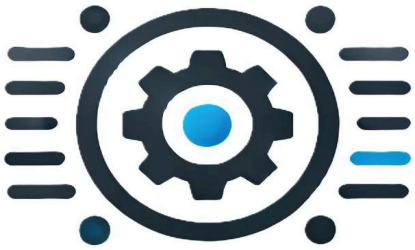
GCISLFullStackApp

Project Solution Approach

Sponsor: WSU Granger Cobb Institute for Senior Living (GCISL)



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[10.20.2024]

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I. Introduction

Our team aims to explore the potential of digital tools for senior living management by rebuilding the gciConnect system from scratch. Originally developed by a capstone team in 2023, the platform was intended to support the Granger Cobb Institute for Senior Living's (GCISL) research efforts by tracking volunteer activities. However, the original system faced usability, reliability, and administrative challenges, limiting its effectiveness for staff, students, and volunteers.

As part of this project, we have successfully redeployed the platform with a fully functional Contact Us page. This feature allows users to submit inquiries directly through the platform, triggering automated notifications to administrators for timely follow-up and efficient communication. This section of the document serves as a comprehensive overview of the inter-relational design of the gciConnect platform, focusing on three main areas: Architecture, Data, and User Interface.

- Architecture: Each subsystem will be explored, with a focus on concepts, algorithms, and interface properties that ensure the system's smooth operation.
- Data: Key data types and relationships will be mapped to ensure consistent data flow throughout the platform.
- User Interface: Mocked versions of key pages will outline their components and functionality, ensuring accessibility and ease of use.

This document serves as a structured guide for developers, ensuring alignment with project goals. Developers will conduct verification tests based on the following:
i. Subsystem descriptions
ii. Subsystem relationships
iii. Data type objects
iv. Data and database relationships
v. Database schema
vi. User interface mocked pages

Additionally, the document provides stakeholders with a reference to ensure that the design aligns with both operational and research needs. Our goal is to deliver a stable, user-friendly, and reliable platform that empowers GCISL faculty, staff, and volunteers to manage activities seamlessly, enabling them to focus on research efforts and improving the quality of life for residents.

II. System Overview

The gciConnect platform is designed to streamline the management of volunteer activities and support the research efforts of the Granger Cobb Institute for Senior Living (GCISL). It enables staff, volunteers, and administrators to coordinate tasks, track engagement, and maintain communication, ensuring effective operations and meaningful research outcomes.

The design of the platform revolves around three core areas:

- Architecture: The system is divided into subsystems, such as User Management, Volunteer Management, Communication, and Reporting. The interaction between these subsystems ensures that tasks, data, and notifications flow smoothly throughout the platform.

- Data: The system uses MongoDB to store key data objects, including users, tasks, and activity logs. Relationships between data entities are structured to facilitate easy retrieval and reporting, ensuring consistency and reliability. The Contact Us page data is collected through Google Forms and stored in Google Sheets for easy tracking and access by administrators.

- User Interface: The interface is built to be accessible and intuitive, supporting multiple roles such as staff, volunteers, and administrators. Key pages, such as the Contact Us page, allow seamless communication, with automatic notifications sent to administrators upon message submission. Additionally, a new information feed will be implemented to keep users updated with relevant announcements and events.

The following sections will provide detailed insights into the platform's design. Architecture Design will cover the subsystems and their interactions, Data Design will focus on the database schema and relationships, and User Interface Design will describe key page layouts and functionality. Together, these elements ensure that the enhanced gciConnect platform will be reliable, user-friendly, and scalable, effectively supporting GCISL's operations and research initiatives.

