CSE 242: Advanced Software Engineering

Milestone 1 Report

Gamification of Nutrition & Healthy Eating

Authored by:

Abdelrahman Mohamed Zayed	23P0094
Hassan Hazem Abdelhady	23P0415
Ahmad ElSayed Abdelhafez	23P0019
Abdelmoneim Mahmoud	23P0015
Hasan Sherif Ahmed	23P0017
Zeyad AbdelMageed Saeed	23P0072
Mariam Mohamed Shemies	23P0178
Jana Mohamed Wael	23P0200
Habiba El-Sabaa Ali	23P0103
Jana Ehab Ibrahim	23P0105

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Introduction

The increasing prevalence of chronic diseases and lifestyle-related health issues has highlighted the urgent need for innovative digital health solutions. Our system emerges as an AI-powered wellness companion designed to promote healthier eating habits and holistic wellness through a personalized and engaging experience. This report outlines the initial research and system design for our system, focusing on the application of artificial intelligence and gamification in meal planning, fitness integration, and health education.

The purpose of this report is to fulfill the objectives of Milestone 1, which include defining the project scope, identifying system requirements, developing user stories, designing initial UML models, and providing an initial cost estimation using the Basic COCOMO model. The proposed solution aims to motivate users to adopt healthier behaviors through an intuitive interface supported by intelligent recommendation systems and engaging reward mechanisms.

Project Proposal

Focus Area: Gamification of Nutrition & Healthy Eating

Objectives: Our system aims to enhance health outcomes through personalized AI-driven meal planning, gamification strategies, and integrated fitness recommendations. Our objectives are:

- **Provide accurate meal planning tailored to individual dietary needs, medical conditions, and lifestyle preferences.**
- **Introduce a gamified rewards system (badges, levels, streaks) to motivate users to maintain healthy habits.**
- **Recommend fitness plans aligned with dietary goals for a holistic wellness approach.**
- **Enable ingredient sourcing by identifying nearby locations and offers to purchase meal components.**
- **Promote health literacy with insights and educational content related to nutrition.**
- **Integrate a Health Expert/Coach that reviews user progress, provides personalized feedback, and ensures that dietary and fitness plans meet specific health needs.**

Target Audience:

- **Individuals seeking a healthier lifestyle.**
- **Patients managing chronic conditions such as diabetes, hypertension, or obesity.**
- **Fitness enthusiasts looking for aligned diet and workout plans.**
- **Parents and caregivers aiming for nutritious family meal planning.**

Innovation and Value Proposition: Our System provides an engaging experience using gamification to sustain long-term user motivation, while leveraging AI for real-time meal and fitness personalization. Localization ensures cultural relevance, and built-in integration with store APIs allows users to purchase ingredients with ease.

Requirements Documentation

Functional Requirements:

- **User registration and authentication.**
- **Input form for dietary preferences, medical history, and lifestyle goals.**
- **AI-based personalized meal plan generation.**
- **Option to adjust or regenerate meals.**
- **Daily reminders and motivational notifications.**
- **Gamification module with progress tracking and achievements.**
- **Ingredient sourcing using geo-location APIs.**
- **Integrated fitness plan suggestions.**
- **Health Expert/Coach module for feedback and guidance.**
- **Save, export, or share meal and fitness plans.**

Non-Functional Requirements:

- **High prediction accuracy (90%+) for AI-generated recommendations.**
- **Pre-trained models for personalization and food categorization.**
- **Localization support for diverse user regions and preferences.**
- **Fast response time (under 3 seconds for AI operations).**
- **Secure and encrypted data storage complying with GDPR.**
- **Responsive design across web and mobile platforms.**
- **Scalable system architecture for increasing user base.**

