BSCS FINAL PROJECT
Requirements Specification

Attention Deficit HyperGuard

Project Advisor

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Software Requirements Specification

Version 1

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Revision History

Name	Date	Reason For Changes	Version

Abstract

This project aims to develop a machine learning model for accurate classification of Attention Deficit Hyperactivity Disorder (ADHD). The significance of this problem lies in the fact that ADHD is a prevalent neurodevelopmental disorder affecting millions of individuals worldwide, and timely diagnosis is crucial for effective treatment and management. The project leverages knowledge areas in machine learning, data analysis, and neuroscience to develop a robust classification model. Specifically, a Random Forest Classifier is proposed to handle high-dimensional ADHD datasets, robust to noise and outliers, and providing interpretable results. The expected outcome is a model that can accurately classify ADHD cases with high precision and recall, contributing to improved diagnosis and treatment strategies. The project's results will have significant implications for the healthcare industry, enabling early intervention and personalized treatment for individuals with ADHD.

1. Introduction and Background

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental condition that is characterized by persistent patterns of inattention, hyperactivity, and impulsivity. These symptoms often begin in childhood and can significantly impact an individual's ability to function in daily life, affecting areas such as academic performance, work productivity, and social relationships. While ADHD is commonly recognized in children and adolescents, many adults also experience its challenges, making it a lifelong condition for some. Individuals with ADHD may struggle with maintaining focus on tasks, organizing activities, controlling impulses, and regulating their behavior, often leading to difficulties in environments that demand sustained attention or self-regulation.

The impact of ADHD is widespread, with symptoms varying from mild to severe, and affecting not only personal well-being but also professional and social outcomes. In light of these challenges, the development of tools and systems that help individuals manage ADHD symptoms more effectively is crucial. This project, Attention Deficit HyperGuard , seeks to design an innovative solution that aids individuals with ADHD by leveraging technology to assist in managing inattention, impulsivity, and hyperactivity in real-time. By creating a device or system tailored to these needs, Attention Deficit HyperGuard aims to improve productivity, reduce disruptive behaviors, and enhance overall quality of life for those living with ADHD. In 1798, a Scottish doctor, Sir Alexander Crichton, noticed some people were easily distracted and unable to focus on their activities the way others could. He reported that these symptoms began early in life. In 1937, Charles Bradley, the medical director of what is today called Bradley Hospital in East Providence, RI, noticed that a stimulant called Benzedrine caused some children to behave better. It also improved their school performance.

1.1 Problem Statement

The product, Attention Deficit HyperGuard, is an innovative software-based system designed to assist individuals with Attention-Deficit/Hyperactivity Disorder (ADHD) in managing symptoms related to inattention, hyperactivity, and impulsivity. The solution aims to help users maintain focus, organize tasks, control impulsive behaviors, and regulate their actions in real time. It uses technology to monitor and support the user's daily activities, providing reminders, alerts, and interactive interventions to improve productivity and reduce disruptive behaviors. The primary problem addressed is the difficulty people with ADHD experience in managing daily life activities, whether at school, work, or in social settings, due to the challenges of sustaining attention and controlling impulsivity.

1.2 Background

Attention-Deficit/Hyperactivity Disorder (ADHD) is a neurodevelopmental condition that often manifests in childhood and persists into adulthood. It affects approximately 5-7% of the global population and is characterized by persistent patterns of inattention, hyperactivity, and impulsivity. ADHD significantly impacts personal, academic, and professional domains, often leading to poor academic performance, challenges in work productivity, and strained social relationships. Treatment typically involves a combination of behavioral strategies and pharmacological interventions, such as stimulant medications. However, many individuals with ADHD continue to face difficulties in managing daily tasks even with traditional treatments. The development of technological solutions, like Attention Deficit HyperGuard, offers a promising approach to provide real-time support and intervention, enhancing the management of ADHD symptoms.

1.3 Scope

This Software Requirements Specification (SRS) covers the design, development, and implementation of the Attention Deficit HyperGuard system, which aims to assist individuals with ADHD in managing their symptoms effectively. The system will include features like task reminders, focus timers, behavioral tracking, real-time alerts, and personalized recommendations based on the user's behavior. The system will be designed for use on mobile devices (smartphones or tablets) and may also be compatible with wearable technology (smartwatches) to provide more direct and real-time assistance. The scope of this product focuses on providing a tool to enhance daily functioning but does not replace clinical interventions like medication or therapy.

1.4 Objectives

- To create a user-friendly software tool that supports individuals with ADHD in managing tasks and maintaining focus throughout the day.
- To integrate real-time feedback mechanisms (e.g., reminders, alerts, focus timers) that help users stay on task and regulate their behavior.
- To design a system that tracks and analyzes the user's activities, providing personalized recommendations for improvement.
- To ensure the system is customizable to cater to the specific needs and preferences of different users with ADHD.
- To test the system's effectiveness in real-world scenarios through user feedback and performance evaluations.
- To create an intuitive, non-invasive interface that does not add additional stress or distraction to the user.