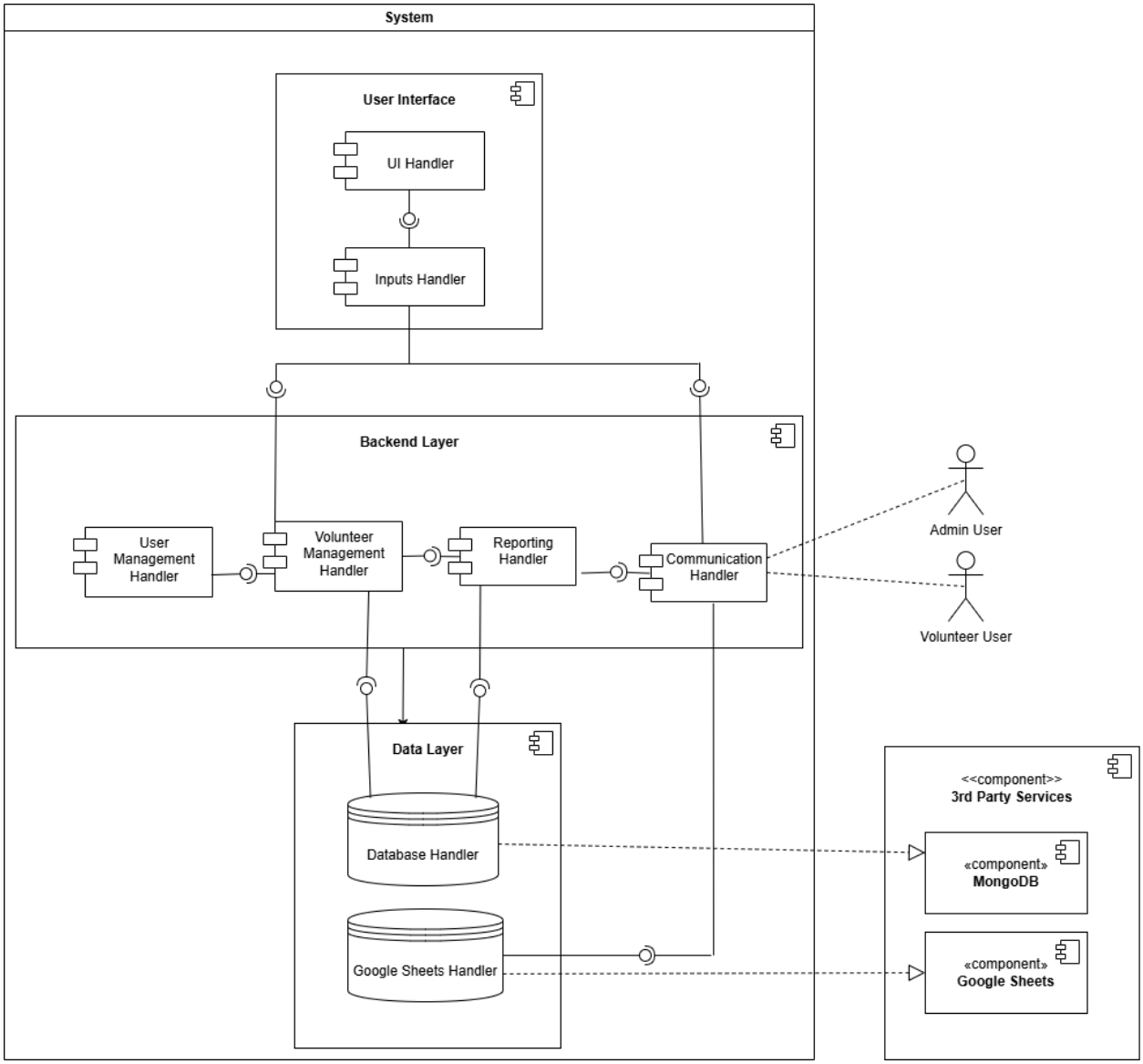
III. Architecture Design

III.1. Overview

Our team has adopted a **component-based architectural pattern** for the gciConnect platform to support the volunteer management and research efforts of the Granger Cobb Institute for Senior Living (GCISL). This pattern ensures modularity, allowing each subsystem to function independently while seamlessly interacting with others. The platform's architecture consists of three layers: User Interface Layer, Backend Layer, and Data Layer. Each layer plays a specific role in ensuring the platform remains scalable, maintainable, and reliable.The User Interface Layer handles interactions between users and the system. The **UI Handler** manages layouts, page transitions, and user navigation, ensuring an accessible experience for all users. Working alongside the UI Handler, the **Inputs Handler** validates input data, such as form submissions, and routes it to the appropriate backend subsystems.

The Backend Layer manages system logic. The User Management Handler oversees accounts and permissions, ensuring proper access to features. The Volunteer Management Handler assigns tasks to volunteers and tracks their activities, sending status updates to the Reporting Handler for logging and to the Communication Handler for notifications. The Communication Handler sends notifications and logs inquiries received from the Contact Us page.The Data Layer ensures efficient data storage and retrieval. The Database Handler stores key data in MongoDB Atlas and logs inquiries in Google Sheets. This combination allows for both structured data storage and real-time tracking of communication.

Below is a diagram showing the system's structure. This design will allow future development without disrupting other components. In the next sections, detailed descriptions of the individual subsystems, algorithms, and services will be provided.



