

# Bio-Twin: An AI Health Twin Platform for Longevity and Preventive Healthcare

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## Abstract:

Thailand is rapidly becoming an aging society, with people aged **60** and above making up **20%** of the population. At the same time, health problems such as obesity are increasing among young adults. Most health systems operate in a "reactive" way—treating people only after they get sick. To solve this problem, we created Bio-Twin, a Digital Health Twin system that predicts a user's health **5 to 10** years into the future. Bio-Twin shows two parallel paths: one path if the user keeps their current lifestyle, and another path if they make healthy changes. The system calculates a Bio-Twin Age and a Pace Score to show how fast the body is aging. It includes a Weekly Pulse feature with easy health tips (Micro-Nudge) and a camera-based Care Companion to track daily medicine and supplement intake. Bio-Twin connects with smartwatches via Apple Health and Google Health Connect, and offers a manual input mode for people without devices. By turning future health risks into clear visuals, Bio-Twin helps people take action early to stay healthy longer.

**Keywords:** Bio-Twin, Digital Health Twin, Preventive Healthcare, Longevity, AI Health, Healthspan

## 1. Introduction

Today, Thailand faces a big health challenge. Over 20% of the Thai population is elderly, and this number will reach 28% by 2036. Moreover, younger people are facing health risks earlier in life. For example, adult obesity in Thailand has reached 37.8%, and obesity among young men has almost doubled over the last 15 years. The main issue is that our healthcare system is "reactive." People usually visit doctors only after they become ill, because they cannot see the long-term damage caused by daily habits like poor diet, lack of sleep, or sitting for too long. To fix this, our team created Bio-Twin. Bio-Twin is an AI application that works like a "magic mirror." It uses basic health data to project a user's health 5 to 10 years in advance. By showing what will happen to their body in the future, Bio-Twin encourages users to build good health habits today before diseases happen.

## 2. Methodology

### 2.1 Dual-Path Future Visualization

Bio-Twin uses basic health metrics to simulate two future health pathways for the user over a 5-to-10-year period:

- Current Path: Shows future health if the user keeps their original habits.
- Improved Path: Shows future health if the user starts making healthy lifestyle adjustments.

### 2.2 Bio-Twin Age and Pace Score

The system uses five main health variables: sleep duration, daily steps, heart rate, strength activity time, and Body Mass Index (BMI). Using these variables, the AI calculates:

- Bio-Twin Age: The biological age of the user's body compared to their actual age.
- Pace Score: How fast or slow the body is aging compared to average people.

The general math model for the biological rate change (Q) can be described as

$$Q = K_{eq} \cdot [B]^a [P]^b - \lambda \cdot \Delta T$$

Where  $K_{eq}$  is the body stability baseline, [B] represents core health parameters, P is the aging pace, and  $\lambda \cdot \Delta T$  represents biological stress accumulated over time.

### 2.3 Micro-Nudges and Care Companion

- Weekly Pulse: Updates health status every week and gives small, easy tasks (Micro-Nudges) that users can do daily.
- Care Companion: Uses a smartphone camera and image recognition to check and record when users take their medicine or vitamins, helping them build daily discipline.

### 2.4 Accessibility and Data Security

Users can sync data automatically from Apple Watch, Xiaomi Mi Band, or Fitbit through Apple Health and Google Health Connect. For people without smartwatches, Bio-Twin provides a manual input mode so everyone can use the app equally. All personal data is encrypted according to standard data protection laws (PDPA).

## 3. Results and Discussion

Compared to traditional healthcare and simple step-counter apps, Bio-Twin offers clear advantages in keeping users motivated.

Table 1: Comparison between Traditional Healthcare, Fitness Trackers, and Bio-Twin

| Feature            | Traditional Healthcare       | Standard Fitness Trackers      | Bio-Twin Platform              |
|--------------------|------------------------------|--------------------------------|--------------------------------|
| Focus              | Treatment after getting sick | Simple daily activity tracking | Preventive care & Longevity    |
| Time Horizon       | Present symptoms             | Past & present data            | 5–10 year dual-path projection |
| Medicine Tracking  | Self-remembering             | Basic alarm setting            | AI camera photo verification   |
| Device Requirement | Doctor visit required        | Requires expensive wearable    | Wearable OR manual input mode  |

By seeing two contrasting future images of their own body, users feel more motivated to change their daily habits. The Care Companion feature also helps patients take their prescription medicine on time, reducing long-term hospital costs.

## 4. Business Model

Bio-Twin uses a Freemium business model:

- Free Version: Free basic calculator, dual-path visualizer, and simple health nudges for all users.
- Premium (\$59/month): Detailed weekly analytics, caregiver connection, and multiple medicine reminders.

- B2B / B2B2C Partnerships: Partnering with health insurance companies, corporate wellness programs, and supplement brands to lower health risks and track product adherence.

## 5. Conclusion

Bio-Twin is an easy-to-use, AI-driven innovation designed to help people in Thailand live healthier and longer lives. By turning invisible health risks into clear 5-to-10-year future images and helping users stick to daily healthy habits, Bio-Twin shifts healthcare from reactive treatment to proactive prevention. This supports the ultimate goal of longevity innovation: making Healthspan equal to Lifespan.

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