

Health and Wellness Lifestyle Solver

Comprehensive Multi-Objective Optimization for Personalized Health

Shyamal Chandra

November 18, 2025

Overview

- 1 Introduction
- 2 System Architecture
- 3 Diet Optimization
- 4 Exercise Planning
- 5 Medical Test Analysis
- 6 Cognitive Assessment
- 7 Sensory Health
- 8 Time-Based Planning
- 9 Long-Term Planning
- 10 Implementation
- 11 Results
- 12 Future Work
- 13 Conclusion

The Challenge

- Health optimization requires considering **multiple interconnected factors**
- Traditional apps focus on **single domains** (diet OR exercise)
- Medical tests, cognitive function, sensory health often **ignored**
- Need for **holistic, integrated approach**

Comprehensive System

- Diet optimization
- Exercise planning
- Medical test analysis
- Cognitive assessment
- Sensory health monitoring
- Time-based planning

Key Features

- Multi-objective optimization
- USDA compliance
- Calendar integration
- Long-term planning
- Journal analysis
- Adaptive difficulty

Objectives

- ① Design comprehensive health data models
- ② Develop multi-objective optimization algorithms
- ③ Integrate medical test analysis
- ④ Create personalized exercise plans
- ⑤ Implement sensory health monitoring
- ⑥ Provide time-based planning
- ⑦ Generate long-term transformation plans

Core Components

Models

- HealthData
- Food & Nutrient
- Exercise
- MedicalTests
- CognitiveAssessment
- Sensory Health

Generators

- RecipeGenerator
- NutritionFactsGenerator
- SongGenerator

Processing

- DietSolver
- ExercisePlanner
- MedicalAnalyzer
- CognitiveAnalyzer
- Sensory Analyzers
- JournalAnalyzer

```
struct HealthData: Codable {
```

- Basic metrics: glucose, hemoglobin, age, weight, height
- Medical Tests: MedicalTestCollection
- Cognitive: [CognitiveAssessment]
- Sensory: Hearing, Vision, Tactile, Tongue prescriptions
- Exercise, Sleep, Journal data

```
}
```

Objective Function

$$S = w_n S_n + w_t S_t + w_d S_d + w_v S_v$$

- S_n : Nutrient compliance score
- S_t : Taste preference score
- S_d : Digestion quality score
- S_v : Food variety score

Optimization Algorithm

- ➊ **Initialization:** Random amounts of seasonal foods
- ➋ **Scoring:** Calculate fitness based on all objectives
- ➌ **Optimization:** Iteratively adjust food amounts
- ➍ **Meal Distribution:** Distribute across breakfast, lunch, dinner
- ➎ **Validation:** Ensure USDA compliance

Automatic Adjustments

- Blood Glucose → Reduce carbs
- Hemoglobin → Increase iron
- Vitamin D → Boost D intake
- Heavy Metals → Detox nutrients
- Organ Health → Adjust nutrients

Analysis Features

- Issue detection
- Warning system
- Trend analysis
- Recommendations

Cardio

- Walking
- Running
- Cycling
- Rowing

Strength

- Weight training
- Bodyweight
- Resistance

Mind-Body

- Yoga
- Tai Chi
- Meditation
- Breathing

Specialized

- Indian Breathing (Pranayama, Bhastrika, Anulom Vilom, Kriya)
- Hearing Activities (Music listening, hearing exercises)
- Tactile Activities (Massage, texture exploration)
- Tongue Activities (Taste training, oral exercises)

- **Fitness Goals:** Cardio, strength, flexibility targets
- **Mental Health:** Stress, anxiety, sleep quality
- **Muscle Mass:** Strength training recommendations
- **Sexual Health:** Hormonal balance, cardiovascular health
- **Sensory Health:** Hearing, vision, tactile, tongue exercises
- **Exercise History:** Current patterns and progress

Blood Tests

- CBC
- Metabolic Panel
- Lipid Panel
- Liver/Kidney Function
- Thyroid
- Vitamins/Minerals
- Hormones