III.2. Subsystem Decomposition

I.1.1. [User Management Handler]

a) Description

The User Management Handler manages user accounts, roles, and permissions. It ensures that only authorized users can access specific features, maintaining security and data integrity.

b) Concepts and Algorithms Generated

This subsystem applies Role-Based Access Control (RBAC) to manage different user roles (e.g., volunteers, staff, and administrators) and uses session management algorithms to validate user access during login.

c) Interface Description

Services Provided:

Service Name	Service Provided To	Description
User Account Management	Volunteer Management Handler	Provides user account data (such as roles and permissions) to facilitate the assignment of tasks to volunteers.
Role Verification	Communication Handler	Verifies roles and permissions to ensure notifications and messages are routed to the appropriate administrators and users.

Services Required: None (self-contained).

I.1.2. [Volunteer Management Handler]

a) Description

The Volunteer Management Handler manages volunteer tasks and engagement, ensuring that volunteers are assigned tasks and their activities are tracked.

b) Concepts and Algorithms Generated

This handler implements a task scheduling algorithm to assign tasks based on volunteer availability and a tracking system to log hours and monitor task progress.

c) Interface Description

Services Provided:

Service Name	Service Provided To	Description
Task Management and Tracking	Reporting Handler	Sends task completion data and volunteer activity logs to the Reporting Handler for record-keeping and report generation.
Status Notification	Communication Handler	Sends updates on task status to the Communication Handler to notify administrators and relevant users about task progress or issues.

Services Required:

Service Name	Service Provided From
Account and Role Management Description: Uses user data to assign tasks to	User Management Handler

volunteers.	

I.1.3. [Communication Handler]

a) Description

The Communication Handler manages notifications and internal communication, ensuring administrators are informed of important updates or new submissions through the Contact Us page.

b) Concepts and Algorithms Generated

This handler applies notification algorithms to send automated emails to administrators and stores message logs in Google Sheets through integrated forms.

c) Interface Description

Services Provided:

Service Name	Service Provided To	Description
Notification Management	Admin Users via Email Notifications	Sends notifications upon task updates or message submissions and stores logs in Google Sheets.

Services Required:

Service Name	Service Provided From
Account and Role Management Description: Ensures notifications are routed to the correct administrators.	User Management Handler

I.1.4. [Reporting Handler]

a) Description

The Reporting Handler aggregates data from other subsystems and generates reports for administrators. It allows exporting of volunteer data to Excel for analysis and sharing.

b) Concepts and Algorithms Generated

This handler uses data aggregation algorithms to compile logs and export functionality to generate downloadable Excel files for offline use.

c) Interface Description

Services Provided:

Service Name	Service Provided To	Description
Data Reporting and Export	Admin Users	Aggregates volunteer activity logs and allows exporting to Excel for reporting purposes.

Services Required:

Service Name	Service Provided From
Task Management and Tracking Description: Uses volunteer data to generate reports.	Volunteer Management Handler

I.1.5. [Database Handler]

a) Description

The Database Handler manages persistent storage for the platform using MongoDB Atlas and Google Sheets integration. It ensures seamless storage and retrieval of data across all subsystems.

b) Concepts and Algorithms Generated

MongoDB is used to store users, tasks, and volunteer logs, while Google Sheets stores Contact Us submissions. The handler ensures consistent data flow between the frontend and backend.

c) Interface Description

Services Provided:

Service Name	Service Provided To	Description
Data Storage	Volunteer Management Handler	Stores volunteer activity data and task assignments to ensure seamless management and updates across the system.
Data Retrieval	Reporting Handler	Provides access to stored task and activity logs to generate reports for administrators. Also, export data into Excel files.

Services Required: None (directly integrated with other handlers).

I.1.6. [UI Handler]

a) Description

The UI Handler manages all user-facing elements, including page layouts, icons, and navigation. It ensures that the user interface is responsive and intuitive for all users.

b) Concepts and Algorithms Generated

The UI Handler applies dynamic layout algorithms to adjust the interface for different devices and users. It also handles navigation flow across various sections of the platform.

c) Interface Description

Services Provided:

Service Name	Service Provided To	Description
Layout Management	Inputs Handler	Provides layout updates to align input elements and navigation flow.

Services Required: None (interacts directly with the frontend interface).

I.1.7. [Inputs Handler]

a) Description

The Inputs Handler processes data input from users, such as form submissions and interactive elements. It ensures that data is validated and routed to the appropriate handlers.

b) Concepts and Algorithms Generated

This subsystem applies input validation algorithms to ensure correct data entry and routes the inputs to backend services such as task assignment or notifications.

c) Interface Description

Services Provided:

Service Name	Service Provided To	Description
Input Processing	Communication Handler	Task Input Routing
Task Input Routing	Volunteer Management Handler	Processes input related to task assignments and routes it to the Volunteer Management Handler for scheduling and tracking.