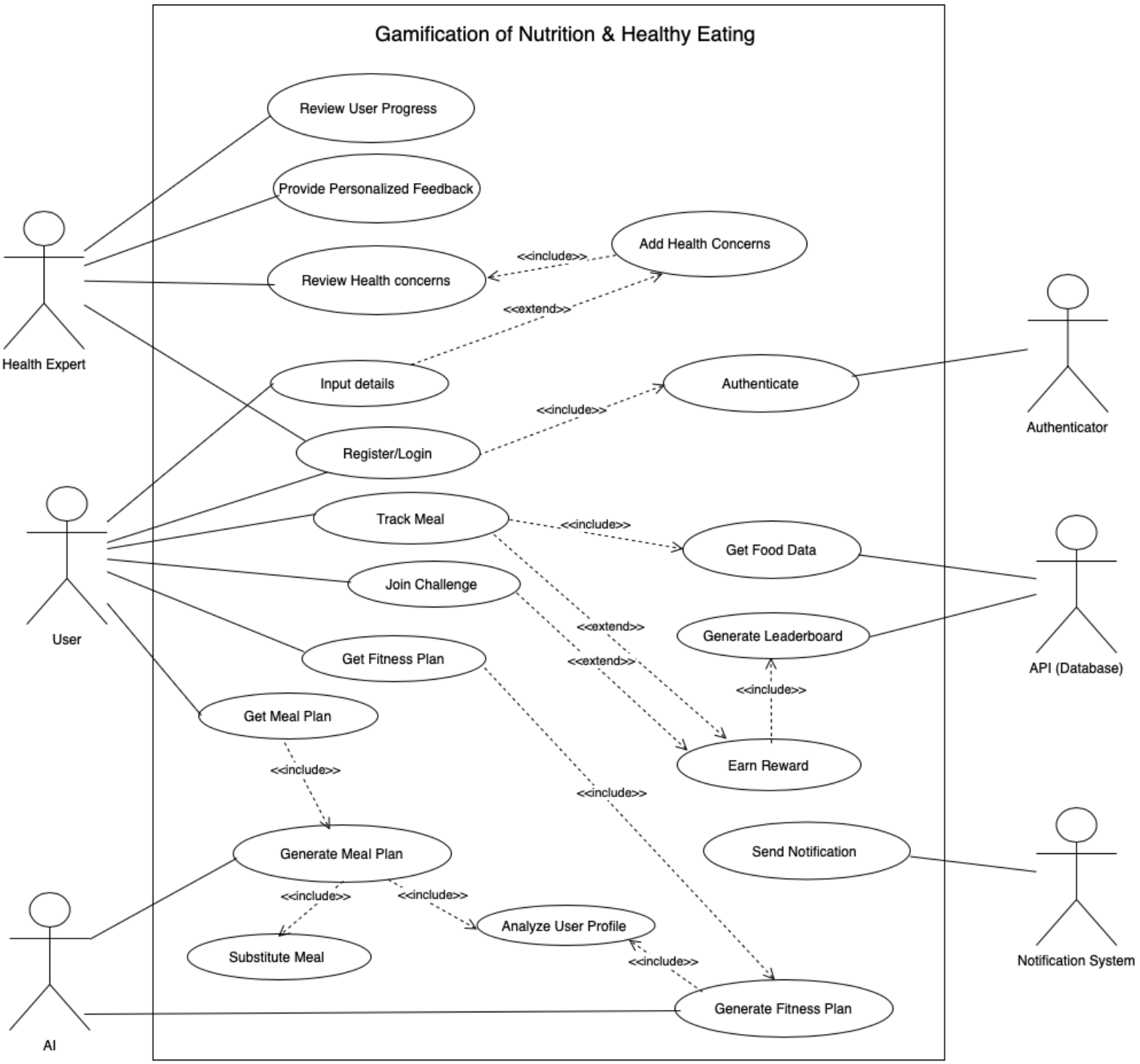
User Stories Development

- **As a user, I want to log in securely so that I can access my personalized data.**
- **As a health-conscious person, I want to input dietary goals so that I get meal plans tailored to me.**
- **As a diabetic patient, I want meal suggestions that avoid sugar-rich items so that I can manage my condition.**
- **As a busy professional, I want reminders and motivational messages so that I stay on track.**
- **As a competitive user, I want to earn points for eating healthy meals so that I stay motivated.**
- **As a parent, I want meal options that cater to children so that my family eats healthier.**
- **As a user, I want to know where I can buy ingredients so that I can prepare meals without hassle.**
- **As a fitness enthusiast, I want to see a fitness plan that complements my meals so that I reach my goals efficiently.**
- **As a user, I want to receive expert guidance from a health coach so that I can make informed decisions about my nutrition and fitness.**
- **As a diabetic patient, I want to consult with the health coach to get advice on meal adjustments and lifestyle changes for better disease management.**

