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Aharix app: An Intelligent Mobile Application for Grocery Barcode Scanning and Health-Aware Shopping

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Abstract: ***Health consciousness and dietary awareness have become increasingly important in today's fast-paced lifestyle [1]. Aharix is an Android-based application designed to assist users in making informed food choices by integrating personalized health data with product nutritional analysis [2]. The system allows users to input and store their health information, creating a personalized health filter based on critical parameters such as sugar, carbohydrates, and fat levels. Using the Open Food Facts API, Aharix scans the barcode of packaged food items to retrieve real-time nutritional details [3]. It then compares these values against the user's predefined health criteria and alerts them if any component exceeds recommended limits, promoting healthier consumption habits [4]. Additionally, the application provides a convenient e-commerce feature, enabling users to add selected items to a cart, complete payments securely through Razorpay's UPI gateway, and generate digital bills [5]. Built using Kotlin and Jetpack Compose, Aharix ensures a smooth, modern, and responsive user experience [6][7]. This project demonstrates how mobile and data-driven technologies can be synergized to promote personalized health management and conscious food selection.***

Keywords: Android Development, Jetpack Compose, Open Food Facts API, m-Health, UPI Integration, Razorpay, Personalized Nutrition, Barcode Recognition.

I. INTRODUCTION

The global landscape of public health has shifted dramatically toward diet-related non-communicable diseases (NCDs), including obesity, Type 2 diabetes, and hypertension [8]. As the consumption of ultra-processed foods increases, so does the complexity of nutritional labeling [4]. While regulatory bodies require food manufacturers to list ingredients and nutritional values, the average consumer often lacks the time or technical knowledge to interpret these labels accurately in the context of their personal health needs [9]. This "information asymmetry" between food producers and consumers often leads to dietary choices that inadvertently exacerbate chronic health conditions. With the rapid introduction of smartphones and high-speed mobile internet, mobile health (mHealth) applications have emerged as a viable solution to bridge this gap [10]. However, most existing applications are either purely informative (nutrition trackers) or purely commercial (e-commerce apps). There is a distinct lack of integrated platforms that combine personalized health filtering, real-time product verification, and secure transaction capabilities [2].

A. Problem Statement

Consumers with specific dietary restrictions — such as diabetics monitoring carbohydrate intake or heart patients managing sodium — face significant cognitive loads when grocery shopping [4]. Identifying "safe" products requires manual inspection of fine print, which is time-consuming and prone to human error. Furthermore, the transition from identifying a healthy product to purchasing it often requires multiple disconnected platforms, leading to a fragmented user experience [10].

B. Proposed Solution: Aharix

This research introduces Aharix, a comprehensive Android-based solution designed to simplify health-conscious shopping. Built using the Jetpack Compose framework and the Kotlin programming language, Aharix serves as a personalized dietary assistant [6][7]. By leveraging the Open Food Facts API, the application provides instant transparency into a product's chemical and nutritional composition via barcode scanning [3].

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The system's novelty lies in its Automated Health Filter, which allows users to input their medical profiles and receive real-time alerts if a scanned item conflicts with their health goals [2]. To provide a holistic utility, Aharix integrates a seamless "Scan-to-Pay" workflow using the Razorpay payment gateway for UPI transactions, enabling a secure and efficient end-to-end shopping journey [5].

II. METHODOLOGY

The Aharix system employs a hybrid architecture that balances cloud-based persistence with high-performance local data handling. This ensures that sensitive user health data is accessible across devices while keeping the shopping experience fast and responsive [11].

A. User Data Management via Firebase

Firebase Authentication and Cloud Firestore are utilized exclusively for the management of the user's personal health profile.

1) User Onboarding: Upon registration, a unique document is created in Firestore.

2) Health Filter Parameters: Fields such as sugar limit, subthreshold, and allergy list are stored in the cloud. This allows the "Health Filter" logic to be persistent and personalized, ensuring the app "remembers" the user's medical needs every time they log in.