Services Required:

Service Name	Service Provided From
Layout Management Description: Uses layout updates to ensure inputs are aligned with the user interface.	UI Handler

IV. Data design

[You may skip this section if your project doesn't require any data manipulation or storage]

Describe all data structures (including the internal and temporary data structures), and the database(s) created as part of the application. This information is important from the design point of view as it will help the team in properly understanding all the data structures and databases which will be required for the coding.

For this application, two primary data structures are utilized, both interacting with external subsystems: MongoDB and Google Sheets. Each plays a crucial role in data management and retrieval for different parts of the system.

1. **MongoDB Data Structures**

MongoDB serves as the primary database for managing system users, volunteer profiles, activities, and reports. The database is structured around collections that store documents in a flexible, JSON-like format. Below is an overview of the key collections and their internal data structures:

userId: Unique identifier for each user.

name: Full name of the user.

email: Email address for communication.

role: User role determining access level.

contact: Phone number or other contact details.

createdAt / updatedAt: Timestamps for tracking the user's record creation and updates.

User Collection

This collection stores user accounts, including administrators, staff, and volunteers, with role-based access control

Google Sheets Data Structure

Google Sheets serves as a complementary tool for Contact Us form submissions and volunteer activity tracking. It allows administrators to access certain data quickly and interact with it via familiar spreadsheet interfaces.

Contact Us Submissions Sheet

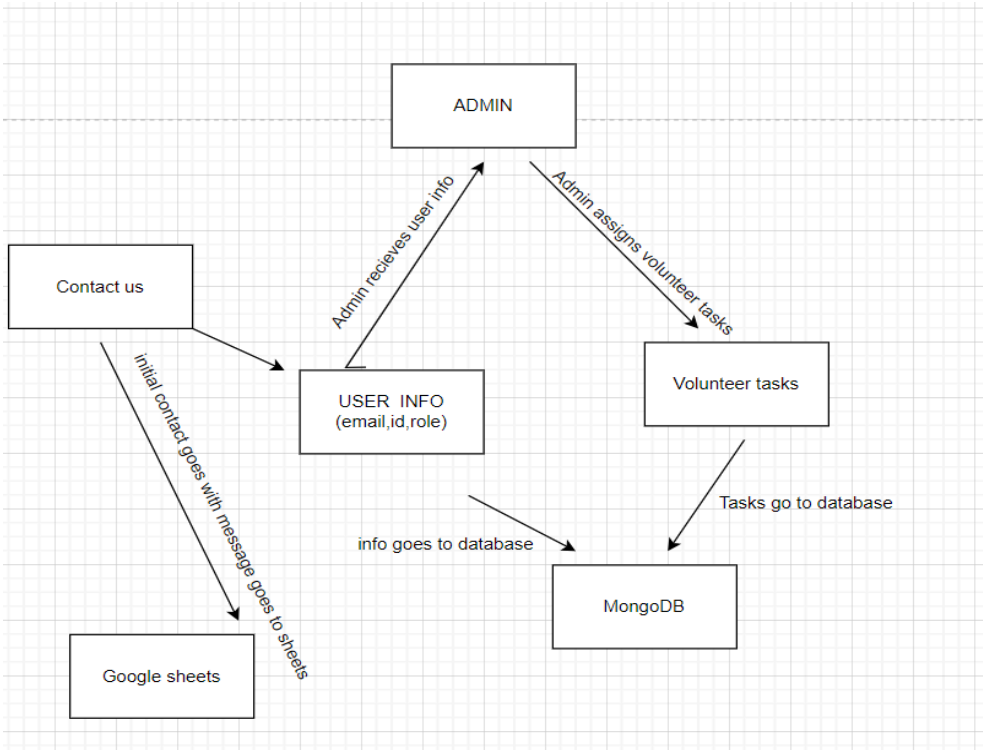
Stores information submitted by volunteers via the contact form.

- **Columns in Google Sheets:**
  - **Name**: Full name of the person submitting the form.
  - **Email**: Contact email.
  - **Message**: The content of the message or inquiry.
  - **Date**: Date of submission.
- **Usage**:
  - Admins access this sheet to review submissions and respond directly via email if required.
  - This data is not stored long-term in MongoDB, as it mainly serves as a communication channel.

Volunteer Tracking Sheet

Stores high-level summaries of volunteer participation for offline analysis and event planning.

- **Columns in Google Sheets:**
  - **Volunteer Name**: Full name of the volunteer.
  - **Activity Type**: Type of the activity the volunteer participated in.
  - **Date**: Date of the activity.
  - **Hours**: Number of hours contributed by the volunteer.
  - **Notes**: Additional notes on participation.
- **Usage**:
  - Admins export volunteer data from MongoDB into this Google Sheet for easy sharing with external teams or event organizers.
  - The sheet acts as a temporary data store to facilitate collaboration without requiring direct database access.