1.5 Challenges

- Designing a system that is both effective and easy to use for individuals with varying severity levels of ADHD.
- Ensuring the system's notifications and interventions do not become overwhelming or disruptive to the user.
- Integrating the system with multiple platforms (mobile, wearable tech) to provide real-time interventions.
- Developing a system that can personalize the experience based on the user's behavior and preferences, while maintaining simplicity.
- Ensuring privacy and data security, especially if the system collects user data for analysis and recommendation purposes.

1.6 Learning Outcomes

- Understanding the specific challenges faced by individuals with ADHD and how technology can assist in mitigating these challenges.
- Gaining experience in user-centered design principles and creating solutions that are tailored to a specific demographic.
- Developing proficiency in mobile application development and integrating wearable technology for real-time feedback systems.
- Gaining insight into the principles of behavioral tracking and data-driven recommendations in health and wellness applications.
- Understanding the complexities involved in privacy and data security, especially when dealing with sensitive user data.

1.7 Nature of End Product

The final product will be a mobile-based application (with optional wearable integration) designed to assist individuals with ADHD. It will include a simple, intuitive interface with customizable features such as task reminders, focus timers, impulse control prompts, and behavioral tracking tools. The product will offer real-time assistance to help users manage their ADHD symptoms throughout the day. The system will be designed to reduce cognitive load and encourage productive behaviors, providing users with actionable insights to improve focus, task management, and self-regulation.

1.8 Completeness Criteria

A fully functional application is developed, tested, and deployed.
All major features, including task reminders, focus timers, real-time feedback, and personalized recommendations, are implemented and operational.
The system has been tested by real users, and feedback has been incorporated to improve the system's effectiveness.
The application meets privacy and security standards for handling user data.
Documentation is provided, including user guides, technical specifications, and a final report detailing the design and development process.
The system demonstrates measurable improvements in user productivity and symptom management, based on user feedback and tracking data.

1.9 Business Goals

To enhance user engagement by providing a tool that improves productivity, reducing the negative impact of ADHD on academic and professional performance. To partner with healthcare providers, educators, and organizations focused on ADHD to expand the product's reach and impact. To provide ongoing support and updates to the product, ensuring it stays relevant and effective for users over time.

1.10 Related Work

Numerous studies have explored the use of digital interventions for ADHD, such as cognitive-behavioral therapy apps, digital task managers, and focus-enhancing tools. These tools aim to help users structure their tasks, reduce distractions, and regulate impulsivity. Research into wearable technologies and smart devices for ADHD management has shown promise in real-time behavioral monitoring. For example, smartwatches can track user activity and provide gentle reminders or nudges to stay on task, though no solution integrates all necessary features in one system yet.

1.11 Document Conventions

Text Formatting: The main body text will use a clear, legible font (e.g., Arial, 12-point), while headings will be bolded for clarity.
Code and Technical Terms: Any code snippets or technical terms will be presented in monospaced font (e.g., Courier New).
Sections and Subsections: Major sections of the document will be numbered (e.g., 1.1, 1.2, etc.), and subsections will be numbered as well (e.g., 1.1.1, 1.1.2, etc.).
Hyperlinks: Links to external sources or references will be underlined for easy identification.
Figures and Tables: All figures and tables will be numbered and captioned for easy reference throughout the document.
This format ensures the document is clear, well-organized, and easy to follow, particularly for stakeholders such as developers, project managers, and potential users of the product.

2. Overall Description

2.1 Product Features

The Attention Deficit HyperGuard product is designed to help individuals with ADHD manage symptoms such as inattention, impulsivity, and hyperactivity in real-time. Key features include:

- Task Reminders: Users can create custom task lists, with reminders that prompt them to stay on track. The reminders are designed to minimize distractions and help users focus on one task at a time.
- Focus Timer: A built-in timer that uses the Pomodoro technique or other focus-enhancing intervals to help users break tasks into manageable periods of concentrated work, followed by short breaks.
- Behavioral Feedback: The system monitors user activity and provides gentle nudges or feedback based on behaviour. For instance, if the user deviates from a task or shows signs of distraction, the system may offer encouragement or suggest a focus technique.
- Progress Tracking: The app tracks user progress, showing completion rates of tasks and improvement over time. This feature can offer insights and motivational statistics to encourage users to stay consistent.
- Personalized Recommendations: Based on user behaviour, the system adapts and provides tailored tips or suggestions to improve focus, productivity, and self-regulation. This might include strategies for organizing tasks, reducing procrastination, or managing impulsivity.
- Customizable Alerts: Notifications and reminders can be tailored to the user's preferences, ensuring that they are not overly disruptive or annoying. The app allows for different levels of urgency in alerts, depending on the task's importance.
- Integration with Wearables: If compatible, the system will sync with wearable devices (like smartwatches) to provide real-time monitoring and intervention, including vibrations or subtle notifications to guide the user.
- Task Prioritization: A feature that allows users to categorize tasks based on urgency or importance, helping them stay focused on high-priority activities.
- Progress Reports: Regular summaries and reports of the user's behaviour and task completion rates are generated, which can be reviewed periodically for insights or shared with a healthcare provider, therapist, or coach.

These features aim to reduce distractions, promote sustained focus, and improve the overall daily functioning of users with ADHD, whether at home, in school, or at work.

