American International University-Bangladesh (AIUB)

Department of Computer Science

Faculty of Science & Technology (FST)

NatureSync Health Tracker using AI

A Software Engineering Project
Submitted By
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Semester: Summer_21_22		**Section:**	**Group Number:**	
SN	Student Name	Student ID	Contribution (CO1+CO2)	Individual Marks
1.	SHAHARIAZZAMAN JOY	22-46955-1	20%	
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3.	TASNIM BINTA KAMRAN NAFISA	21-45045-2	20%	
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5.	MUKSHIT SAFI OWASI	22-47251-1	20%	

The project will be Evaluated for the following Course Outcomes

CO1: *Analyze* the impact of software engineering models over various context of software development to assess societal, health, safety, legal and cultural issues.	Total Marks	
Project Background Analysis and feasibility (needs, goal, benefits, etc.)	[5 Marks]	
Analysis the impact of societal, health, safety, legal and cultural issues	[5Marks]	
Review of existing Studies and Relevant Example	[5Marks]	
CO2: *Explain* appropriate software engineering model, project management roles and their skills in the context of professional engineering practice and solutions to complex engineering problems in a software development environment.	Total Marks	
Appropriate Process Model Selection and Argumentation with Evidence	[5Marks]	
Evidence of Argumentation regarding process model selection	[5Marks]	
Submission, Defense, Completeness, Spelling, grammar and Organization of the Project report	[5Marks]	

Description of Student's Contribution in the Project work

Student Name: SHAHARIAZZAMAN JOY
Student ID: 22-46955-1
Contribution in Percentage (%): 20%
Contribution in the Project:

- Background and Solution to the Problem
- Functional Requirements
- Activity Diagram
- Sequence Diagram

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Signature of the Student

Student Name: SADMAN SAMIR RAFITH
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Contribution in Percentage (%): 20%
Contribution in the Project:

- Functional Requirements
- Use Case Diagram
- Sequence Diagram
- Process Model Selection: Selected Process Model

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Student Name: TASNIM BINTA KAMRAN NAFISA
Student ID: 21-45045-2
Contribution in Percentage (%): 20%
Contribution in the Project:

- Functional Requirements
- Class Diagram
- Use case Diagram
- Process Model Selection: Project Role Identification & Responsibilities

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Student Name: LABONI SOMODDAR
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Contribution in the Project:

- Functional Requirements
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▪ Class Diagram _____Laboni_____ Signature of the Student
Student Name: MUKSHIT SAFI OWASI Student ID: 22-47251-1 Contribution in Percentage (%): 20% Contribution in the Project: ▪ Functional Requirements ▪ Use Case Diagram ▪ Class Diagram ▪ Process Model Selection: Project Role Identification & Responsibilities _____Owasi_____ Signature of the Student

1. PROJECT PROPOSAL

1.1 Background to the Problem

In the contemporary healthcare landscape, there's a growing awareness of the intricate interplay between an individual's health and the surrounding environment. Factors like weather conditions, air quality, and overall environmental context have a profound impact on our well-being. Recognizing this, the NatureSync Health Tracker project emerges to address the complexities of this relationship and provide a holistic solution to personalized health management.

Modern living exposes individuals to a myriad of environmental influences that can significantly affect health outcomes. Climate variations, air pollution, and other environmental elements contribute to the challenges people face in maintaining optimal health. NatureSync positions itself at the forefront of the convergence between environmental factors and individual health, aiming to create a comprehensive system that caters to the unique needs of each user. The overarching goal of NatureSync is to empower individuals with a profound understanding of their health within the context of their environment. It acknowledges that health is not a one-size-fits-all concept and seeks to provide tailored recommendations based on the symbiotic relationship between personal health data and the surrounding world.

At the heart of NatureSync lies advanced technology, specifically artificial intelligence (AI) and machine learning (ML). These technologies form the backbone of the system, enabling it to process vast amounts of data, recognize patterns, and generate meaningful insights. The integration of AI and ML not only enhances the accuracy of health predictions but also allows

the system to adapt and improve over time. NatureSync utilizes an array of sensors strategically placed to capture real-time health metrics. These sensors measure crucial indicators such as pulse, heart rate, and thermal conditions while individuals engage in their daily activities. Simultaneously, the system taps into external data sources, including weather forecasts, air quality indices, and other environmental parameters. What sets NatureSync apart is its ability to translate collected data into actionable recommendations. Whether it's advising individuals on appropriate clothing for upcoming weather changes or cautioning against outdoor activities during periods of poor air quality, the system tailors its suggestions to each user's unique health profile.

Ultimately, NatureSync aspires to be more than a monitoring tool; it aims to be a proactive companion in users' health journeys. By fostering an understanding of how environmental factors impact health, the system empowers individuals to make informed decisions, leading to healthier and more fulfilling lives.

In essence, NatureSync Health Tracker represents a paradigm shift in health management, where the fusion of advanced technology and environmental awareness creates a platform that goes beyond traditional health tracking. It opens new avenues for personalized well-being, putting users in control of their health in the context of the world around them.

1.2 Root Causes

i. **Limited Integration:** Traditional health monitoring systems often overlook the dynamic influence of environmental factors on individual health.
ii. **Gap in Understanding:** The absence of a cohesive approach to integrating external elements, such as weather conditions and air quality, results in a gap in understanding potential health risks.
iii. **Adaptation Challenges:** Individuals face difficulties in adapting their routines to changing environmental conditions, contributing to a disconnect between health management and the surrounding context.

Importance of the Problem:

i. **Enhanced Relevance of Recommendations:** Addressing this gap is crucial for providing health recommendations that are more accurate and relevant to the individual's unique context.
ii. **Proactive Health Management:** By considering environmental influences, NatureSync enables a proactive approach to health management, allowing users to anticipate and mitigate potential health risks.

iii. **Comprehensive Healthcare Solution:** The integration of environmental data contributes to a more comprehensive healthcare solution, aligning with the holistic understanding of health that encompasses both personal and environmental factors.

Informed Decision-Making: Recognizing the importance of external factors empowers individuals to make informed decisions about their health, fostering a more active and engaged approach to well-being.

1.3 Solution to the Problem

- Describe what is your project/thesis objective? What solutions are you going to provide to solve the above-mentioned problems?
  Solution: The NatureSync Health Tracker project aims to revolutionize health monitoring by addressing the limited integration of environmental factors in traditional systems. The objective is to provide a holistic and personalized solution that considers both individual health metrics and the dynamic influence of the environment. The key solutions include comprehensive data integration, contextual health insights, personalized recommendations, and proactive health management. By seamlessly integrating personal and environmental data, the project strives to empower users, enhance their well-being, and contribute to community health and research opportunities.