V. User Interface Design

The GCISL Full Stack Application features a user interface designed to be intuitive, accessible, and user-friendly for administrators, staff, volunteers, and other stakeholders. The UI focuses on simplicity and efficiency, ensuring that users can navigate the system and perform essential tasks with minimal effort. Each page has been designed with accessibility and clarity in mind, ensuring that users of all technical backgrounds, particularly those in the senior living community, can easily interact with the system.

Home Page[Image 1]:
The Home Page serves as the entry point for all users, providing a brief overview of the system's features and quick access to important sections. It includes:

- Navigation Bar: Links to the main sections of the website, such as Get Involved, Contact Us, About, Login, and Register.
- Welcome Message: A brief introduction to GCISL's mission and purpose.
- Featured Opportunities/News Feed: A section highlighting current volunteering or research involvement opportunities, with quick links to more detailed information.

Get Involved Page[Image 2]:
The Get Involved Page serves as the primary hub for volunteers and community members looking to contribute to GCISL activities. It includes three main sections:

- Research Involvement: Provides opportunities for volunteers to participate in ongoing research projects.

- Education and Mentorship: Lists opportunities for users to contribute through educational programs and mentorship roles.
- Outreach and Charitable Contributions: Allows users to engage in charitable activities and community outreach programs.

This page is designed to be engaging and easy to navigate, with large, interactive buttons and concise descriptions to guide users through available opportunities. Users can quickly explore the roles they are interested in and sign up with minimal effort.

Contact Us Page[Image 3]:
The Contact Us Page is designed to streamline communication between users and the administration. It includes:

- Use Case: Contact Us
  Description: Users submit inquiries or feedback to GCISL administration.
  Interface Interaction:
  Users fill out the contact form on the Contact Us Page with their name, email, and message.
  After submitting the form, the message is sent to administrators, and users receive an automated confirmation.
  This page is simple enough for users of all technical skill levels to navigate, with a clean and straightforward layout. It ensures that users can easily get in touch with GCISL staff for any inquiries or issues they may have.

About Page[Image 4]:
The About Page provides an overview of the GCISL organization, its mission, and its past activities. The page includes:

- FAQ (Frequently Asked Questions): Answers to common questions regarding the organization and its services.
- Picture Gallery: A visual gallery of images from past events and activities at GCISL.

This page is visually appealing and informative, designed to give visitors a comprehensive understanding of the organization's purpose and initiatives. The combination of text and images ensures a user-friendly and engaging experience.

Login Page[Image 5]:
The Login Page provides a straightforward mechanism for users to access the system. It includes:

- Use Case: User Login
  Description: Users log into their accounts to access personalized features and services.
  Interface Interaction:
  Users navigate to the Login Page, where they enter their username and password.
  The system authenticates the credentials and redirects users to the Home Page.
  This page has been designed with accessibility in mind, featuring large text fields and a

clear error message system that provides immediate feedback in case of invalid login attempts. The design uses bold, easily readable fonts to ensure that the login process is seamless for all users.

Register Page[Image 6]:
The Register Page allows new users to create an account and join the GCISL community. It includes:

- Use Case: User Registration
  Description: New users can create an account to join the GCISL community.
  Interface Interaction:
  Users access the Register Page to fill out personal information fields (name, contact details, password).
  Upon submission, the system creates a user profile and sends a confirmation email.
  The registration process is designed to be quick and easy, with large input fields and clear instructions. The page is simple, ensuring that new users can sign up without encountering difficulties.

Admin View Page[Image 7]:
The Admin View Page is the central hub for administrators to manage volunteers, tasks, and reports within the GCISL system. After logging in, administrators are presented with a dashboard overview of key activities and controls for managing the platform. The page is designed to provide a clear and concise overview of all admin functions, ensuring efficient workflow and management.

- Use Case: Admin Task Management
  Description: Admins can view, assign, and manage tasks for volunteers, ensuring efficient allocation of resources.
  Interface Interaction:
  Admins access a list of all current tasks, with options to assign or reassign tasks to specific volunteers.
  They can add new tasks with relevant descriptions and deadlines, as well as mark tasks as complete or update their statuses.
  The page provides a summary of active, completed, and pending tasks, making it easy for admins to track volunteer contributions and project progress.
- Use Case: Volunteer Reporting
  Description: Admins can generate detailed reports on volunteer activity and task completion to assess engagement and productivity.
  Interface Interaction:
  The Admin View Page includes options for filtering reports by time period, volunteer, or task type.
  Reports can be exported in various formats (e.g., CSV, PDF) to allow for offline analysis and sharing with other stakeholders.