2.2 User Classes and Characteristics

The Attention Deficit HyperGuard system will cater to different user classes based on specific needs, usage patterns, and expertise. Key user classes include:

1. ***Primary Users (Individuals with ADHD)**:*
    - Frequency of Use: High, as the app is designed to be used throughout the day.
    - Characteristics: This group comprises individuals diagnosed with ADHD, ranging from children to adults. They may experience difficulty maintaining focus, staying organized, and regulating their behaviour. The app should be intuitive and easy to use, with minimal cognitive load. They may vary in technical proficiency, but most will prefer an uncomplicated user interface.
    - Needs: Personalized task management, focus-enhancing features, real-time reminders, and behavioral feedback to help manage ADHD symptoms.
    - Experience: Varies, but most users are likely to have limited experience with similar tech tools designed specifically for ADHD management.
2. ***Secondary Users (Caregivers, Parents, or Teachers)**:*
    - Frequency of Use: Moderate, as they may use the app to monitor and guide the primary user.
    - Characteristics: These users are responsible for helping the primary user (child or student) manage their ADHD symptoms. They may have some experience with ADHD management tools but may not be as tech-savvy as the primary user.
    - Needs: Access to progress reports, the ability to set goals, and provide additional feedback to the primary user. They may also need features that allow them to track progress over time or adjust settings for specific situations (e.g., homework time, study time, etc.).
    - Experience: Basic or moderate technical skills, depending on age and familiarity with ADHD tools.
3. ***Healthcare Providers (Therapists, Coaches, or Psychologists)**:*
    - Frequency of Use: Low to moderate, depending on their involvement with the user.
    - Characteristics: These users will need access to progress tracking and reports to monitor how the user is progressing over time. They may use the app to provide recommendations or adjustments to the user's ADHD management plan.
    - Needs: Ability to view and analyze behavioral data, make notes on progress, and provide suggestions for users based on their observed behavior.
    - Experience: High level of expertise in ADHD management, but they may not have deep technical knowledge of the app. They will expect an interface that is simple but rich in actionable data.
4. ***Administrators (App Maintenance or Customer Support Team)**:*
    - Frequency of Use: Occasional, as these users will maintain the app's functionality, handle updates, and address user issues.
    - Characteristics: Technical experts who will ensure that the app functions properly, troubleshoot user issues, and manage updates or new feature releases.
    - Needs: Access to backend features such as user accounts, analytics data, and system logs to monitor app performance and user experience.
    - Experience: High technical expertise in software maintenance and troubleshooting.

2.3 Operating Environment

The Attention Deficit HyperGuard software will operate in the following environments:

- **Hardware Platforms**:
  - Mobile Devices: The primary target platforms are smartphones and tablets (iOS and Android). The app will be available for download on the Apple App Store and Google Play Store.
  - Wearable Devices (Optional**)**: Compatibility with wearable devices like smartwatches (e.g., Apple Watch, Android Wear) for real-time feedback and task monitoring.
- **Operating Systems**:
  - Mobile OS: The app will support iOS (versions 12 and above) and Android (versions 8.0 and above).
  - Wearables: If integrated, the app will be compatible with wearable operating systems such as watchOS (Apple Watch) and Wear OS (Android).
- **Software Components**:
  - Backend: The app may use cloud-based services for storing user data, behavioral analytics, and providing synchronization across devices (e.g., Firebase, AWS, or Google Cloud).
  - Third-Party Integrations: Integration with task management tools or productivity apps (e.g., Google Calendar, Microsoft To-Do) may be included for task synchronization.
- **Network Environment**:
  - The app will require internet access for syncing data, receiving updates, and backing up user progress.

2.4 Design and Implementation Constraints

Security and Privacy**:** The app must adhere to privacy regulations such as GDPR (for users in the EU) and HIPAA (if handling sensitive health data). Strong encryption should be employed for storing user data and communicating with external services.

Technology Stack**:** The app will be developed using cross-platform mobile development tools such as Flutter or React Native to target both iOS and Android. Wearable device compatibility may require platform-specific development (e.g., watchOS for Apple Watch**).**

User Interface**:** The design should be simple and intuitive, following accessibility guidelines. Features should be non-intrusive and customizable based on user preferences to minimize distractions and cognitive overload.

Clinical Integration: If any healthcare providers or therapists need to access user data, the system must ensure that access is controlled and compliant with relevant healthcare regulations. It will need to have secure login protocols, such as OAuth2, and role-based access control.

Offline Functionality: The app should provide basic features even in offline mode (e.g., task reminders, focus timers). It should synchronize with the cloud once an internet connection is restored.

2.5 Assumptions and Dependencies

User Hardware: The app assumes that users will have a modern smartphone or tablet (iOS or Android) capable of running the latest operating systems and downloading apps.

Internet Access**:** The app will rely on internet access for syncing data and accessing cloud services. If the user has limited or no internet access, some features (such as progress tracking or real-time behavioral feedback) may be unavailable.

Wearable Device Compatibility: The app's wearable device integration depends on the availability of third-party APIs (e.g., watchOS or Wear OS) and the user's device compatibility. If the user does not own a compatible wearable device, they will not benefit from this feature.

Data Collection: It is assumed that users will provide accurate and consistent data (e.g., task entries, behavioral logs) to receive meaningful recommendations. Inaccurate data entry may affect the personalized recommendations.

