing them with clarity and choices for active engagement.

Contribution

The project demonstrates practical implementation of human-centered AI principles in a health tracking application. The Health Insights App delivers important benefits.

1. This mobile interface allows users complete command over their health data which gives them total ownership and control.
2. The app delivers clear visualizations and insights which demonstrate both the source of information and the confidence level of its suggestions.
3. Active features enable users to provide context to their health records and give feedback about the app’s analysis.
4. Users benefit from strong privacy measures alongside customizable settings which enable them to determine data retention periods and deletion schedules.

5. The app features an intentionally crafted dark mode which provides enhanced comfort and accessibility to users with various lighting preferences and visual requirements.

The design elements of this project fulfill the objectives outlined in Track 1 (Tools and Interfaces for Human/Data-Centered AI) from the initial proposal document. Users benefit from this application through its easy-to-use platform which allows them to access and manage their health data.

Related Work

This project's design and development processes build on multiple foundational research areas which create its human-centered health tracking methodology.

Human-Centered AI Design Principles

According to Shneiderman (2022), effective AI systems need to be transparent and trustworthy while ensuring people remain active participants throughout their development. This app embodies its philosophy by providing transparency in insight creation while allowing users complete data control. The principles proposed by Amershi et al. (2019) served as a guiding framework during the design process. The design principles proposed by Amershi et al. (2019) directed the creation of user feedback tools and display of recommendation confidence levels in the app.

Data Feminism and Critical Data Studies

D'Ignazio and Klein’s 2020 work on Data Feminism pushes us to rethink who holds power in how data is collected and to intentionally include diverse perspectives. Inspired by this, the app was designed to let users add context through annotations and adjust health metric thresholds to reflect personal differences in care needs. Drawing from critical data studies (Iliadis & Russo, 2016), the app is transparent about where its data comes from and openly acknowledges the limits of what algorithms can conclude.

Privacy-Focused Health Applications

This application prioritizes user privacy through research principles established by Patel & Kannampallil (2019) which highlight transparency in health technology data management. The application utilizes privacy by design principles from Cavoukian (2011) through its features that store data locally and provide users with extensive privacy settings.

Open-Source Health Tracking Applications

The app developed its data visualization and export capabilities through inspiration from open-source tools such as Nextcloud Health and OpenScale. The available technology

demonstrates that robust health tracking systems can function without the need for cloud services or proprietary algorithms.

Methods

Application Architecture

Development of the Health Insights App utilized React Native to ensure seamless operation across iOS and Android platforms with native app performance. Each part of the app functions as a reeusable component which gives its architecture a modular structure. Here are the key building blocks:

1. The app's navigation system uses React Navigation to implement bottom tabs for primary sections while stacks handle nested screens.
2. The Storage Layer implements AsyncStorage for local data storage while custom utility functions manage data reading and deletion.
3. UI Components with custom elements such as HealthMetricCard and LineChartComponent along with feedback tools are essential for delivering a consistent and intuitive user experience.
4. The Theme System enables context-based theming that supports dark and light modes to provide visual comfort and accessibility.

Implementing Human-Centered Features

Human-centered design principles guided the implementation of multiple thoughtful features in the app.

1. Participatory Features

- Users take an active role in shaping their insights beyond merely providing data. Feedback System: The FeedbackDialog enables users to both rate insights and provide comments.
- Context Annotations: The DataEntryForm gives users options to select "illness," "travel," or "stress" which assists in interpreting health data variations. Users can also write free-text notes.
- Impact Assessment: The DataManagement screen displays the extent of user input contribution to their personal insights by linking data with feedback.
  The application uses React state to handle these tools and AsyncStorage to store them locally.

2. Data Provenance Tracking

The application displays the origin of each insight for user clarity.

- Insight Source Badges: The insight source badges display if the information originates from personal data analysis or derives from general advice or external research findings. (**doesn’t work. Too simplistic**)
- Confidence Indicators: A small confidence meter informs users about the reliability of each insight through the evaluation of data quantity and consistency.
- Export Metadata: The application provides the source origin for each data point during the export process.

The provided features enable users to make decisions through reliable information and relevant context.

3. Ethical Data Handling

User privacy and data control are central.

- Granular Controls: Users can remove specific data entries by selecting either their date or metric type.
- Custom Retention Settings: Users have the option to set how long their data remains on their device.
- Local Storage Only: The data remains on the user's phone unless they decide to export it.