- What are the solutions you are going to propose to deal with the problem? Why is this solution being particularly appropriate to solve the problem? Is the solution feasible to meet the business objective?
  Solution:
  Comprehensive Data Integration:
  - Develop advanced algorithms and sensors for seamless integration of personal health and real-time environmental data.

  Appropriateness:
  - Ensures a holistic understanding, combining individual health metrics with external factors for more accurate recommendations.

Personalized Health Recommendations:

- Utilize machine learning for tailored recommendations that consider real-time environmental dynamics.

Proactive Health Management:

- Implement features for real-time alerts, predictions, and interventions based on environmental data.

Community Health and Research Opportunities:

- Aggregate and anonymize data for community health analysis, unlocking research opportunities.

Feasibility:

- Solutions leverage advancements in sensor technologies, machine learning, and real-time data sources, ensuring feasibility.
- Commitment to technology advancements ensures accuracy and enhances user experience.

Business Objectives:

- ✓ Solutions align with NatureSync Health Tracker's objective of providing a user-centric system integrating personal and environmental data for effective health management.

- o Describe the basic functionalities of your proposed solution that makes the best use of state-of-art technology and produces a significant result that is likely to have a major impact on societal, health, safety, legal and cultural issues. Provide a deep insight that demonstrates and presents a creative solution to the real-life problem.

Solution:

1. **Advanced Data Integration:**
   - **Functionality:** Integrates real-time personal health and environmental data using cutting-edge sensors.
   - **Significance:** Provides a comprehensive health profile, bridging the gap between individual health and the environment.

2. **Contextual Health Insights:**
   - **Functionality:** Utilizes machine learning to identify correlations between personal health and diverse environmental factors.
   - **Significance:** Enhances understanding of how external factors influence health, offering precise and contextual insights.

3. **Personalized AI Recommendations:**
   - **Functionality:** Applies machine learning for tailored health recommendations and interventions based on real-time data.
   - **Significance:** Empowers users with adaptable recommendations for proactive health management.

4. **Proactive Health Alerts and Predictions:**
   - **Functionality:** Uses predictive analytics to issue real-time alerts and predictions for users to anticipate and mitigate potential health risks.
   - **Significance:** Fosters proactive health management and prevention of health issues.

5. **Community Health Analytics:**

- **Functionality:** Aggregates and anonymizes user data for community health analysis, contributing to broader public health initiatives.
- **Significance:** Addresses community-level health concerns, creating positive societal impact.

Impact:

1. **Societal Impact*:*** Fosters well-being awareness and engagement for a healthier society.
2. **Health Impact*:*** Promotes healthier lifestyles and prevents potential health risks.
3. **Safety Impact:** Enhances user safety with timely health information.
4. **Legal Impact:** Ensures legal compliance and user data privacy.
5. **Cultural Impact:** Aligns with cultural shifts towards proactive health management.

- Describe the target group of users of your solution? And how they will benefit by your proposed solution to the problem?
  Solution: NatureSync Health Tracker is designed for individuals of all ages and backgrounds.

  Benefits:

  a. Users benefit by receiving personalized health recommendations that consider both their individual health metrics and the dynamic influence of the environment.
  b. Proactive alerts and insights empower users to make informed decisions, fostering a culture of active health management.
  c. The system's holistic approach contributes to overall well-being, promoting healthier lifestyles and preventing potential health risks for all users.

- Describe the contribution of your project to the development of scientific results that is identified and well documented.
  Solution:

  Correlation Discovery:

  - Identification: Nature Sync’s research-driven approach uncovers and documents intricate correlations between personal health metrics and diverse environmental factors.
  - Contribution: Advances scientific understanding by revealing how external elements influence individual well-being.

  Predictive Modeling:

- Identification: Development and documentation of predictive models based on real-time personal and environmental data.
- Contribution: Contributes to scientific research by enhancing predictive modeling techniques in the realm of health.
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Community Health Analytics:

- Identification: Aggregation and anonymization of user data for community health analysis.
- Contribution: Provides valuable insights for public health research, enriching the scientific understanding of community-level health trends.

Behavioral Insights:

- Identification: Exploration of behavioral insights through machine learning algorithms.
- Contribution: Advances scientific knowledge in behavioral science by uncovering patterns in individual responses to health recommendations based on environmental cues.

NatureSync Health Tracker's scientific contribution is marked by its ability to identify, document, and advance knowledge in correlation discovery, predictive modeling, community health analytics, behavioral insights, and effective data integration techniques in health informatics.

- Provide a literature review on what are the other studies that have discussed the same topic of yours in the literature and explain how your study has utilized and extended the problems of existing studies.

Solution:

Literature Review:

To date, there is a scarcity of comprehensive studies or discussions on the integration of real-time environmental data with personalized health monitoring systems. The intersection of personal health metrics and dynamic environmental factors has not been extensively explored in existing literature. This unique perspective forms the basis for the innovative approach taken by NatureSync Health Tracker.

While traditional health monitoring systems have been widely studied, their focus tends to be more on individual health metrics without a robust integration of real-time environmental data. Existing literature lacks in-depth insights into the potential correlations, predictive models, and behavioral aspects when both personal and environmental factors are considered concurrently.

Contribution and Extension:

NatureSync Health Tracker stands out as a pioneering initiative that extends beyond existing studies by bridging the gap between individual health and the dynamic environment. By seamlessly integrating personal health metrics with real-time environmental data, the project introduces a novel perspective on health monitoring.

The absence of comprehensive studies in this domain underscores the significance of NatureSync's contribution to scientific literature. The project not only identifies this research gap but also leverages state-of-the-art technology to offer solutions that can reshape how health is monitored and managed. In essence, NatureSync Health Tracker represents a unique and groundbreaking exploration of the intersection between personal health and the environment, providing a foundation for future research and advancements in this emerging field.

- Provide a description of all the existing studies presented in the problem area. What are the existing software solutions (for project) available to solve the problems?
  Solution:
  In the problem area of integrating real-time environmental data with personalized health monitoring, there is a notable absence of existing studies and dedicated software solutions. Traditional health monitoring systems tend to focus on individual health metrics without a comprehensive approach to environmental factors. The unique perspective offered by NatureSync Health Tracker, combining personal and environmental data, distinguishes it from existing projects. This gap in the literature and the absence of specific software solutions emphasize the innovative contribution of NatureSync in addressing this unexplored domain.

- What are the existing software solutions available to solve the problem? And how your proposed solution is going to extend them in providing more benefits to the users?
  Solution:
  As of the current understanding, there is a limited presence of existing software solutions specifically designed to address the integration of real-time environmental data with personalized health monitoring. Traditional health monitoring systems primarily focus on individual health metrics without a robust integration of dynamic environmental factors.