B. Local Session & API Integration

To optimize performance and minimize unnecessary cloud costs, the shopping lifecycle is managed as follows:

1) Real-time Scanning: When a barcode is scanned, the app fetches data from the Open Food Facts API.

2) Personalized Logic: The app performs a comparison between the API's nutritional values and the user's health profile retrieved from Firebase.

3) Local Cart Management: The shopping cart is maintained within the application's state (using Kotlin's StateFlow or a local Room database) during the active session. This allows for rapid addition and removal of items without network latency.

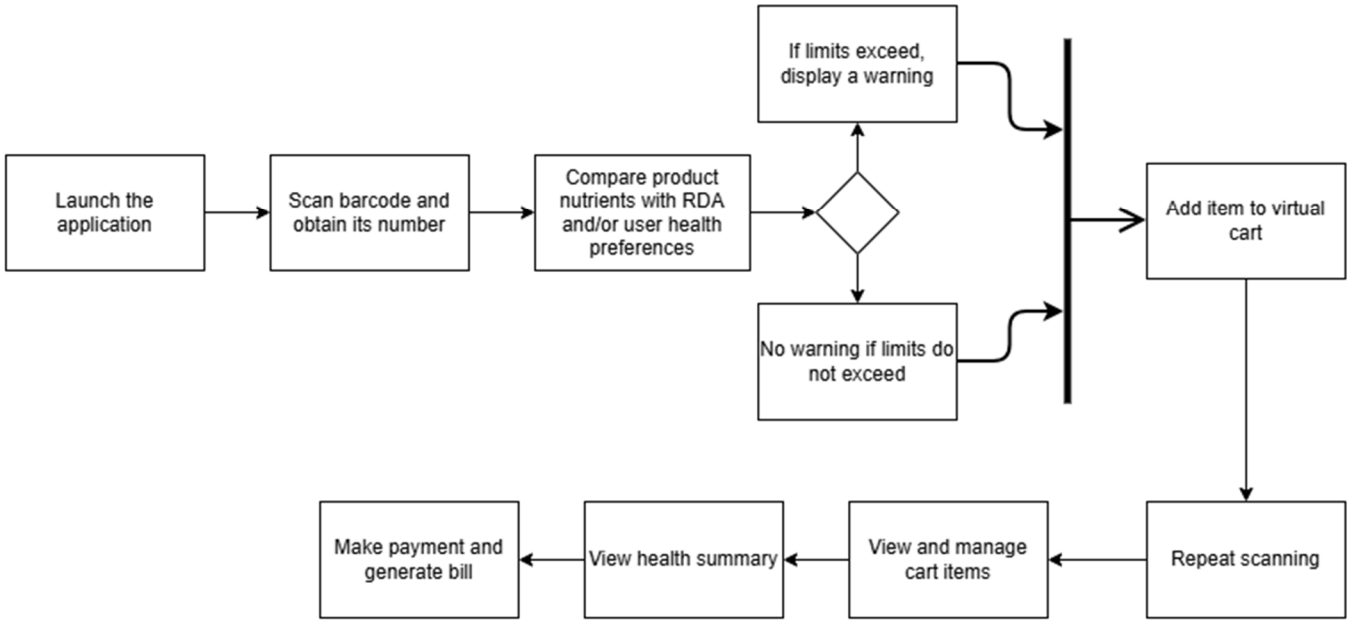
C. Payment & Billing Execution

The transition from a health-check tool to a commerce platform is handled through the Razorpay SDK:

1) Checkout: The total amount is calculated from the local cart state.

2) UPI Transaction: Razorpay processes the payment.

3) Bill Generation: Using the Document library**,** a receipt is generated on the client-side, incorporating the itemized list and the user information fetched from Firebase.



Flow-Diagram of 'Aharix' 1

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III. LITERATURE REVIEW

The Convergence of Health-Tech and Grocery in India (2025)

1) The "Health-First" Consumer Shift (2025 Data) [1]

According to the PwC India 'Voice of the Consumer 2025' report, a staggering 84% of Indian consumers now prioritize food safety and health benefits when choosing brands. The research indicates that 29% of shoppers would switch their regular grocery brand if a healthier alternative was presented.