Other Tests

- Urine Analysis
- Semen Analysis
- Bone Marrow
- Saliva
- Skin (multi-part)
- Hair (metals)
- Organ Analysis

- **Radiology:** X-Ray, CT, MRI, Ultrasound, PET, SPECT
- **Cardiology:** ECG, Echocardiogram, Stress Tests
- **Nuclear Medicine:** Bone scans, perfusion studies
- **Neurology:** EEG, EMG, Nerve Conduction
- **Pulmonology:** Spirometry, Lung Volumes
- **Gastroenterology:** Endoscopy, Colonoscopy

Intelligence

- IQ (Full-scale, verbal, performance)
- EQ (Emotional intelligence)
- CQ (Creative intelligence)

Reasoning

- Spatial reasoning
- Temporal reasoning

Problem-Solving

- Tactical (immediate)
- Strategic (long-term)

Psychic

- Remote viewing
- Clairvoyance
- Telepathy
- Precognition

Vision

- Prescription tracking
- Daily vision checks
- Vision game sessions

Hearing

- Hearing prescription
- Daily audio tests
- Music sessions

Tactile

- Tactile prescription
- Daily tactile tests
- Vitality sessions

Tongue

- Tongue prescription
- Daily tongue tests
- Vitality sessions

Day-Level

- Day Start
- Day End

Week-Level

- Week Start
- Week End

Month-Level

- Month Start
- Month End

Features

- Calendar integration (EventKit)
- Journal analysis integration
- Automatic scheduling
- Reminder system

- **Structured Entries:** Categorized journal data
- **Unstructured Entries:** Free-form text analysis
- **Theme Identification:** Pattern recognition
- **Emotional Trends:** Mood tracking
- **Insights:** Recommendations for planning

Transformation Plans

Durations

- 3-Month (Intensive)
- 6-Month (Moderate)
- 1-Year (Comprehensive)
- 2-Year (Extended)
- 5-Year (Long-term)
- 10-Year (Lifetime)

Features

- Phased approach
- Daily plans
- Milestones
- Adaptive adjustments
- Multiple goals

Difficulty Levels

- Gentle (Low urgency)
- Moderate (Medium)
- Aggressive (High)
- Extreme (Critical)

Technology Stack

- **Language:** Swift 5.9+
- **Platform:** iOS 16.0+ / macOS 13.0+
- **UI:** SwiftUI
- **Architecture:** MVVM
- **Persistence:** Codable/JSON
- **Calendar:** EventKit
- **Health:** HealthKit support

Test Types

- Unit Tests
- Integration Tests
- Regression Tests
- Black Box Tests
- UX Tests

Coverage

- Core functionality
- Cross-component
- Stability
- Edge cases
- User experience

Key Achievements

- ✓ Multi-objective diet optimization
- ✓ Comprehensive medical test integration
- ✓ Personalized exercise planning
- ✓ Sensory health monitoring
- ✓ Cognitive assessment analysis
- ✓ Time-based planning with calendar
- ✓ Long-term transformation plans
- ✓ Journal analysis and insights

- Medical tests → Nutrient adjustments
- Exercise plans → Multiple health factors
- Sensory health → Activity recommendations
- Cognitive assessments → Learning suggestions
- Journal analysis → Planning enhancement
- Calendar integration → Practical scheduling

For Users

- Comprehensive health view
- Integrated optimization
- Proactive management
- Personalized recommendations
- Long-term planning
- Self-monitoring tools

For System

- Modular design
- Extensible architecture
- Well-tested codebase
- Clear documentation
- Scalable structure
- Maintainable code

Potential Enhancements

- Machine learning for trend prediction
- Wearable device integration
- Real-time health monitoring
- Advanced music therapy
- Hearing aid/vision device integration
- Social features
- Healthcare provider integration
- Advanced optimization algorithms

- Comprehensive health optimization system
- Multi-objective optimization approach
- Integration of all health domains
- Personalized recommendations
- Long-term planning support
- Holistic wellness approach
- Foundation for future enhancements

Thank You

Questions?

Contact: Shyamal Chandra