  NatureSync Health Tracker is positioned to extend the capabilities of existing solutions by providing a comprehensive and innovative approach. While the specifics of existing solutions in this problem area are scarce, NatureSync aims to offer the following extensions and benefits:

  1. **Holistic Health Insights:**

     - **Existing Solutions:** Most current solutions concentrate on personal health metrics, neglecting the integration of real-time environmental data.
     - **NatureSync Extension:** NatureSync goes beyond individual health metrics, offering a holistic perspective that considers both personal and environmental factors, providing users with more comprehensive health insights.

2. **Proactive Health Management:**

    - **Existing Solutions:** Traditional systems often lack features for proactive health management based on real-time environmental conditions.
    - **NatureSync Extension:** NatureSync introduces proactive alerts, predictions, and personalized recommendations, enabling users to anticipate and mitigate potential health risks, fostering a proactive approach to well-being.

3. **Behavioral Adaptation:**

    - **Existing Solutions:** Behavioral insights may be limited in existing systems, overlooking the dynamic influence of environmental factors on individual behavior.
    - **NatureSync Extension:** By leveraging machine learning algorithms, NatureSync explores behavioral adaptations in response to real-time environmental cues, providing users with tailored recommendations for effective health management.

4. **Community Health and Research Opportunities:**

    - **Existing Solutions:** Limited integration of community health analytics and research opportunities in current systems.
    - **NatureSync Extension:** NatureSync aggregates and anonymizes data, contributing to community health analysis and unlocking avenues for collaborative research in environmental health, fostering a collective approach to well-being.

While the specifics of existing solutions are not detailed, NatureSync's extensions aim to provide users with a more integrated, proactive, and personalized health monitoring experience, filling the gap in the current landscape of health monitoring software.

2. SOFTWARE DEVELOPMENT LIFE CYCLE

2.1 Process Model

Selected process model:

For our generative education system using AR, the initial requirements of the project are vague and may be subjected to changes as development progresses. Hence an agile process model will be appropriate in this scenario. Considering the fact that our project will deal with continuous changes due to customers changing requirements, we may need to release the system in steps. And so, the Scrum framework will be the best choice for the project.

Reasons for choosing this model:

Scrum is one of most widely used agile process models, due to its lightweight management practices, transparency among developers as well as frequent consumer feedback. Scrum uses an approach that is both iterative and incremental. There is also a benefit of regular inspection of the progress. Everyone can see every part of the project, from inside and outside the team which helps customers/stakeholders to observe if the features are working as desired.

In this model, the development process is divided into shorter intervals, called 'sprints'. For each sprint the requirements are prioritized and developed accordingly. Additionally the product Backlog list is constantly updated with new and more detailed items. An iteration continues until the customer is satisfied with the features implemented. As our project relies on customer feedback, we will be able to review our progress before release.

Scrum emphasizes collaboration and frequent communication between team members and stakeholders. This is beneficial for developing learning modules, course contents, and progress tracking functionalities as it allows for continuous refinement based on feedback.

Scrum promotes regular communication through daily stand-up meetings, sprint reviews, and sprint planning sessions. This supports the development of collaborative communication features, n-way communication between teachers and students, and live interaction functionalities.

Overall, the Scrum process framework will nicely fit within the scope of our project as it provides the best approach for development with continuous progress tracking & feedback as well as deep customer engagement.

Why are other models insufficient?

Since our project requirements initially are not well defined, the plan driven frameworks will fail in this regard. So, the agile process is best suited in terms of ambiguous & changing requirements.

Extreme Programming (XP) focuses heavily on technical practices such as pair programming and test-driven development which could be beneficial for ensuring high-quality code and timely delivery. But XP might not provide as much structure for managing the overall development process and stakeholder collaboration as Scrum does. Scrum provides clearer roles and artifacts to focus on specific goals than XP.

DSDM emphasizes the importance of frequent delivery and active user involvement. While this aligns well with the requirements for iterative development and stakeholder engagement, DSDM's focus on fixed time and cost constraints might not be as flexible for accommodating evolving requirements as Scrum. DSDM focuses on engineering activities and may include roles beyond the development team, meanwhile Scrum focuses on the operational team with more standardized terminologies.

FDD focuses on features and may require extensive planning beforehand. Moreover, in FDD the operational team consists of a large group which are then divided into smaller groups to work in parallel. Scrum focuses on smaller teams and is more oriented towards customer feedback to improve its results.

2.2 Project Role Identification and Responsibilities

In a development project, members of the team will be given specific roles, each with their own sets of obligations to ensure the development progress continues as planned. The number and scope of these roles will vary with the complexity & needs of the project. For our project the following roles are included:

- **Scrum Master:**
  - Make sure the development team abides by Scrum principles and track their progress through daily Scrum meetings & reviews.
  - Prevent team from over committing to elusive requirements during sprint planning as well as aid in estimation of task progress and sub-task creations.
  - Assist product owner in managing & prioritizing product backlogs to achieve clear requirements for the project.
  - Advise development team on organization of tasks & manage internal obstacles through workflow improvements.

- **Product Owner:**
  - Communicate with the development team to define the product goal for the Scrum team.
  - Create & manage product backlog as well as review & finalize tasks related to product backlog.
  - Prioritize & verify requirements.defined in the backlog.
  - Represent the needs of shareholders and discuss with them to change or create additional requirements for the backlog.

- **Scrum Development Team**
  - Produce increments of working software based on product backlog requirements.
  - Ensure product quality through identifying the best approach for development. This can be achieved through consulting with the Scrum master, testing prototype builds and including quality assurance tasks.
  - Create an estimation of the time required for a sprint as well as commit to the necessary goals to achieve during that sprint.
  - Collaborate with Scrum Master and other members of the team to organize & delegate tasks to suit overall development progress.

- **Management Group**
  - Manage the overall project by interacting with both the developers and shareholders to ensure smooth delivery of the product.
  - Participate in review meetings to ensure backlog requirements are met as demanded from the shareholders.

- Take part in final decision makings and make sure all agreements between developers and shareholders are met accordingly. Also make sure all standards and necessary protocols are maintained throughout the project.

2.3 Project Sustainability in terms of Society and Environment

The software has positive social impacts by enhancing education through immersive learning experiences. It promotes engagement, empowerment of teachers, and collaboration among students and teachers. However, it's essential to ensure that the system remains accessible to all socio-economic groups and does not exacerbate existing educational inequalities.