Significance: This marks a transition from "Price-focused" shopping to "Value-and-Health" focused shopping in the Indian middle class.

2) The Failure of Traditional Labels (Label Literacy Gap) [4]

A scoping review published in PubMed Central (November 2025) reveals that while FSSAI has mandated nutritional tables, they are largely ineffective.

Findings: Indian consumers still prioritize expiry dates and price over nutritional information because traditional back-of-pack labels are too technical and time-consuming to read during a quick shopping trip.

Technological Need: The study concludes that emerging technologies are required to bridge the gap between "awareness" and "actual purchase decisions."

3) FSSAI Regulatory Momentum: Front-of-Pack Labelling (FOPL) [8]

In August 2025, public health experts and the Supreme Court of India intensified the call for mandatory Front-of-Pack Warning Labels (WL) on products high in fat, sugar, and salt (HFSS).

The Conflict: There is an ongoing debate between the "Health Star Rating" (which can be misleading) and "Warning Labels" (which are direct).

Role of Aharix: Research suggests that interpretive labels (Traffic lights: Red/Amber/Green) are 57% more effective in helping consumers identify unhealthy foods than raw numbers. Aharix provides this interpretation digitally, even if the physical pack lacks it.

4) AI and QR Code Integration in Retail [2]

Current 2025 trends in Smart Grocery Systems show a move toward AI-driven personalization.

Bibliometric Analysis (2024-2025): Research in the *Food and Nutrition Journal* highlights that AI-enabled QR codes provide real-time, personalized nutritional information.

Personalization Gap: Most existing grocery apps (Blinkit, BigBasket) offer a "one-size-fits-all" view. Literature suggests that apps must now offer medical-condition-based filtering (e.g., flagging high sodium for hypertension patients or sugar for diabetics) to be truly useful.

5) Comparative Analysis of Current Methodologies

Source / Research	Method	Key Contribution	Identified Limitation
PwC India (2025)	Consumer Survey	Identifies 84% health-priority.	Does not provide a tech solution.
FSSAI (2025)	Regulatory Policy	Mandates clean labeling.	Implementation is slow and confusing.
AI Smart System	Predictive Analytics	Forecasts grocery needs.	Often ignores real-time health alerts.
Aharix	Scan + Interpretive UI	Real-time Health Scoring	Requires robust API (GS1/FSSAI).

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IV. SIGNIFICANCE OF THE SYSTEM

The development of Aharix addresses several critical challenges in the intersection of public health and digital technology. Its significance is multifaceted:

1) *Bridging the Nutritional Information Gap:* While food manufacturers are legally mandated to provide nutritional labels, labels are often complex and utilize varying units (e.g., per 100g vs. per serving). Aharix democratizes this information by translating these complex data into a simplified "Green/Red" alert system based on the user's personal health profile. This significantly reduces the cognitive load on consumers, particularly those with low health literacy.
2) *Precision Dietetics for Chronic Disease Management:* For individuals suffering from lifestyle diseases such as Type 2 Diabetes, Hypertension, or chronic kidney disease, dietary discipline is a form of treatment. Aharix acts as a real-time decision-support system at the point of purchase. By utilizing Firebase to store personalized health filters, the system ensures that dietary restrictions are enforced consistently, potentially reducing the frequency of hospitalizations caused by dietary negligence.
3) *Efficiency in the Modern Retail Experience:* Traditional grocery shopping for health-conscious individuals is time-consuming. By integrating barcode scanning, personalized filtering, and UPI payments via Razorpay into a single workflow, Aharix optimizes the "Scan-to-Bill" cycle. This represents a significant advancement in m-Commerce (Mobile Commerce), where health-check and transaction are no longer separate activities but a unified, seamless experience.
4) *Data-Driven Health Awareness:* By providing an itemized digital bill that includes nutritional warnings, Aharix creates a "health trail" for the user. This data can eventually be used to help users track their purchasing patterns over time, fostering long-term behavioural changes and promoting more sustainable, healthier consumption habits.