- Use Case: System Notifications
  Description: Admins receive real-time notifications about critical system events, such as new volunteer registrations or task completion updates.
  Interface Interaction:
  Notifications appear as alerts on the Admin View dashboard, allowing admins to quickly address any issues or take action on pending items.
  This feature ensures that admins are kept up-to-date with important activities within the system, improving response times and overall efficiency.

Accessibility and Usability:
The GCISL Full Stack Application is designed with accessibility in mind to meet the specific needs of the senior living community. Key features include:

- High Contrast and Large Fonts: These design elements ensure that the interface is easy to read, even for users with visual impairments.
- Clear Navigation: Simple, intuitive navigation ensures that users can move between different sections of the site without confusion.
- Feedback and Error Handling: The system provides real-time feedback through error messages and confirmation prompts to guide users through tasks and prevent mistakes.

VI. Glossary

Component-based architecture(CBA): an architectural style where systems are built by assembling pre-built and reusable software components

Role-Based Access Control (RBAC): A system of managing user permissions based on their role within an organization (e.g., volunteer, staff, administrator).

User Interface (UI) Layer: The part of the application responsible for managing interactions between users and the system, such as page layouts and navigation.

Backend Layer: Manages the system's core functionality, including user and volunteer management, task assignments, and notifications.

MongoDB Atlas: A cloud-based NoSQL database used for storing user, task, and volunteer information in a flexible document format.

Task Scheduling Algorithm: A method used by the Volunteer Management Handler to assign tasks to volunteers based on availability and need.

Session Management Algorithm: Ensures user sessions are validated and managed securely throughout the platform.

VII. References

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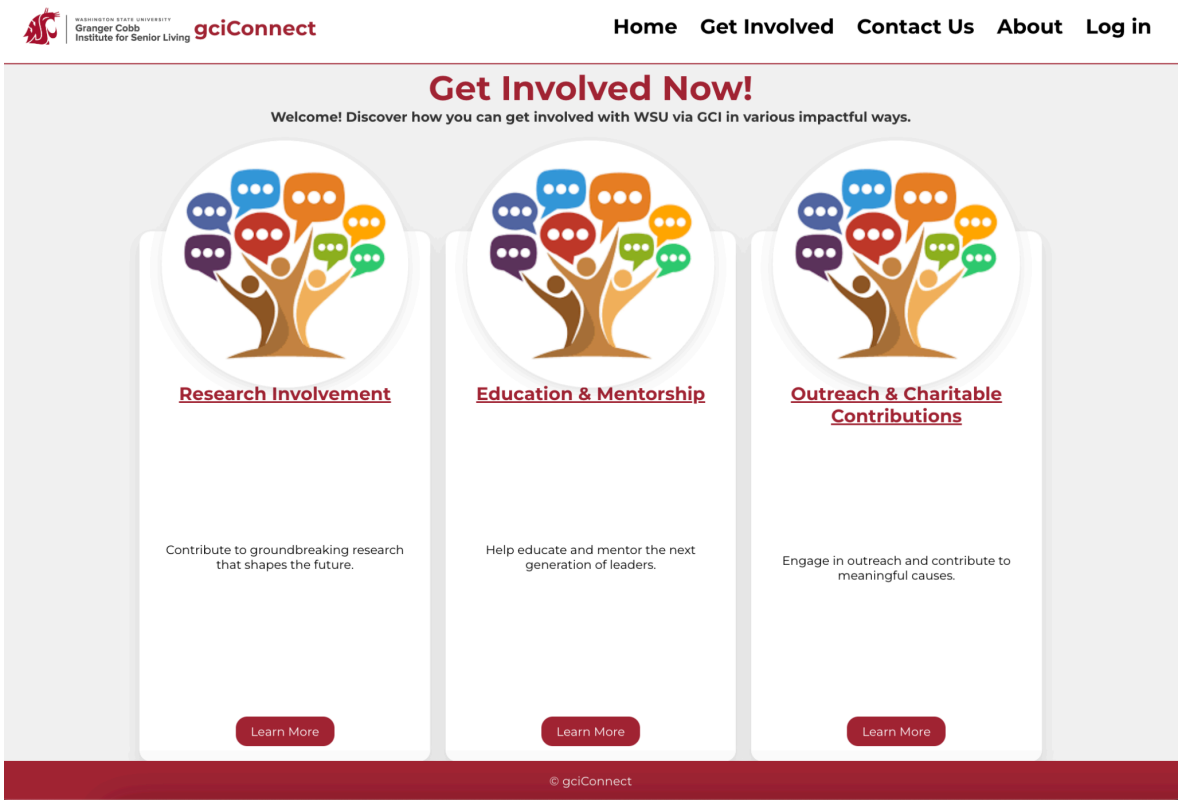
VIII. Appendices