The environmental impact of the hardware components has been assessed, particularly in terms of energy consumption and material use. Since the system utilizes AR technology, which often involves complex hardware components, efforts are made to ensure energy efficiency and the use of sustainable materials. Additionally, considering the potential for increased electronic waste, proper lifecycle management and disposal practices are also in our extended vision.

The project has the potential for sustainability, given its alignment with market needs, technological advancements, and social benefits. However, further research, planning, and ongoing assessment will be necessary to ensure sustained success. Additionally, addressing environmental considerations and ensuring responsible business practices will be essential for long-term viability.

3. SOFTWARE REQUIREMENTS ANALYSIS

Functional Requirements

1.Authentication System

- The User class includes methods such as login() and multiFactorAuthentication() to handle the authentication process.
- The login(username, password) method takes a username and password as parameters and verifies them against the stored credentials.
- The multiFactorAuthentication() method implements multi-factor authentication for enhanced security.
- The User class includes an attribute -location, which represents the user's location information.
- This location attribute can store the user's current location or any other relevant location information associated with the user.

This representation ensures that the functionality of the authentication system is encapsulated within the User class and maintains a clear relationship with user account management. The login() method handles user authentication with a valid username and password, while the

multiFactorAuthentication() method provides an additional layer of security through multi-factor authentication when needed.

Priority Level: Medium

Precondition: User has a registered account

2. User Registration

- The User class includes an attribute -registered, which indicates whether the user account has been registered and email verified.
- Methods such as register() and verifyEmail() are provided to handle the registration process.
- The register() method is responsible for creating a new account with a unique username, email, and password.
- The verifyEmail() method is responsible for verifying the user's email address for account activation.

This representation ensures that the functionality of user registration is encapsulated within the User class and maintains a clear relationship with user account management. The register() method handles the creation of new user accounts, while the verifyEmail() method manages the email verification process for account activation.

Priority Level: Medium

Precondition: User does not have an existing account/registered email address.

3. Password Recovery

- The PasswordRecovery class is introduced to handle password recovery functionality.
- The PasswordRecovery class includes attributes such as securityQuestions, verificationCode, and failedAttempts.

The User class has a one-to-one association with the PasswordRecovery class, indicating that each user has one associated password recovery instance.

Priority Level: Medium

Precondition: User has a registered email address.

4. Logout Functionality

- The User class includes attributes such as -loggedIn, representing whether the user is currently logged in, and -lastActiveTime, indicating the last time the user was active.
- Methods such as login(), logout(), and autoLogout() are provided to handle user authentication and session management.

- The login() method is responsible for logging in the user.
- The logout() method is responsible for logging out the user from the current device.
- The autoLogout() method checks for user inactivity and logs out the user automatically after a specified period of inactivity.

This representation ensures that the functionality of the logout process is encapsulated within the User class and maintains a clear relationship with the user's session management. The logout() method can handle the user's action of clicking on the "Logout" button, while the autoLogout() method ensures security by logging out users after a period of inactivity.

Priority Level: Medium Precondition: User is logged in.

5. User Dashboard

- The UserDashboard class represents the functionality of the user's personalized dashboard.
- It includes attributes such as -userId, -healthMetrics, -environmentalConditions, -recommendations, and -alerts.
- -userId links the dashboard data to the specific user.
- -healthMetrics stores the health metrics displayed on the dashboard.
- -environmentalConditions stores the environmental conditions displayed on the dashboard.
- -recommendations stores personalized recommendations for the user.
- -alerts stores alerts for the user.

This representation ensures that the functionality of the user dashboard is encapsulated within its own class and maintains a clear relationship with the User class. The UserDashboard class can provide users with a personalized view of their health metrics, environmental conditions, recommendations, and alerts upon successful login, enhancing the user experience and facilitating informed decision-making regarding their well-being.

6. Profile Creation

- The User class includes attributes such as -profilePicture and -healthGoals to represent the user's profile-related information.
- Methods such as createProfile() and updateProfile() are provided to handle profile creation and updating processes.
- The createProfile() method allows users to create their profile with personal information, including uploading a profile picture and setting health goals and preferences.
- The updateProfile() method enables users to update their profile information, including the profile picture, health goals, and preferences.

This representation ensures that the functionality of profile creation and updating is encapsulated within the User class and maintains a clear relationship with user account management. The

createProfile() and updateProfile() methods provide users with the ability to manage their profile information conveniently within the application.

Priority Level: High

Precondition: User is logged in

7. Health Profile Setup

- The HealthProfile class is introduced to handle health profile setup functionality.
- The HealthProfile class includes attributes such as medicalHistory, allergies, and healthConditions.
- The User class has a one-to-one association with the HealthProfile class, indicating that each user has one associated health profile instance.

This representation ensures that the health profile setup functionality is encapsulated within its own class and maintains a clear relationship with the User class.

Priority Level: High Precondition: User is logged in.

8. Real-time Health Monitoring

- The HealthMonitor class is introduced to handle real-time health monitoring functionality.
- The HealthMonitor class includes attributes such as pulseRate, heartRate, and thermalConditions.
- The HealthMonitor class has a one-to-one association with the User class, indicating that each user has one associated health monitoring instance.

This representation ensures that the real-time health monitoring functionality is encapsulated within its own class and maintains a clear relationship with the User class.

Priority Level: High

9. Environmental Data Integration

- The EnvironmentalDataIntegration class is introduced to handle the integration of environmental data.
- The EnvironmentalDataIntegration class includes attributes such as weatherCondition, airQualityIndex, pollenCount, and uvIndex.
- These attributes represent different environmental factors that can impact people's health.
- The EnvironmentalDataIntegration class has a one-to-one association with the User class, indicating that each user has one associated environmental data instance.

This representation ensures that the environmental data integration functionality is encapsulated within its own class and maintains a clear relationship with the User class. Additionally, it provides a more descriptive view of the attributes related to environmental factors.

Priority Level: High Precondition: User has selected a location or destination for health monitoring.

10. Personalized Health Recommendations

- These attributes provide a more comprehensive set of environmental measurements, including temperature, humidity, wind speed, air pressure, precipitation, visibility, pollution levels (such as ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide), and particulate matter levels (PM10 and PM2.5).
- Including these attributes in the EnvironmentalDataIntegration class allows for a more detailed representation of environmental conditions, which can be valuable for correlating with health metrics and providing personalized recommendations to users.

Priority Level: High

Precondition: Weather forecast data for the selected time and location is available.

11. Health Alerts and Warnings

- The HealthRecommendations class represents the personalized health recommendations functionality.
- It includes attributes such as -userId, -selectedLocation, -weatherForecastData, and -healthInsights.
- -userId and -selectedLocation link the recommendations to the specific user and their chosen location for health monitoring, fulfilling the precondition.
- -weatherForecastData stores weather forecast data for the selected location and time, fulfilling the precondition.
- -healthInsights stores insights derived from real-time health and environmental data, which are used to generate tailored recommendations.
- The User class remains unchanged.