Aharix transforms the smartphone from a communication device into a proactive medical screening tool and a financial terminal, ensuring that the user's health goals are never compromised by the convenience of modern shopping.

V. FUTURE WORK

Future enhancements include seller-side analytics, AI-based food recognition using CNNs [12], predictive health modeling [2], USI-based payments, and BLE-enabled wearable barcode scanners [12].

A. Seller-Side Ecosystem and Business Intelligence

To complete the commercial loop, a dedicated Aharix Seller Application is planned. This application will empower merchants to manage their digital presence and financial operations by:

Transaction Analytics: Providing a real-time dashboard to track payments processed via Aharix, complete with daily and monthly revenue reports.

Consumer Insights: Helping sellers understand localized health trends — such as a high demand for low-sugar products — based on anonymized scanning data.

Unified Settlement: Automating the reconciliation of UPI payments received through the user app, ensuring a hassle-free accounting process for small-scale vendors.

B. Integration of Advanced AI for Health & Recognition

The system will transition from a rule-based filter to an AI-driven intelligence engine: Computer Vision for Non-Barcoded Items: Utilizing Deep Learning models (e.g., Mobile Net or custom CNNs) to identify loose produce, artisanal goods, and fresh fruits that lack barcodes. This allows users to receive nutritional insights for the entire grocery cart, not just packaged goods. Predictive Health Observation: Using Machine Learning to analyse a user's purchase history and predict long-term health trends, offering proactive warnings if a user's cumulative nutrient intake (e.g., sodium over a week) deviates from their medical goals.

C. Unique Seller Identification (USI) and Seamless Payments

To further reduce friction at the point of sale, a Unique Seller Identification (USI) system will be introduced:

Automated Routing: Every registered merchant on the seller app will receive a unique identifier. This eliminates the need for users to manually enter API keys or scan specific merchant QR codes for every transaction.

One-Tap Checkout: Upon scanning any item within a specific USI-enabled store, the app will automatically link the cart to that specific seller's gateway, enabling a truly seamless "scan-and-go" experience.

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D. Hardware-Software Co-design: Peripheral Scanning Device

To enhance usability in fast-paced retail environments, the project aims to develop a compact, wearable barcode scanner (Hardware Peripheral):

Bluetooth-Low-Energy (BLE) Integration: This device will serve as an extension of the mobile app, allowing users to scan items instantly without repeatedly reaching for their smartphone.

Alert-Centric Interaction: The user can focus on the physical task of shopping, while the smartphone — acting as the "brain" of the system — remains in the pocket. The user only interacts with the mobile interface when the system triggers a vibratory or auditory alert indicating a nutritional conflict.

VI. CONCLUSION

The development of Aharix demonstrates a successful paradigm shift in how mobile technology can be leveraged to mitigate the rising tide of diet-related non-communicable diseases in India. By integrating the Open Food Facts API, Firebase Cloud Firestore, and the Razorpay payment gateway into a unified Jetpack Compose environment, this research has successfully addressed the "Information Asymmetry" prevalent in modern retail. The system effectively transforms a standard smartphone from a passive communication device into a proactive medical screening tool and a secure financial terminal.

The core innovation of the Automated Health Filter solves a critical cognitive challenge for health-compromised individuals, allowing for precision dietetics at the point of purchase. Rather than overwhelming users with technical nutritional tables, Aharix provides actionable, personalized intelligence that aligns with the FSSAI's "Eat Right India" mission. Furthermore, the integration of a full-stack e-commerce workflow — from barcode recognition to UPI-based digital billing — optimizes the retail cycle, proving that health consciousness and consumer convenience are not mutually exclusive.

Ultimately, Aharix establishes a benchmark for the next generation of m-Health applications. It proves that when open-source data is synergized with modern Android development practices, it can empower consumers to bypass misleading marketing and make choices that foster long-term behavioural change. As India moves toward a more digitized and health-aware econour, Aharix provides a scalable, data-driven blueprint for a healthier, more transparent future in food consumption.