Custom storage utilities and a dedicated data management screen enable these options.

4. Transparency Dashboard

Knowing how the app functions holds equal importance to its actual usage.

- How It Works Screen: The How It Works Screen explains the process of data gathering and insight creation.
- Limitations Disclosure: The app’s limitations disclosure section provides a straightforward explanation about its capabilities and limitations.
- Info Modals: Every info icon throughout the application links to small pop-up explanations for features displayed in context.

5. Theme System Implementation

To support accessibility and comfort:

- Theme Context Provider: Manages switching between light and dark modes.
- Optimized Color Palettes: Both the light and dark themes feature robust contrast levels to enhance reading clarity.
- Persistent Preferences: The app saves user theme preferences in AsyncStorage.

Development and Testing Approach

The app underwent an iterative development process that incorporated regular feedback to improve its features throughout its creation. Here's how the process unfolded:

1. The development process began with core functionalities including data entry and storage capabilities plus charting features.
2. I incorporated elements that focus on human needs by adding user feedback systems, transparency tools and ethical controls into the app.
3. The user interface received a polish update during which dark mode was integrated.

Results

The Health Insights App creates a human-centered approach to health tracking through its collection of carefully designed features. A detailed summary of the app's features follows below:

1. Core Application Functionality

The application delivers a comprehensive health tracking solution that is user-friendly and intuitive.

- **Dashboard**: The home screen displays updated health metrics and provides immediate access to log new information.
- **Data Entry**: This app features a basic form that tracks steps and sleep patterns as well as hydration and emotional state with additional context entry options.
- **Visualizations**: With interactive charts users can track their health progression across different time periods.
- **Insights**: The app creates personalized recommendations through analysis of patterns found in user data.
- **Data Export**: Individuals have the option to download their health information in JSON or CSV formats for their own use or sharing purposes.

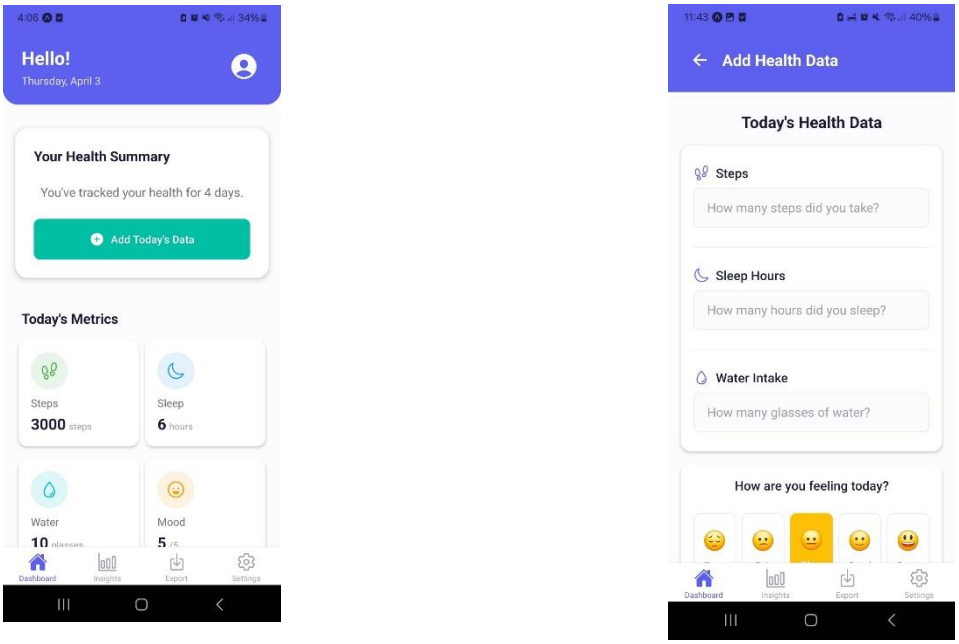

Figure 2: The application displays screens for the Dashboard and Data Entry and for viewing trend visualizations.

2. Human-Centered Features

The app demonstrates its user-first approach through these specific features.

Participatory Features

The app encourages users to directly influence their health insights by participating in data input and review.

- **Context Flags**: Users will have the option to mark specific days with relevant details such as travel occurrences or health issues during data input. (**Not fully implemented**)
- **Feedback Mechanism**: Users can evaluate the effectiveness of recommendations on the insights screen. (**Not connected to a backend service**)
- **Notes Field**: Users can attach personal annotations to their entries to enhance their significance.