This representation ensures that the personalized health recommendations functionality is encapsulated within its own class and maintains a clear relationship with the User class. The HealthRecommendations class can utilize data from the EnvironmentalDataIntegration class and other sources to generate tailored recommendations for each user.

Priority Level: High

12. Adaptive Clothing and Activity Suggestions

- The HealthAlerts class represents the functionality of generating health alerts and warnings.

- It includes attributes such as -userId, -alertType, -alertMessage, and -precautionaryMeasures.
- -userId links the alert to the specific user experiencing the health risk.
- -alertType specifies the type of alert, such as "High UV Index", "Air Quality Warning", etc.
- -alertMessage provides details about the alert, including the nature of the health risk and any relevant information.
- -precautionaryMeasures offers guidance or precautionary measures to mitigate the health risk, such as staying indoors during poor air quality or applying sunscreen during high UV index days.

This representation ensures that the functionality of health alerts and warnings is encapsulated within its own class and maintains a clear relationship with the User class. The HealthAlerts class can utilize data from the EnvironmentalDataIntegration class and real-time health monitoring to generate alerts tailored to each user's health profile and environmental context.

Priority Level: Medium

13. Food Habit Tracking

- The FoodTracking class represents the functionality of tracking food habits.
- It includes attributes such as -userId, -loggedFoods, -nutritionInsights, and -dietRecommendations.
- -userId links the food tracking data to the specific user who logged the foods.
- -loggedFoods is an array that stores the daily food intake logged by the user.
- -nutritionInsights provides insights on nutrition derived from the logged food intake.
- -dietRecommendations offers recommendations for a balanced diet based on the user's food habits and nutritional needs.

This representation ensures that the functionality of food habit tracking is encapsulated within its own class and maintains a clear relationship with the User class. The FoodTracking class can provide users with valuable insights into their dietary habits and offer recommendations to help them maintain a healthy and balanced diet.

Priority Level: Medium

14. Personalized Fitness Program

- The ActivitySuggestions class represents the functionality of generating adaptive clothing and activity suggestions.
- It includes attributes such as -userId, -clothingRecommendation, and -activitySuggestion.

- -userId links the suggestions to the specific user for whom the recommendations are being provided.
- -clothingRecommendation provides suggestions for suitable clothing based on upcoming weather conditions.
- -activitySuggestion offers recommendations for activities aligned with individual health metrics and environmental factors.

This representation ensures that the functionality of adaptive clothing and activity suggestions is encapsulated within its own class and maintains a clear relationship with the User class. The ActivitySuggestions class can utilize data from the EnvironmentalDataIntegration class and real-time health monitoring to generate tailored recommendations that promote the user's well-being and comfort.

15. Behavioral Insights Exploration

- The BehavioralInsights class represents the functionality of exploring behavioral insights.
- It includes attributes such as -userId and -consentGiven.
- -userId links the behavioral insights data to the specific user for whom the analysis is conducted.
- -consentGiven indicates whether the user has provided consent for behavioral data analysis.

Other attributes related to behavioral data analysis, such as machine learning algorithms and insights, can be included as needed within the class.

This representation ensures that the functionality of exploring behavioral insights is encapsulated within its own class and maintains a clear relationship with the User class. The BehavioralInsights class can analyze user responses to health recommendations, identify behavior patterns, and provide adaptive suggestions to help users improve their health habits, provided they have given consent for such analysis.

Priority Level: High

Precondition: User has provided consent for behavioral data analysis.

16. Integration of Mental and Physical Health

- The MentalPhysicalIntegration class represents the functionality of integrating mental and physical health.
- It includes attributes such as -userId and -mentalHealthMetricsLogged.
- -userId links the mental and physical health integration data to the specific user.

- -mentalHealthMetricsLogged indicates whether the user has actively logged mental health metrics, fulfilling the precondition for this feature.

This representation ensures that the functionality of integrating mental and physical health is encapsulated within its own class and maintains a clear relationship with the User class. The MentalPhysicalIntegration class can provide users with a holistic approach to well-being by addressing both mental and physical health needs, including stress management and strategies for mental health improvement.

Priority Level: High

Precondition: User has actively logged mental health metrics.

17. Integration of Telehealth Services

- The TelehealthIntegration class represents the functionality of integrating telehealth services.
- It includes attributes such as -userId, -scheduledConsultations, and -secureChannels.
- -userId links the telehealth integration data to the specific user.
- -scheduledConsultations stores information about scheduled virtual consultations with healthcare professionals.
- -secureChannels provides secure channels for confidential telehealth interactions.

This representation ensures that the functionality of integrating telehealth services is encapsulated within its own class and maintains a clear relationship with the User class. The TelehealthIntegration class can offer users the option to schedule virtual consultations with healthcare professionals and ensure secure and confidential interactions to address their health needs.

Priority Level: Medium

18. Emergency Health Support

- The EmergencySupport class represents the functionality of emergency health support.
- It includes attributes such as -userId, -emergencyContactInfo, and -locationTrackingEnabled.
- -userId links the emergency support data to the specific user.
- -emergencyContactInfo stores the emergency contact information provided by the user.
- -locationTrackingEnabled indicates whether location tracking is enabled for quick access to emergency services.

This representation ensures that the functionality of emergency health support is encapsulated within its own class and maintains a clear relationship with the User class. The EmergencySupport class can offer users quick access to emergency services, location tracking, and provide emergency response protocols to ensure immediate assistance during critical situations.

Priority Level: High

Precondition: User has provided emergency contact information.

19. Collaboration with Wearable Devices

- The WearableDeviceIntegration class represents the functionality of collaborating with wearable devices.
- It includes attributes such as -userId, -wearableDevices, and -realTimeSyncEnabled.
- -userId links the wearable device integration data to the specific user.
- -wearableDevices stores information about the wearable devices that are paired and connected to the app.
- -realTimeSyncEnabled indicates whether real-time syncing of health metrics is enabled for enhanced tracking accuracy.

This representation ensures that the functionality of collaboration with wearable devices is encapsulated within its own class and maintains a clear relationship with the User class. The WearableDeviceIntegration class can seamlessly integrate with wearable devices, sync real-time health metrics, and enhance tracking accuracy to provide users with comprehensive health insights.

Priority Level: High

Precondition: Wearable devices are paired and connected to the app.