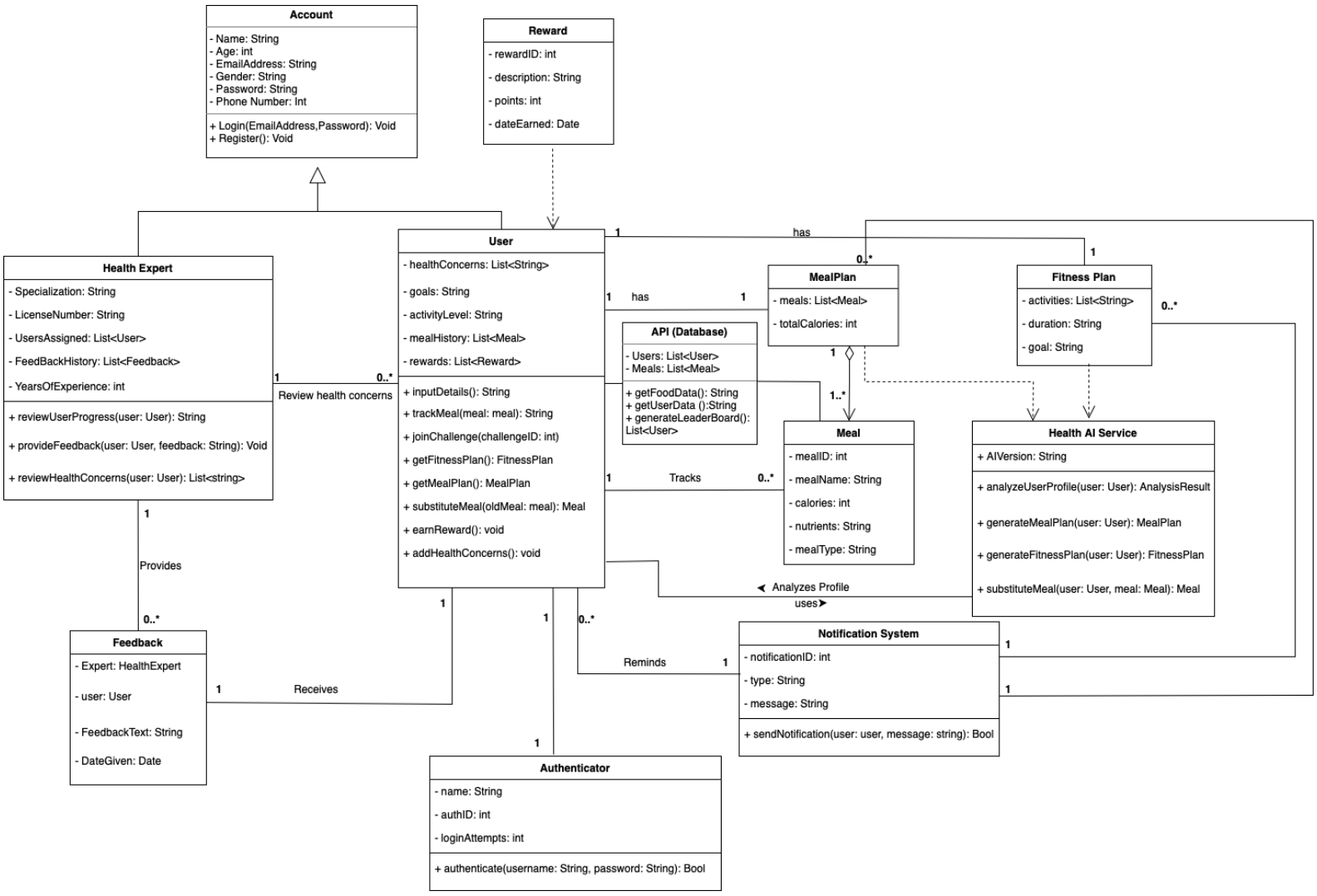
- **As a user with chronic conditions, I want personalized feedback from a health expert so that I can ensure my diet and fitness plans are appropriate for my health concerns.**

UML Modeling

Use case Diagram



Class Diagram



Cost Estimation

Function Point Classification Table

#	Function	FPA Category	Complexity Level	Function Points (FP)
1	User Registration	EI	Low	3
2	Meal Track	EI	Average	4
3	Health Metrics Tracking	EO	High	7
4	Join Challenge	EI	Low	3
5	Meal Plan Generation	EO	High	7
6	Reward Point Calculation	EO	Average	5
7	Provide Feedback	EO	Low	4
8	Store Meal's Data	ILF	Average	10
9	Store User's Data	ILF	Average	10
10	Authentication	EIF	High	10
11	Send Notification	EO	Average	5
12	Input User Details	EI	Low	3
13	Get Ingredient Offer	EQ	High	6
14	Fitness Plan Generation	EO	High	7
15	Suggest Meal Swaps	EO	Average	5
16	Get Progress Report	EQ	Average	4
17	Calculate Calories Burned	EO	Low	4
18	Leader Board Update	EO	Average	5
Total FP				102

COCOMO Model

We chose the Semi-Detached model because our project involves AI, which makes it moderately complex. This type of project requires some experience and guidance but isn't as complex as embedded systems.

Since we're using the Basic COCOMO Model, we do not consider detailed complexity factors. That means the Adjustment Factor (AF) is 1, so the Function Points (FP) are equal to the Unadjusted Function Points (UFP).

Given:

- **36 FP ≈ 5.5 KLOC**
- **We have 102 FP →** KLOC = (102 × 5.5) / 36 ≈ 15.583

COCOMO Constants:

- **a = 3.0**
- **b = 1.12**
- **c = 2.5**
- **d = 0.35**

Effort (E)= a ×(Size)^{b}

E= 3.0x (15.583)$^{1.12}$ = 65 person-months

Time(T)= c ×(Effort)^{d}

T= 2.5 × (65)$^{0.35}$ = 10.78 months

People Required (P) **= Effort(E) / Time(T)**

P= 65/10.78 = 6

Assumptions:

- **The estimation is based on preliminary size (KLOC) derived from FP.**
- **Team capacity aligns with the calculated personnel requirement.**
- **More refined cost and schedule assessments will be conducted during Milestone 2 as the design matures.**