Data Provenance

Users can easily identify the origin of each insight through the app's clear presentation.

- **Confidence Levels**: Users can identify the reliability of recommendations through their respective confidence scores.
- **Transparent Methodology**: A separate screen explains the process of insight generation and the factors that influence the outcome.

Ethical Data Handling

Users maintain complete authority over their data at every stage.

- **Selective Deletion**: Users have the ability to delete particular data based on date or metric selection.
- **Retention Settings**: The application provides users with options to configure the duration for which data remains stored on their device.
- **Impact Preview**: Users have the ability to preview the impact of data deletion on their insights before making the decision to remove data.

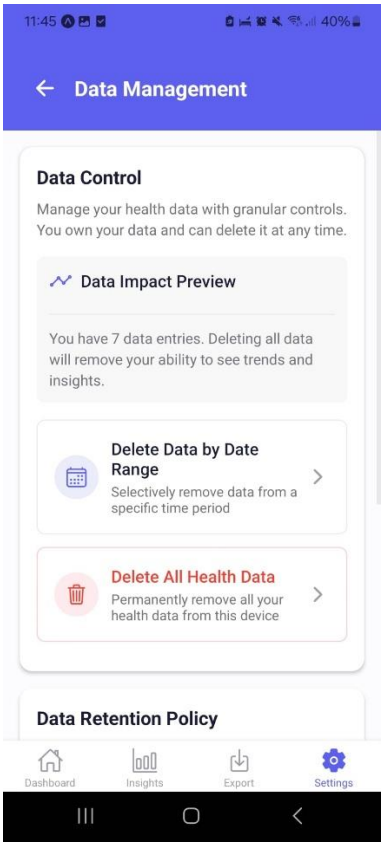

Figure 3: The Data Management interface displays user choices for privacy settings and data deletion functions.

Dark Mode Implementation

The app offers visual comfort through its polished dark mode feature.

- **Persistent Preferences**: The app remembers the user's theme choice.
- **Optimized Contrast**: The color schemes guarantee clear visibility across light and dark display settings.
- **System Integration**: The app theme adjusts automatically based on system configurations which include status bars and navigation elements.

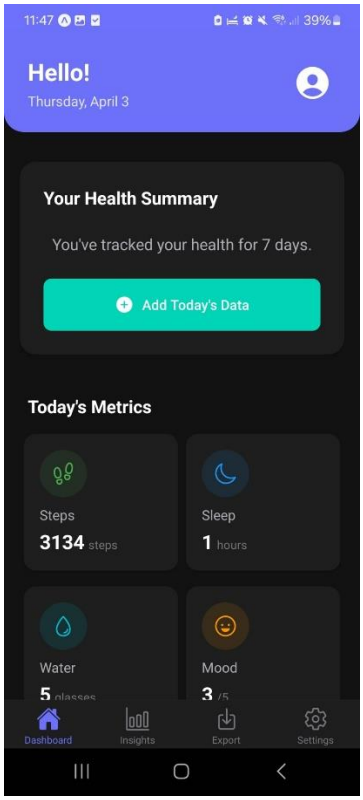

Figure 6: Comparison of light and dark modes.

3. User Experience

The design features focused on human needs combine to provide users with a meaningful and supportive experience.

- **Better Understanding**: Users understand the origin of their insights as well as the generation process behind them.
- **More Control**: The app safeguards user privacy while enabling users to control their health data.
- **Deeper Insight**: Context and feedback tools allow users to tailor their health monitoring experience through personalized approaches.
- **Improved Accessibility**: Dark mode provides a comfortable viewing experience which works particularly well during nighttime or dim conditions.

Discussion

Implications of a Human-Centered Approach

The Health Insights App demonstrates how health technology designed around people transforms our approach to monitoring personal health data while enabling better interpretation and action.

Balancing Algorithmic Insights with Real-Life Context

The app functions by using user-added context markers such as “sick,” “stressed,” or “traveling” to avoid sole dependence on numeric data. When you fell ill which caused your step count to decrease the app will accurately display this information without offering false or disheartening feedback. The approach aligns with Shneiderman’s (2022) principle that AI systems must enhance human decision-making processes instead of replacing them.

The application demonstrates Data Feminism concepts (D'Ignazio & Klein, 2020) by honoring qualitative data and personal experiences through context annotations. The system stands against the tech industry trend of reducing everything to numerical values by offering a complete view of individual health.