20. Comprehensive Health History Record

- The HealthHistory class represents the functionality of managing the comprehensive health history record.
- It includes attributes such as -userId, -healthMetricsArchive, -environmentalArchive, and -recommendationsArchive.
- -userId links the health history data to the specific user.
- -healthMetricsArchive stores a detailed archive of past health metrics recorded by the user within the app.
- -environmentalArchive stores a detailed archive of past environmental conditions recorded by the app.
- -recommendationsArchive stores a detailed archive of past recommendations provided to the user.

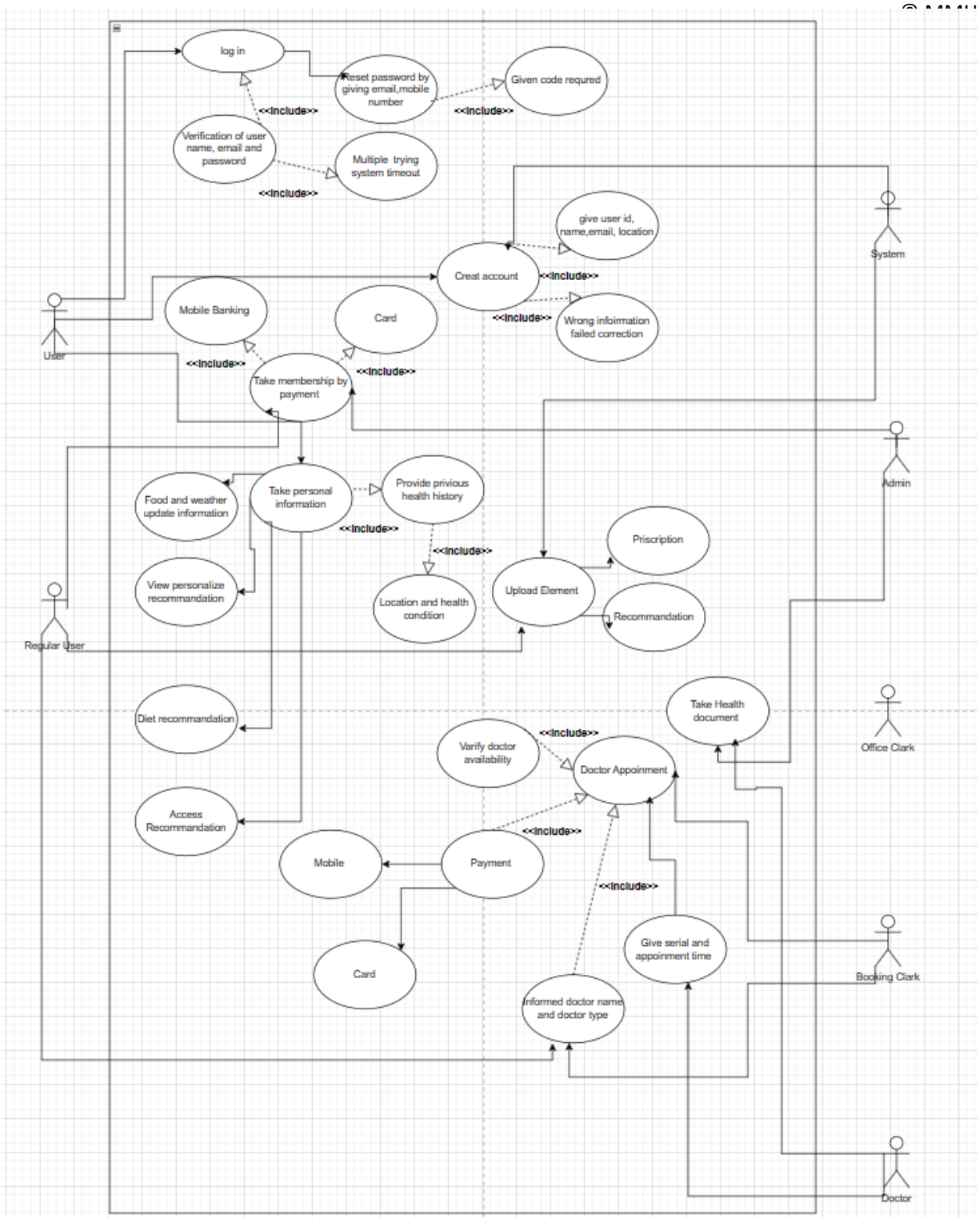
This representation ensures that the functionality of maintaining a comprehensive health history record is encapsulated within its own class and maintains a clear relationship with the User class. The HealthHistory class can provide users with insights into their health trends over time, environmental conditions, and recommendations received, allowing for reflection and informed decision-making regarding their well-being.

Priority Level: High

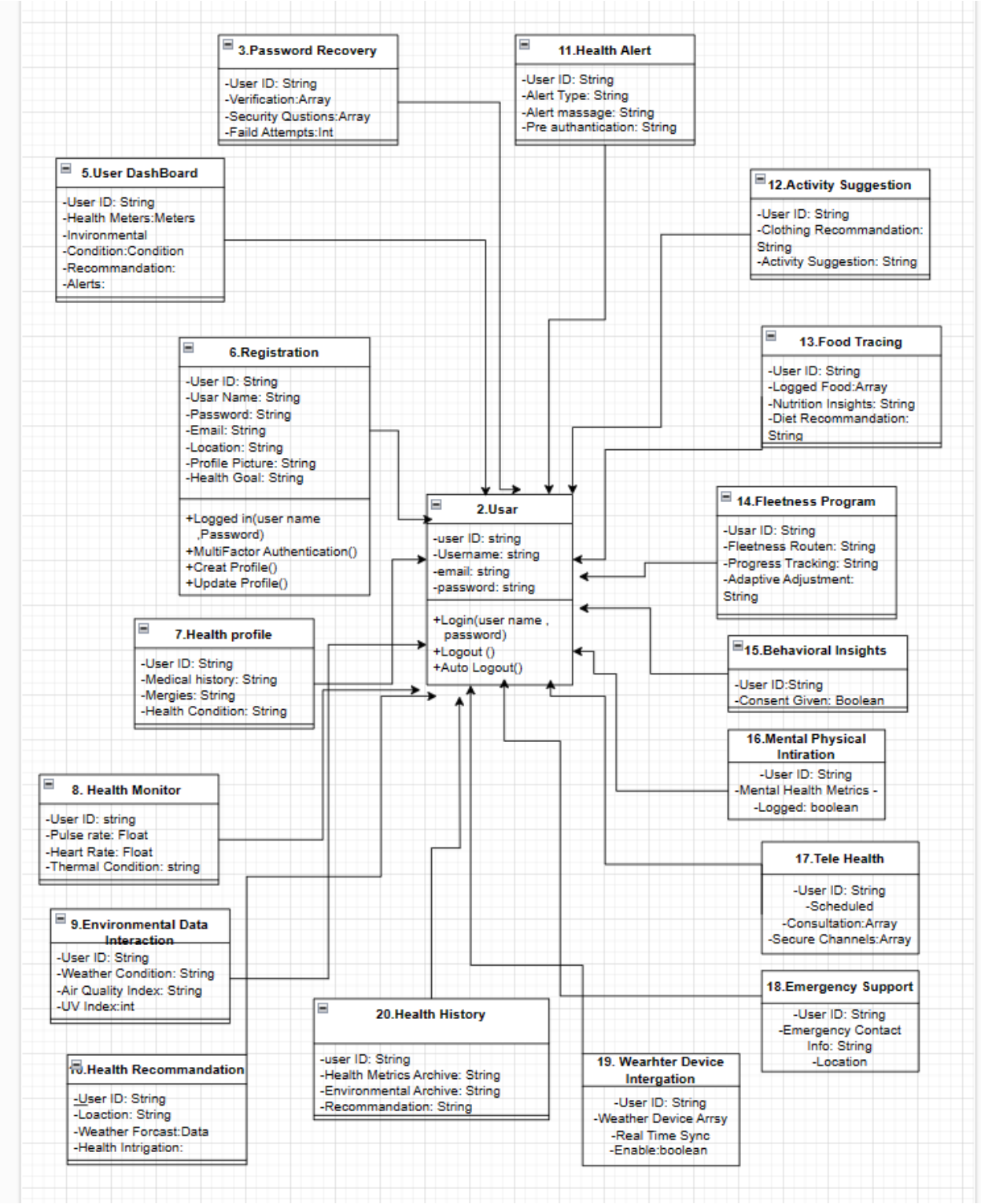
Precondition: User has a history of recorded health metrics within the app