[Image 1]:

[Image 2]:



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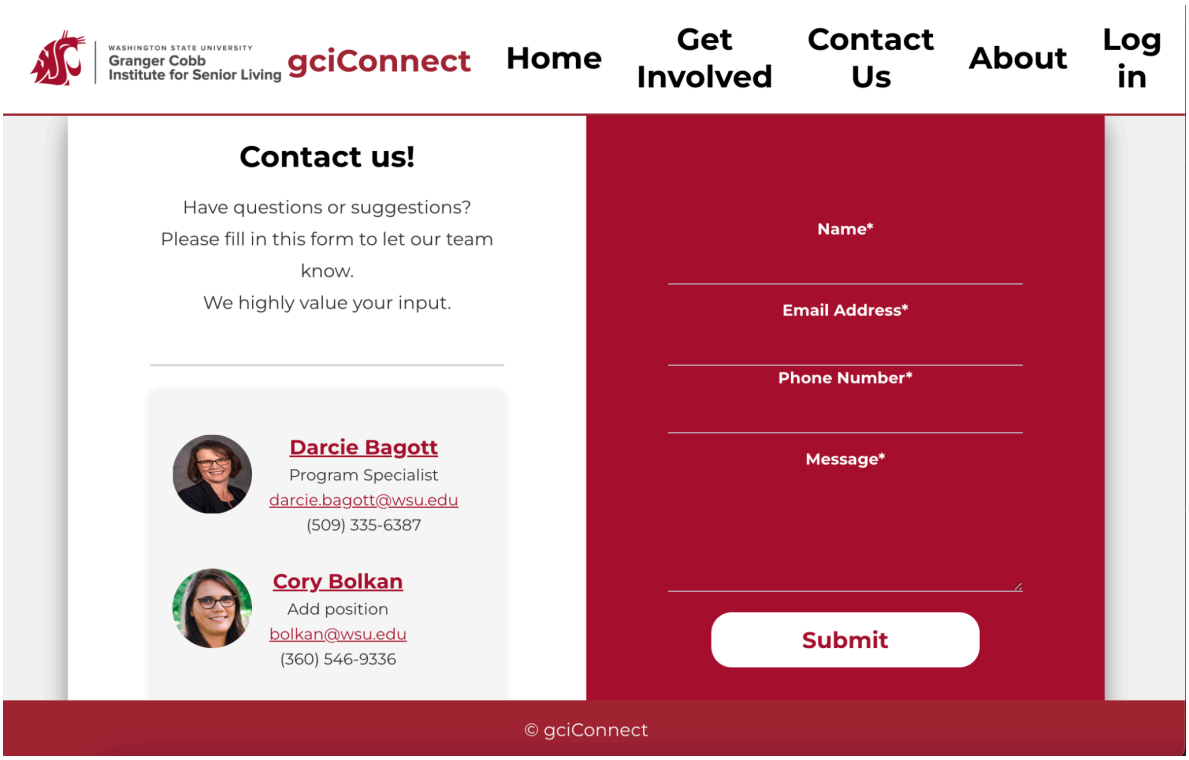

