# Description of Problem

In today's world, health management has become a core focus for all age groups. While awareness of tracking health metrics like exercise, heart rate, hydration and nutrition continue to grow, existing monitoring platforms suffer from function fragmentation and failure to provide real-time analysis based on user historical data, as evidenced by:

1. Generic fitness recommendations

Most exercise apps offer standardized suggestions (e.g., "walk 8,000 steps daily") rather than generating personalized workout plans by analyzing users' historical activity patterns, heart rate variability and hydration data.

2. Static heart rate analysis

Current mainstream solutions rely on fixed threshold alerts, lacking real-time dynamic modeling capabilities using longitudinal user data, which limits personalized trend prediction and proactive health warnings.

3. Manual hydration tracking

Water intake monitoring still requires tedious manual logging that users often forget, resulting in unreliable data that cannot support scientifically valid hydration recommendations.

4. Isolated nutrition modules

Calorie estimation features rarely integrate with other health functions, causing data silos across devices/platforms (e.g., smart bands, water bottles, diet apps) that prevent holistic health insights and constrain AI-driven predictive analytics.

# Description of Proposed Solution

To address current health challenges, we plan to develop a smart health management system. This system will focus on managing diet and exercise, two key aspects of personal well-being, and will consist of the following main components:

1. Smart Wristband

We will design a smart wristband that leverages the micro:bit's built-in sensors, including its accelerometer, and gyroscope. It will also connect to external GPS and heart rate sensor modules. The wristband's primary function is to record daily human activity data.

2. Smart Water Bottle

The smart water bottle will comprise a pressure sensor and a microcontroller, designed to record the user's daily water intake.

3. Raspberry Pi Backend

The Raspberry Pi will serve as the system's core backend. It will be responsible for real-time data storage, training, and inference. It will provide an HTTP backend service, communicate with microcontrollers, and be able to integrate with external large models.

This smart health management system will offer the following core functionalities:

1. Exercise Detection and Recording

By training on accelerometer and GPS sampling data, the system will be able to detect and record a person's current posture, cadence, steps, speed, and distance traveled. We will also combine cadence, speed, and heart rate data for integrated training to establish an exercise heart rate prediction model. When a user exercises again, if their heart rate significantly deviates from historical predicted values, the system will promptly send health exercise reminders.

2. Hydration Management

The smart water bottle will record the user's daily water intake, with the data stored on the Raspberry Pi. Based on historical data, the Raspberry Pi will provide personalized hydration adjustment suggestions, helping users gradually meet their recommended daily water intake. Simultaneously, the smart wristband will send drinking reminders.

3. Dietary Calorie Calculation and Meal Recommendations

Users will be able to upload photos of their daily meals via their smartphones, enabling the system to log dietary intake and estimate calorie content. The Raspberry Pi will use image recognition to identify food items and estimate their calories. Based on this, it will then provide daily meal suggestions to help users better achieve their weight loss goals.

Additional material and sensors:

<https://sg.cytron.io/p-gy-neo6mv2-flight-control-gps-module>

<https://sg.cytron.io/p-micro-bit-wearable-accessories> x2

<https://sg.cytron.io/p-1kg-load-cell-with-hx711-amplifier>

<https://sg.cytron.io/p-max30102-oximeter-and-heart-rate-sensor-module>

AAA Battery