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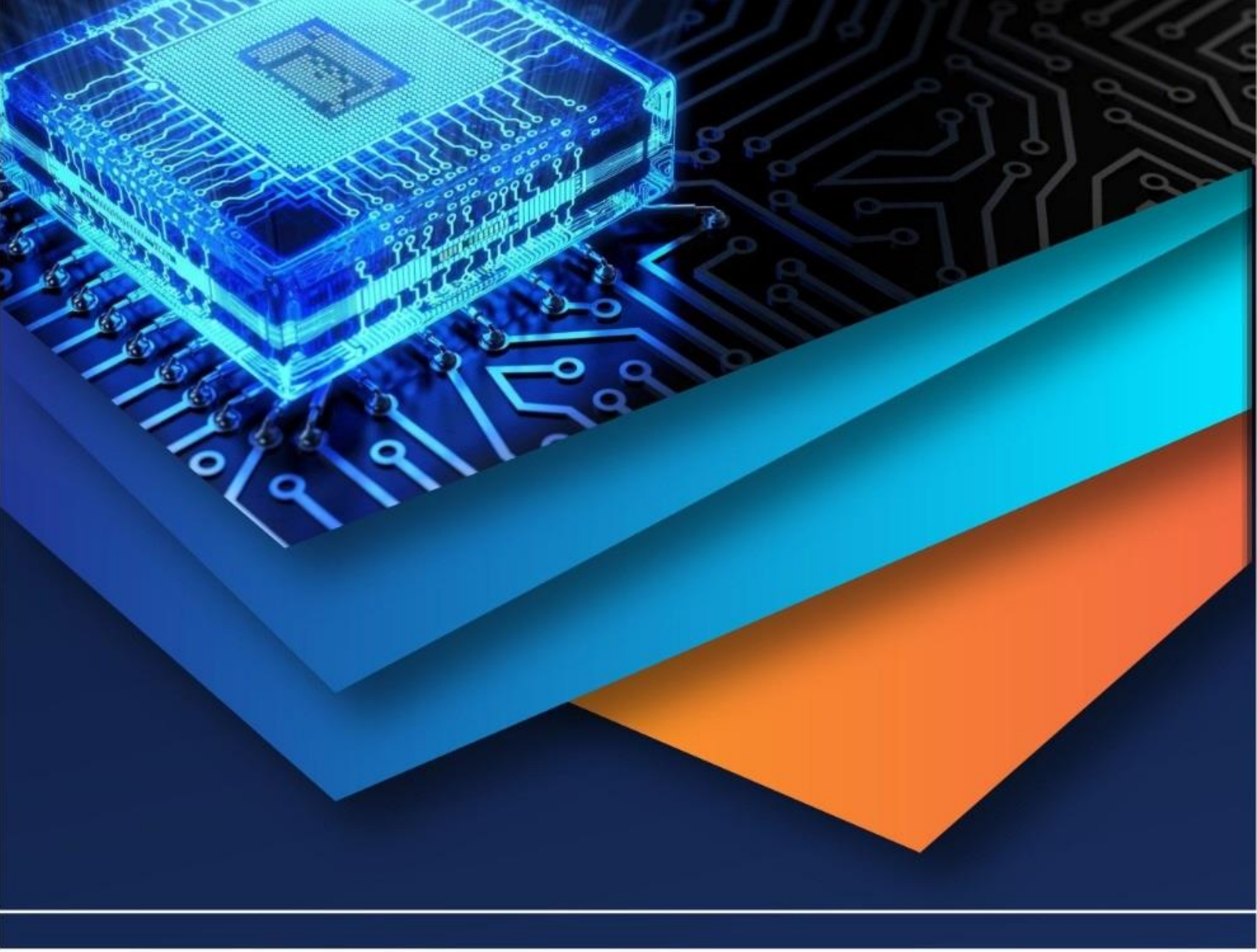
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