4. SYSTEM DESIGN SPECIFICATION

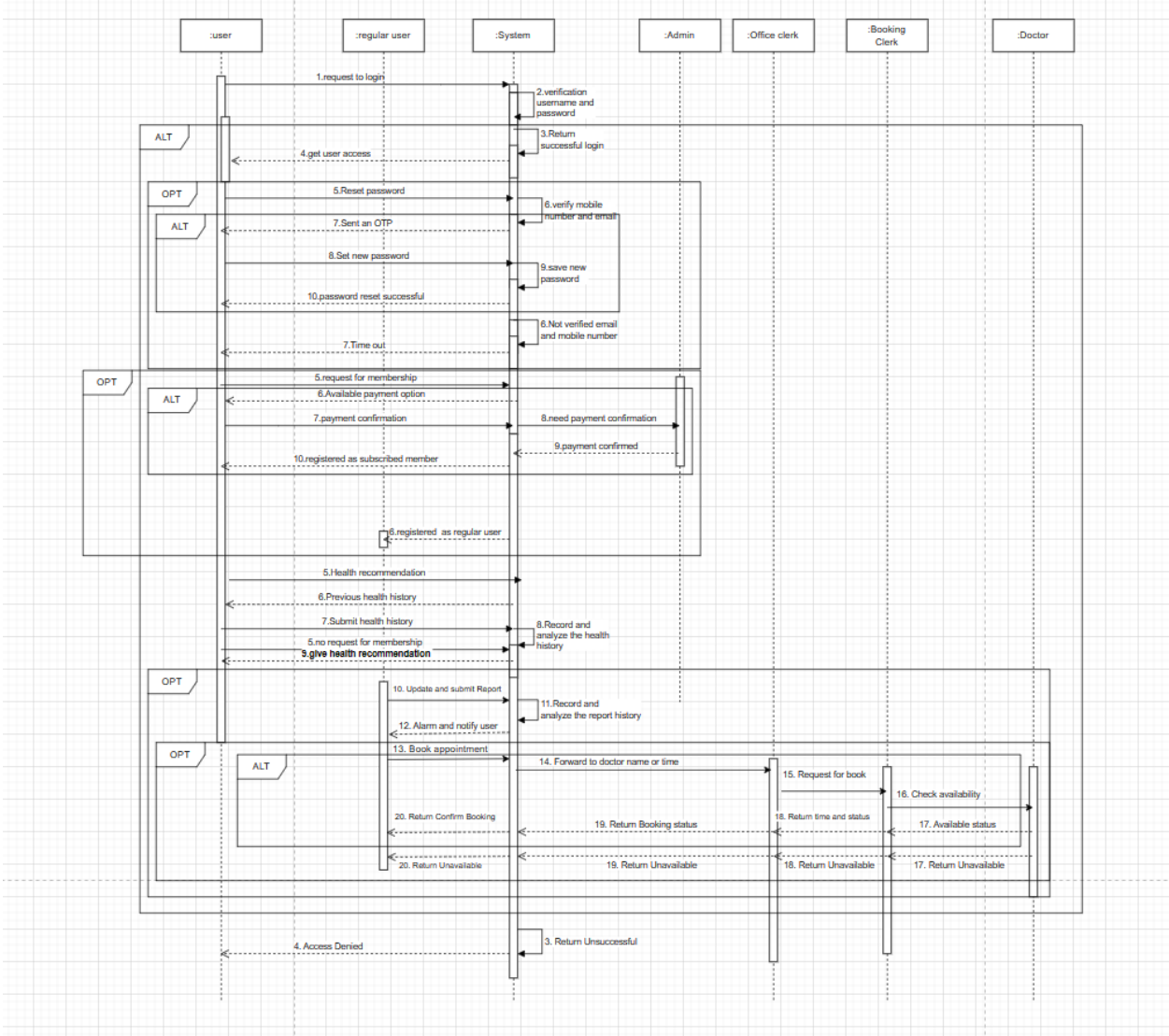
1. Use Case Diagram


log in
Reset password by giving email,mobile number
Given code requred
<<Include>>
<<Include>>
Verification of user name, email and password
Multiple trying system timeout
<<Include>>
System
give user id, name,email, location
Creat account
<<Include>>
<<Include>>
Wrong infoirmation failed correction
Mobile Banking
Card
User
<<Include>>
<<Include>>
Take membership by payment
Admin
Food and weather update information
Take personal information
Provide privious health history
<<Include>>
<<Include>>
Priscription
View personalize recommandation
Location and health condition
Upload Element
Recommandation
Regular User
Diet recommandation
Take Health document
Office Clark
Varify doctor availability
<<Include>>
Doctor Appoinment
Access Recommandation
<<Include>>
Mobile
Payment
<<Include>>
Give serial and appoinment time
Booking Clark
Card
Informed doctor name and doctor type
Doctor