Third-Party Integrations**:** The app's functionality may depend on third-party APIs for task management (e.g., Google Calendar, Microsoft To-Do) and cloud storage (e.g., Firebase, AWS). If these services experience outages or changes in their API, it may impact app performance.

Regulatory Changes**:** The app's compliance with healthcare data privacy regulations (like HIPAA and GDPR) assumes that these regulations remain stable throughout development and the product's lifecycle. Changes in these laws could necessitate additional compliance measures.

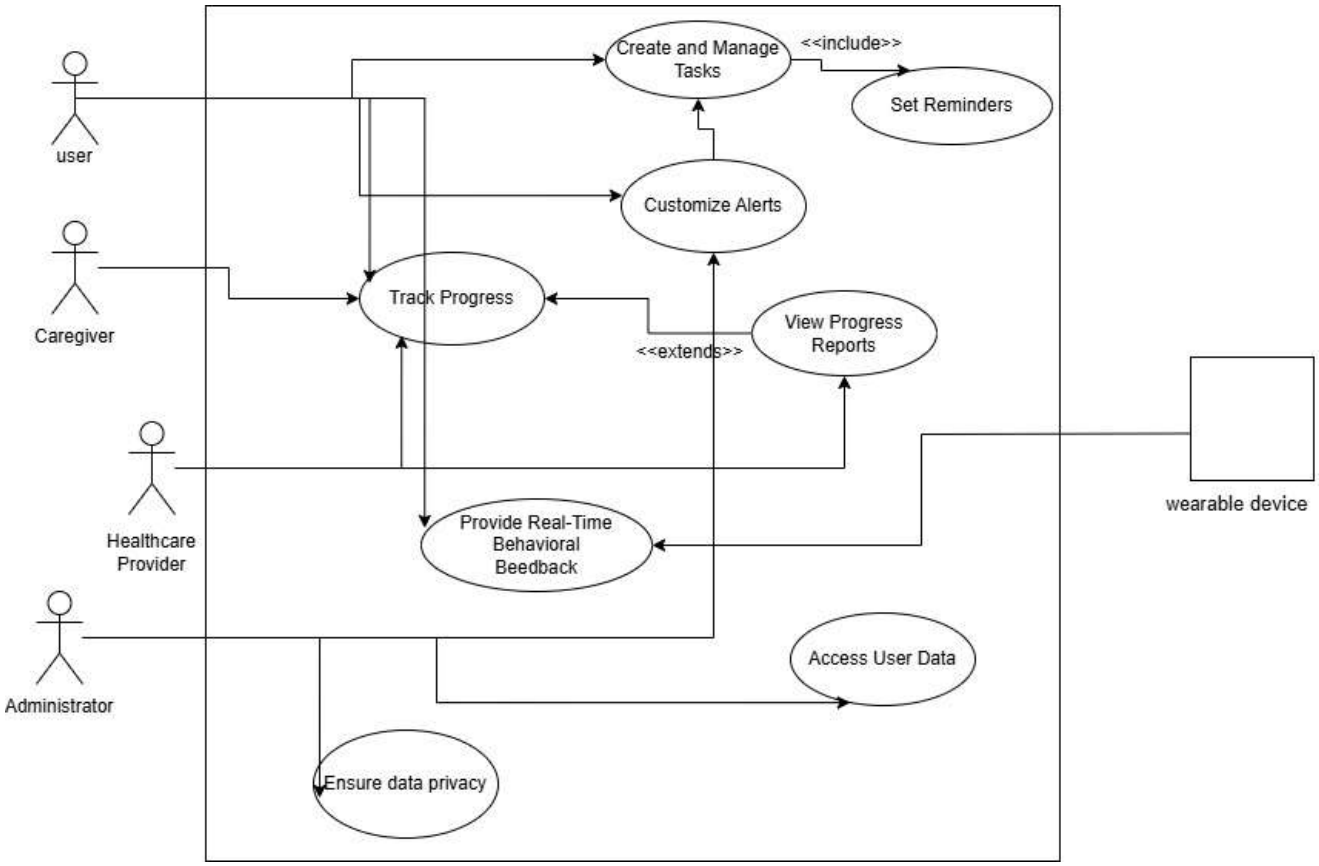
3. Functional Requirements

3.1 Create and Manage tasks:

Identifier	UC-1	
Purpose	Allow users to create and manage tasks effectively.	
Priority	High	
Pre-conditions	User must be logged into the app.	
Post-conditions	Task is saved in the user's task list and is available for reminders and progress tracking.	
Typical Course of Action		
S#	**Actor Action**	**System Response**
1	User selects "Create Task" option.	System displays task creation form.
2	User enters task details (title, description, due date).	System validates input and enables "Save" button.
3	User clicks "Save."	System saves the task and displays a confirmation message.
4	User can choose to set reminders for the task.	System allows user to set reminders and saves them.
Alternate Course of Action		
S#	**Actor Action**	**System Response**
1	User enters invalid data (e.g., empty title).	System displays an error message indicating the required fields.
2	User cancel the task creation	System returns to the previous screen without saving.