Transparency in Confidence and Limitations

AI systems frequently show insights as absolute truths even when those insights originate from incomplete or unreliable data. Through visual confidence indicators and source badges the app informs users about both the reliability and origin of each insight. The system enables people to choose more wisely while preventing overreliance on uncertain advice which becomes crucial in healthcare situations (Crawford, 2021). (**The AI system didn’t work. Ollama connection failed**)

User Agency and Data Ownership

Health applications frequently upload your information to cloud storage while disguising their terms under complex language. This app flips that model: Data remains saved on your device until you choose otherwise and you control both the retention duration and what gets removed. This method upholds "privacy by design" principles (Cavoukian, 2011) while demonstrating the impact of data deletion on analytical insights. This system ensures users remain informed so they can make decisions that match their personal preferences and comfort levels.

Challenges and Limitations

Despite its advantages building human-centered applications comes with multiple challenges.

Technical Complexity

Implementing features such as context tagging along with confidence levels and detailed privacy controls made app development more complicated. Future development efforts can be simplified through the establishment of reusable components or design templates.

Risk of Information Overload

Transparency benefits users but excessive detail can create an overwhelming experience. Given we are using localstorage, there is a relatively small size to store data.

Future Work

The app's future development will benefit from several promising directions.

Integration with Wearables

The application can establish connections with smartwatches and fitness bands to automatically receive tracked data. A user-focused approach requires establishing methods to label and verify automated data collection while reconciling discrepancies between user-inputted data and readings from devices.

Long-Term Impact Studies

Future studies should investigate the long-term impacts of human-focused health tracking methods. The inclusion of transparent confidence scores enables users to establish appropriate trust levels in the application. Are better health results achieved through the use of features that require user participation? Achieving an understanding of long-term effects would represent significant progress.

Connection to Class Themes

The Health Insights App implements core concepts from both human-centered and data-centered artificial intelligence research. These principles become operational within the app instead of remaining theoretical concepts.

Human-AI Complementarity

The app supports Shneiderman's (2022) trustworthy AI goals by keeping human users informed and in control throughout their interactions. The app provides operation explanations while ensuring user control over data and decisions and clearly articulates its inherent limitations. The system demonstrates its knowledge level and certainty through confidence indicators and source badges following Amershi et al.'s recommendations. (2019) recommend for ethical AI design.

Data Agency and Ownership

The app grants users complete control over their data based on the principles established by Lanier & Weyl (2018). The system saves information on local devices by default while offering straightforward exporting mechanisms and exact deletion management. The application enables users to determine the duration of data storage on their devices by providing genuine control instead of superficial consent options.

Inclusive Design Principles

The application provides dark mode support along with context-based annotations and personalized thresholds to address diverse user requirements. The design approach represented here aligns with inclusive design principles (Holmes, 2020) because it recognizes the different ways people interact with health and technology. The app allows users to add narrative context to their data which reflects principles of Data Feminism (D'Ignazio & Klein, 2020) as it recognizes that numerical data is insufficient to fully capture health stories from real life.

Responsible AI Practices

The application demonstrates ethical AI practices through transparent communication of its capabilities and limitations. All processing happens on-device, preserving user privacy. The inclusion of features such as confidence indicators, context annotations and explanatory modals demonstrates a responsible approach towards users that aligns with established ethical AI frameworks (Fjeld et al., 2020).

Conclusion

The Health Insights App demonstrates how health tracking tools can be built upon human-centered principles. The app emphasizes user control through transparent operations and privacy protection instead of merely collecting data.

The app creates a powerful option for users by integrating confidence scores and source indicators along with context flags and flexible data controls that transform traditional health app user interactions from data suppliers to collaborative partners. Of course, there are trade-offs. The inclusion of thoughtful features introduces complexity which presents new challenges including managing user information overload. The project demonstrates that it is both feasible and beneficial to create health technology which prioritizes people.

The Health Insights App creates a meaningful advancement in technology by focusing its design on actual human needs and experiences to support wellness as an active partner instead of just a passive tracker.

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Contribution Statement

This project was developed as a personal project to explore human-centered design principles in the context of health tracking applications. All components, including the React Native implementation, human-centered features, and dark mode support, were created as documented in this report. The code and implementation details can be used as a reference for future projects exploring similar human- centered approaches.