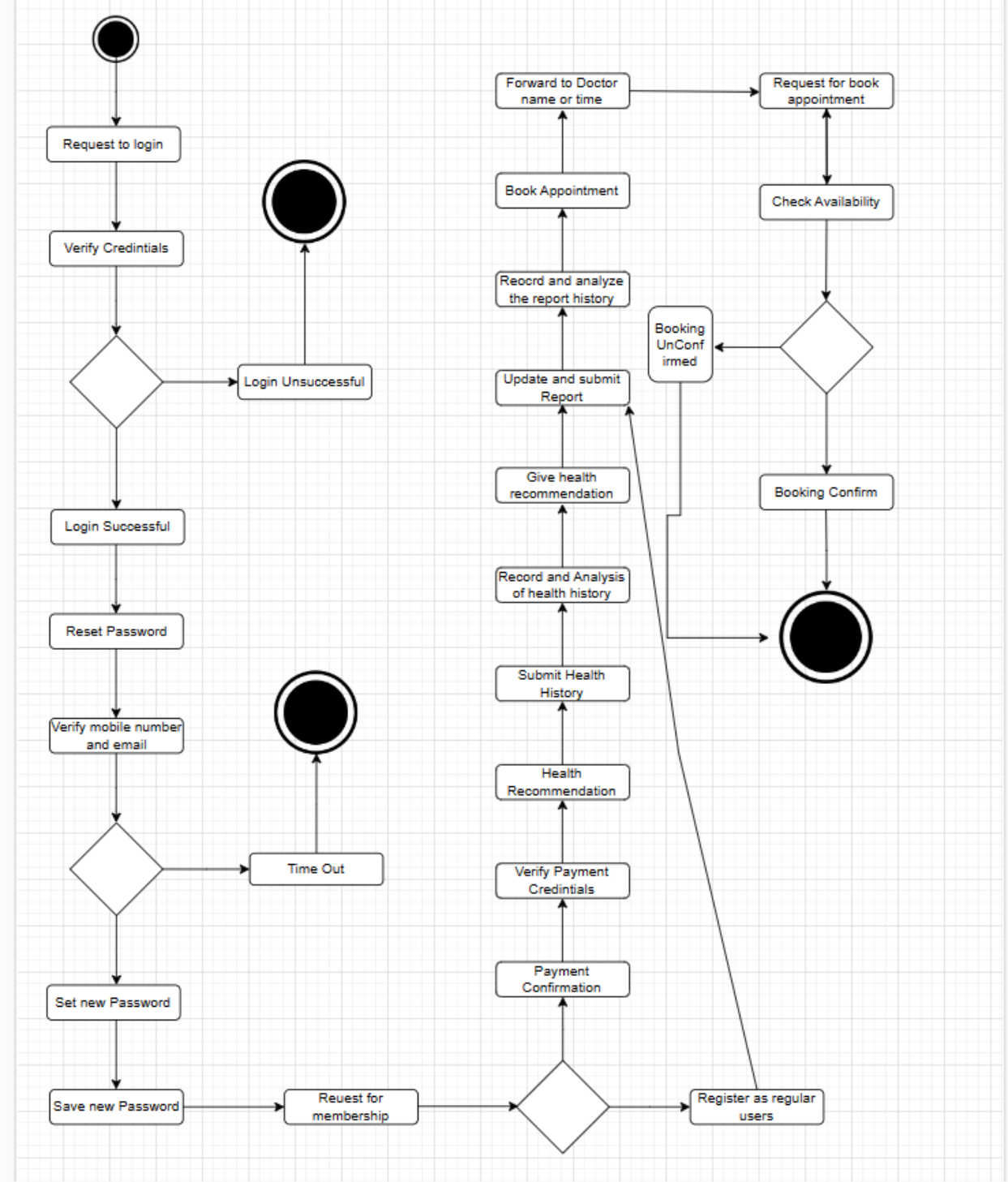
2. Class Diagram



3. Sequence Diagram



4. Activity Diagram



Rubric for Project Assessment (CO1)

Marking Criteria	Marks Distribution (Maximum 3X5=15)	Acquired Marks

	Inadequate (1-2)	Satisfactory (3)	Good (4)	Excellent (5)	

Criteria	Marks distribution (Max 3X5= 15)				Acquired
Background Analysis	No background information regarding the project is given; project goals and benefits are missing.	Insufficient background information is given; project goals and benefits are poorly stated	Sufficient background information is given; the purpose and goals of the project are explained.	Thorough and relevant background information is given; project goals are clear and easy to identify.	
Analysis the impact of societal, health, safety, legal and cultural issues	Student vaguely discuss the impact of societal, health, safety, legal and cultural issues in their project	Student provided with partial relevance to the impact of societal, health, safety, legal and cultural issues in their project	Student fairly provided the analysis to the impact of societal, health, safety, legal and cultural issues in their project	Student comprehensively provided the analysis to the impact of societal, health, safety, legal and cultural issues in their project	
Existing Studies and Relevant Example	Ambiguous representative example.	Partially identify / indicate towards real-life example.	Real-life example is fairly connected towards the definition.	Comprehensively defend with real life example.	
				Acquired Marks:	
				CO Pass / Fail:	

Rubric for Project Assessment (CO2)

	Inadequate (1-2)	Satisfactory (3)	Good (4)	Excellent (5)	
Argumentation of Model selection with Evidence of Argumentation	Does not articulate a position or argument of choosing appropriate model. Does not present any evidence to support the arguments for the choice of the model	Articulates a position or argument for choosing models that is unfocused or ambiguous. Presents incomplete/vague evidence to support argument for model choice	Articulates a position or argument of choosing models that is limited in scope. Does not present enough evidence to support the argument for the choice of the model	Clearly articulates a position or argument for the choosing software engineering models. Presents sufficient amount of evidence to support argument for the model selection	
Role identification and Responsibility Allocation	The project has poor project management plans for identifying roles and assigning the responsibilities	Identify few roles in the project management where some of the roles are left alone with any project responsibilities	Identify most of the roles in the project management and assign their responsibilities	Well planned project with proper role identification and responsibility allocation in the project management activities	
Submission, Completeness, Spelling, grammar and Organization of the Project report	Project report is not complete and Several errors in spelling and grammar. Present a Confusing organization of concepts, supporting arguments, and real-life example. Sentences rambling, and details are repeated.	Some errors in spelling and grammar. Some problems of organizing the answer in a logical order of defining, elaborating, and providing real-life examples.	Few errors in spelling and grammar. Presents most of the details in a logical flow of organization in definition, details, and example.	Project report is complete and No errors in spelling and grammar. Consistently presents a logical and effective organization of definition, details, and real-life example of the topic.	
				Acquired marks:	
				CO Pass / Fail:	