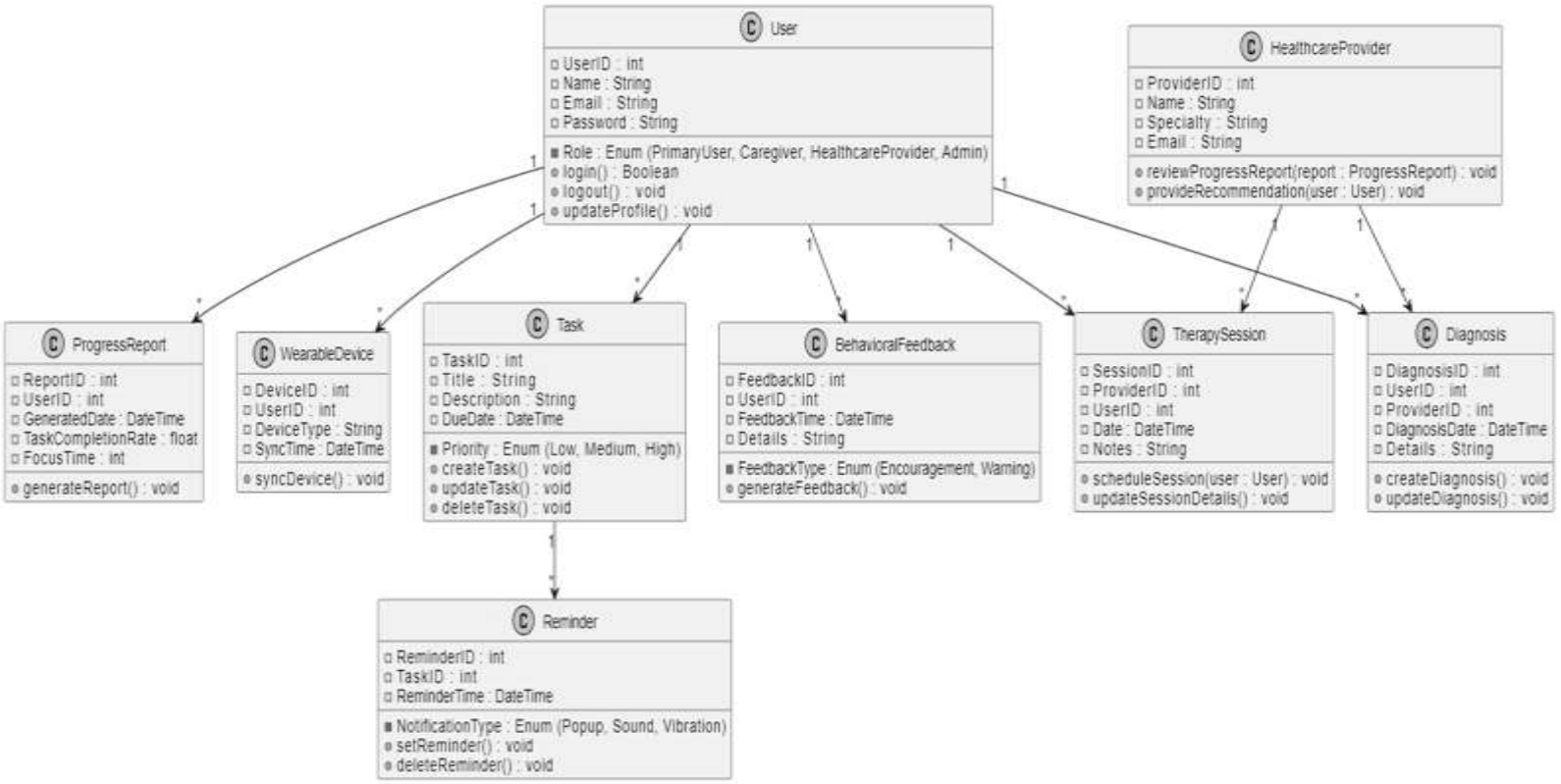
Table 1: UC-1

Use Case 1:

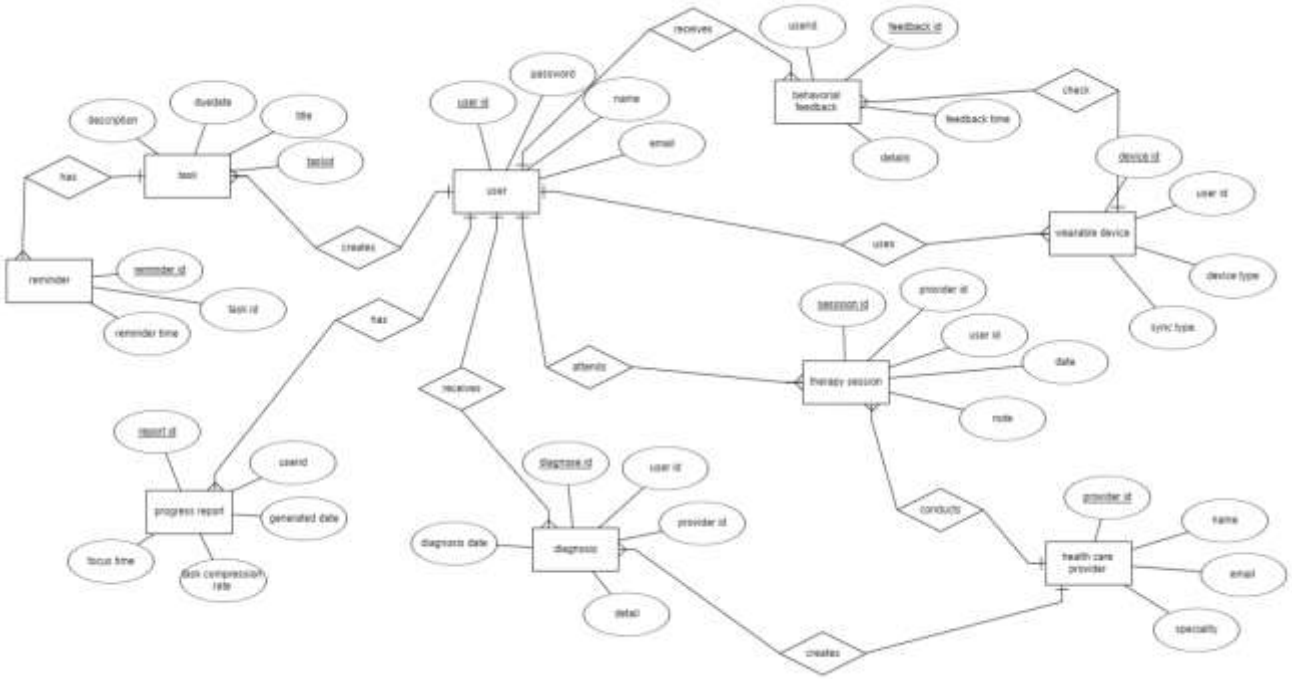

user
Caregiver
Healthcare Provider
Administrator
Create and Manage Tasks
<<include>>
Set Reminders
Customize Alerts
Track Progress
View Progress Reports
<<extends>>
Provide Real-Time Behavioral Beedback
Access User Data
Ensure data privacy
wearable device

3.2 Requirements Analysis and Modeling

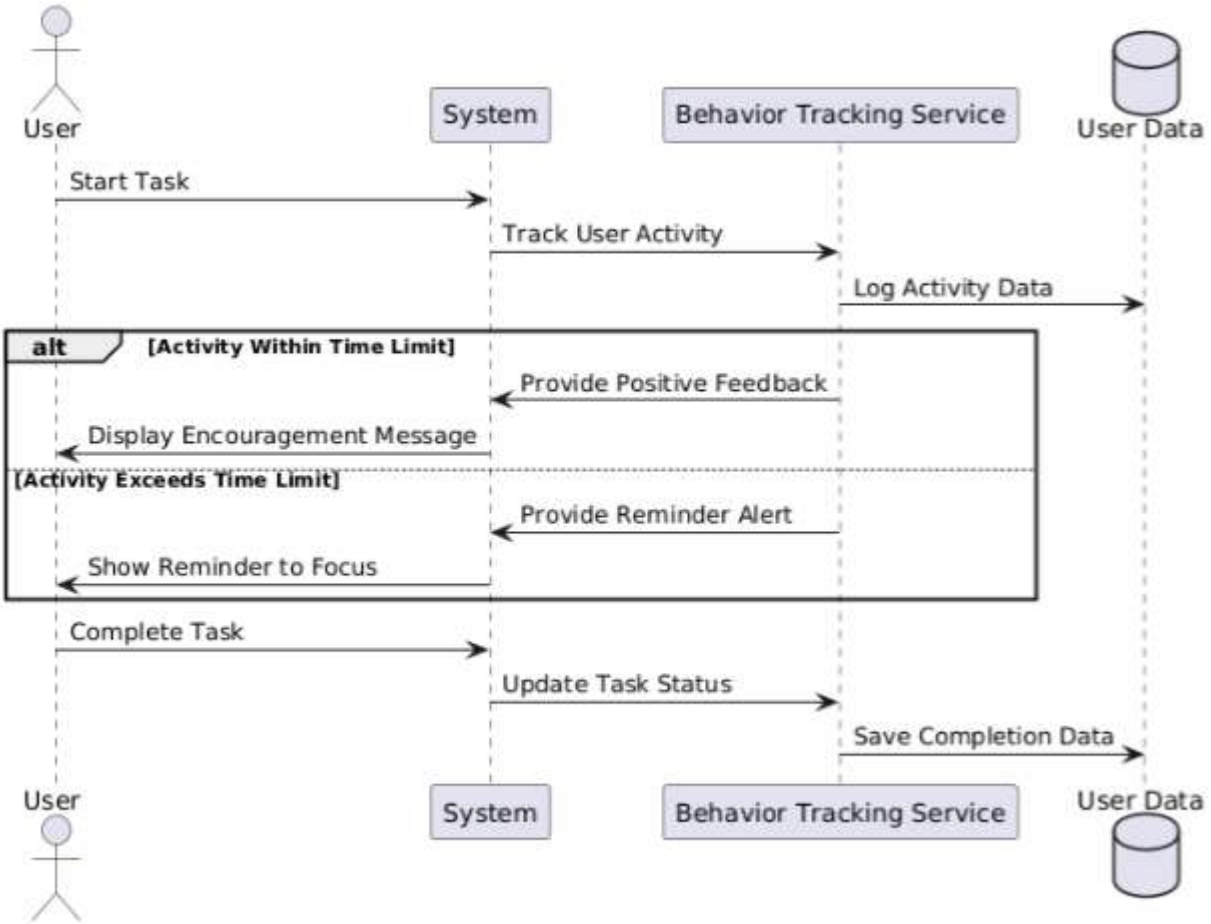
Class diagram:



ERD Diagram:


receives
userid
feedback id
password
user id
name
email
behavioral feedback
check
feedback time
details
description
duedate
title
has
task
taskid
device id
user id
creates
user
uses
wearable device
device type
sync type
reminder
reminder id
task id
reminder time
has
session id
provider id
user id
date
note
attends
receives
therapy session
report id
userid
progress report
generated date
focus time
diagnosis id
user id
provider id
diagnosis date
diagnosis
detail
conducts
provider id
name
email
specialty
health care provider
creates

Sequence Diagram:



4. Nonfunctional Requirements

4.1 Performance Requirements

he Attention Deficit HyperGuard product must meet the following performance requirements to ensure smooth user experience and functionality under different usage conditions:

- Response Time for User Interactions:
  - The app should respond to user inputs (e.g., button presses, task entries) within 1 second under normal operating conditions.
  - Task reminders, alerts, and notifications should be delivered within 3 seconds after the scheduled time.
- Real-Time Behaviour Feedback:
  - For users with ADHD, real-time behavioral feedback (e.g., alerts, nudges, focus timers) must occur immediately when certain criteria are met (e.g., after 15 minutes of inactivity or distraction), with a maximum delay of 5 seconds for notifications.
- Data Synchronization:
  - The app should synchronize data across devices (mobile and wearable) with no more than a 30-second delay. This will ensure that users can track their progress and receive updates on multiple platforms seamlessly.
  - Cloud synchronization should be reliable and occur every 10-15 minutes when connected to the internet, ensuring up-to-date information on user progress and preferences.
- App Load Time:
  - The app should load within 5 seconds after startup on supported devices, with minimal loading time between screens (less than 2 seconds

4.2 Safety Requirements

Safety is a critical aspect for any health-related software, especially one that aims to support individuals with a neurodevelopmental condition like ADHD. The safety requirements for Attention Deficit HyperGuard are as follows:

- User Data Privacy:
  - The app must ensure that no sensitive user data (e.g., personal health information) is exposed or accessible to unauthorized individuals. If user data is transmitted or stored, it must be encrypted both in transit and at rest.
- Physical Safety:
  - The app should not encourage or contribute to behaviours that could physically harm the user. For example, the system must avoid any suggestions or reminders that might lead to overexertion, excessive screen time, or distraction while performing tasks that could be hazardous (e.g., driving or operating heavy machinery).
  - Notifications must be designed to avoid distracting the user during critical tasks, and real-time interventions should be subtle and not alarming.
- Behavioral Safeguards:
  - If the app is being used to monitor a child or student, it must provide safeguards such as parental controls and limitations on usage time, especially for tasks that involve extended screen time, to prevent overuse or potential harm.

4.3 Security Requirements

- Password Protection: Require users to create strong passwords (minimum 8 characters, including one number and one uppercase letter)
- Session Timeout: Log users out after 15 minutes of inactivity to prevent unauthorized access.
- Data Encryption: Use SSL/TLS encryption for data in transit and AES-256 encryption for stored data.
- Password Recovery: Send a password reset link via email, valid for 30 minutes.
- Role-Based Access: Different user roles (e.g., caregivers, healthcare providers) should only access appropriate data.
- Failed Login Attempts: Lock account after 5 failed login attempts to protect against brute force.
- Minimal Permissions: Only request permissions necessary for the app to function (e.g., no camera access if not needed).
- Automatic Updates: Enable automatic updates to ensure users always have the latest security patches

4.4 Additional Software Quality Attributes

- Usability: The app should be easy to navigate, with an intuitive interface designed for users with ADHD.
- Reliability: The app must have 99.9% uptime and recover gracefully from errors.
- Maintainability: Code should be modular, well-documented, and easy to update or fix.
- Adaptability: The app should allow users to customize settings (e.g., reminder frequency, interface layout).
- Portability: The app should work on both **iOS and Android** devices with consistent performance.
- Testability: The app should be easy to test, with automated testing for key features.
- Robustness:The app should handle errors gracefully, ensuring a smooth user experience even with unexpected inputs.

5. Other Requirements

5.1 Database Requirements

- Database Management System: The application will utilize a cloud-based database (e.g., Firebase Firestore, AWS DynamoDB) to store user data, tasks, reminders, and behavioral feedback securely.
- Data Model: The database schema must support user profiles, task details, reminders, and feedback logs. It should include proper indexing to facilitate fast data retrieval.
- Backup and Recovery: The system must implement automatic backup procedures to ensure data integrity and availability. Backup frequency should be daily, with a retention policy of at least 30 days.

5.2 External Interface Requirements

- Hardware Interfaces: The app must support integration with wearable devices (e.g., smartwatches) via Bluetooth or relevant APIs to provide real-time feedback and notifications.
- Software Interfaces: The app should interface with third-party APIs for task management (e.g., Google Calendar, Microsoft To-Do) and cloud services for data synchronization.
- Communication Interfaces: The app should utilize RESTful APIs for communication between the mobile app and the backend server, ensuring secure and efficient data exchange.

5.3 Internationalization Requirements

- Language Support: The application should support multiple languages, with the ability to switch between languages dynamically. The initial release should include English, Spanish, and French.
- Date and Time Formats: The app should adapt to local date and time formats based on user settings or device locale.

5.4 Legal Requirements

- Compliance with Regulations: The app must comply with relevant data protection regulations, such as GDPR for users in the European Union and HIPAA if it handles sensitive health information.
- User Consent: The app should include a clear user consent form regarding data collection and processing, ensuring users are informed about how their data will be used.

5.5 Reuse Objectives

- Code Reusability: The development team should follow best practices for modular design to ensure that components can be reused across the application or in future projects.
- Open Source Libraries: Utilize open-source libraries and frameworks where applicable to reduce development time and leverage community support for maintenance.

6. Revised Project Plan

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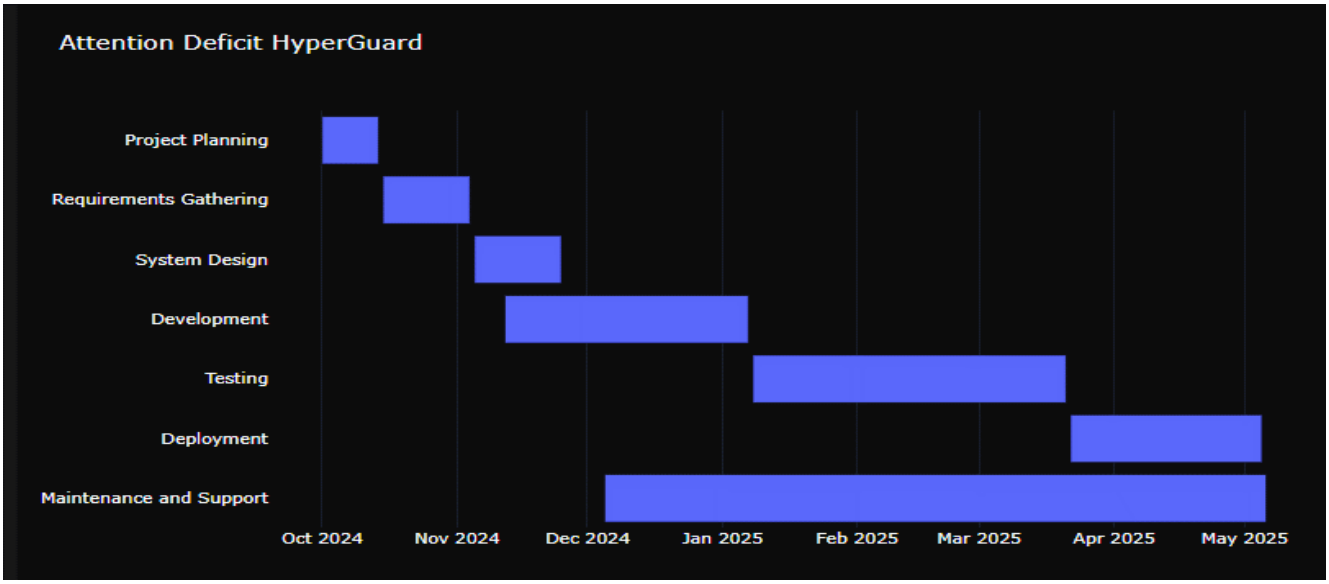

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Appendix A: Glossary

This glossary defines the terms, acronyms, and abbreviations used in this SRS document to ensure clarity and understanding.

1. ADHD: Attention-Deficit/Hyperactivity Disorder - A neurodevelopmental disorder characterized by patterns of inattention, hyperactivity, and impulsivity.
2. API: Application Programming Interface - A set of rules and protocols for building and interacting with software applications.
3. Backend: The server-side part of an application that processes data and business logic, typically not visible to users.
4. Cloud-Based Database: A database service that is hosted in the cloud, allowing for data storage and access over the internet.
5. Cognitive Behavioral Therapy (CBT): A type of psychotherapy that helps individuals understand and change their thought patterns and behaviors.
6. Data Integrity: The accuracy and consistency of data stored in a database over its lifecycle.
7. GDPR: General Data Protection Regulation - A regulation in EU law on data protection and privacy for all individuals within the European Union.
8. IV & V: Independent Verification and Validation - A process to ensure that a system meets its specifications and fulfills its intended purpose.
9. Mobile Application: Software designed to run on mobile devices such as smartphones and tablets.
10. RESTful API: An architectural style for designing networked applications using HTTP requests to access and use data.
11. User Interface (UI): The means by which a user interacts with a computer or application, including screens, buttons, and menus.
12. User Experience (UX): The overall experience a user has when interacting with a product, focusing on ease of use and satisfaction.
13. Wearable Devices: Electronic devices worn on the body, often used for health monitoring or fitness tracking.
14. Validation: The process of checking if a product, service, or system meets the needs of the user and fulfills its intended purpose.
15. Verification: The process of evaluating a system or component to determine whether it satisfies the specified requirements.

Appendix B: IV & V Report

(Independent verification & validation)
IV & V Resource

Name Signature

S#	Defect Description	Origin Stage	Status	Fix Time	
				Hours	Minutes
1					
2					
3					
…					

Table 2: List of non-trivial defects