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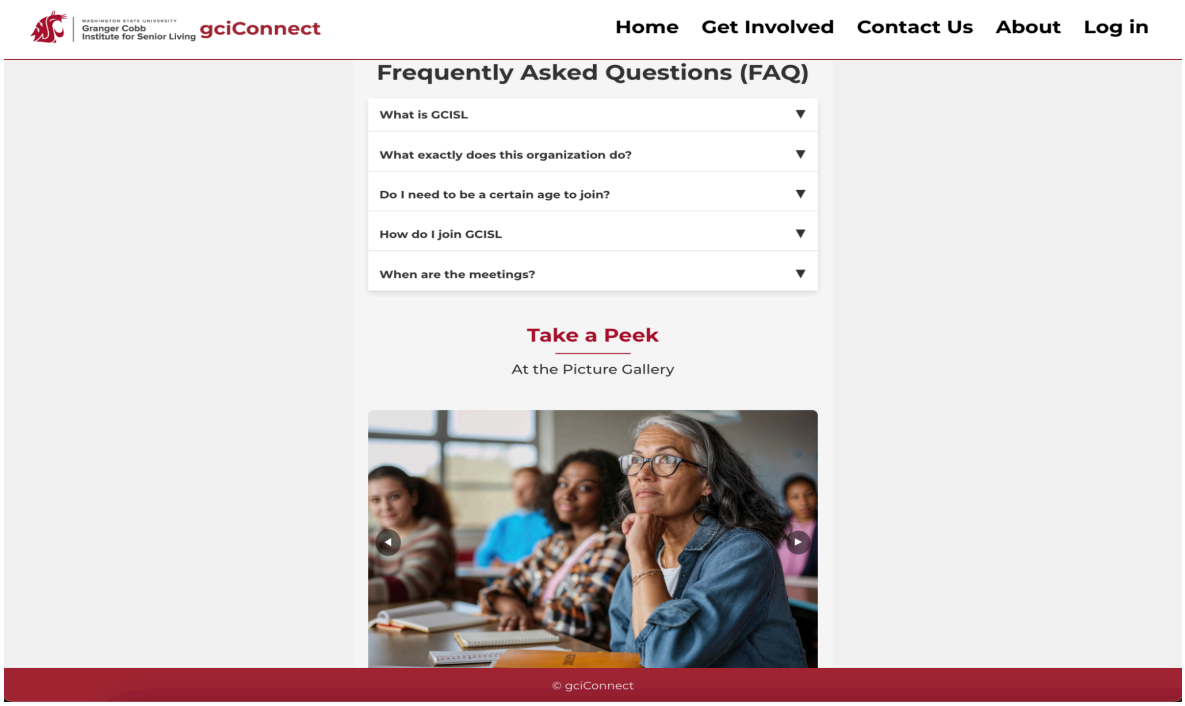

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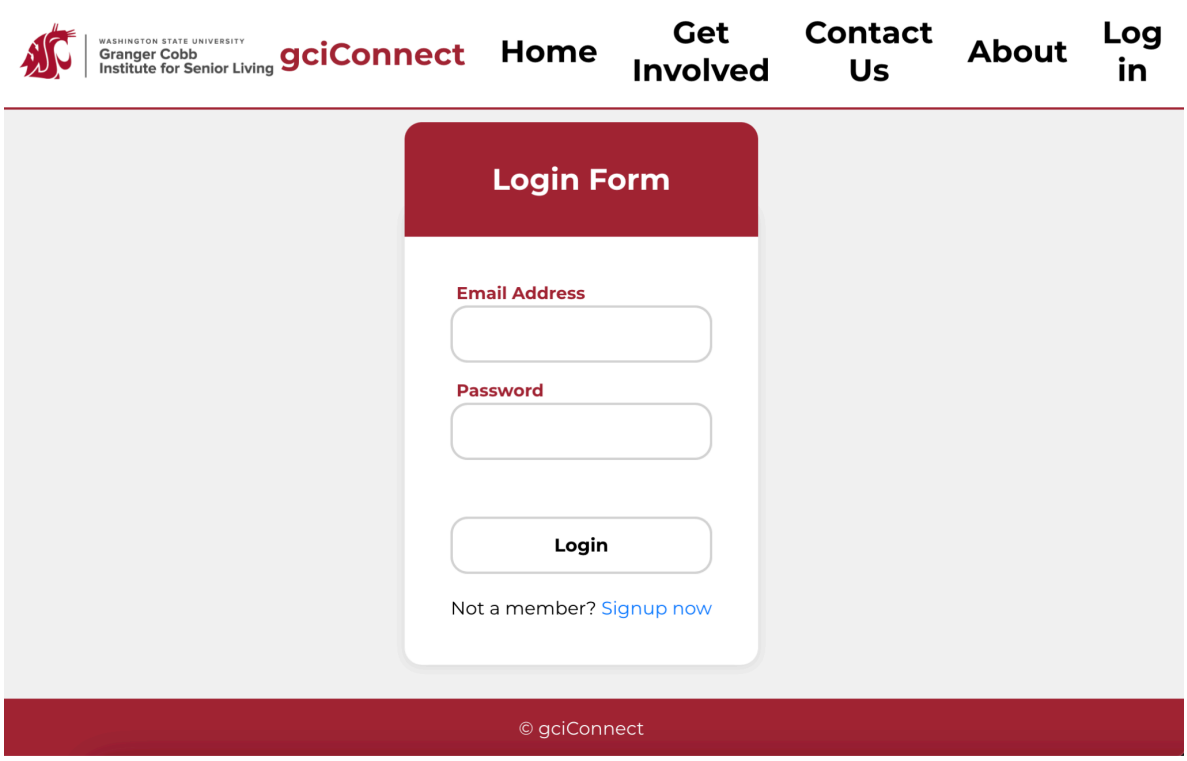

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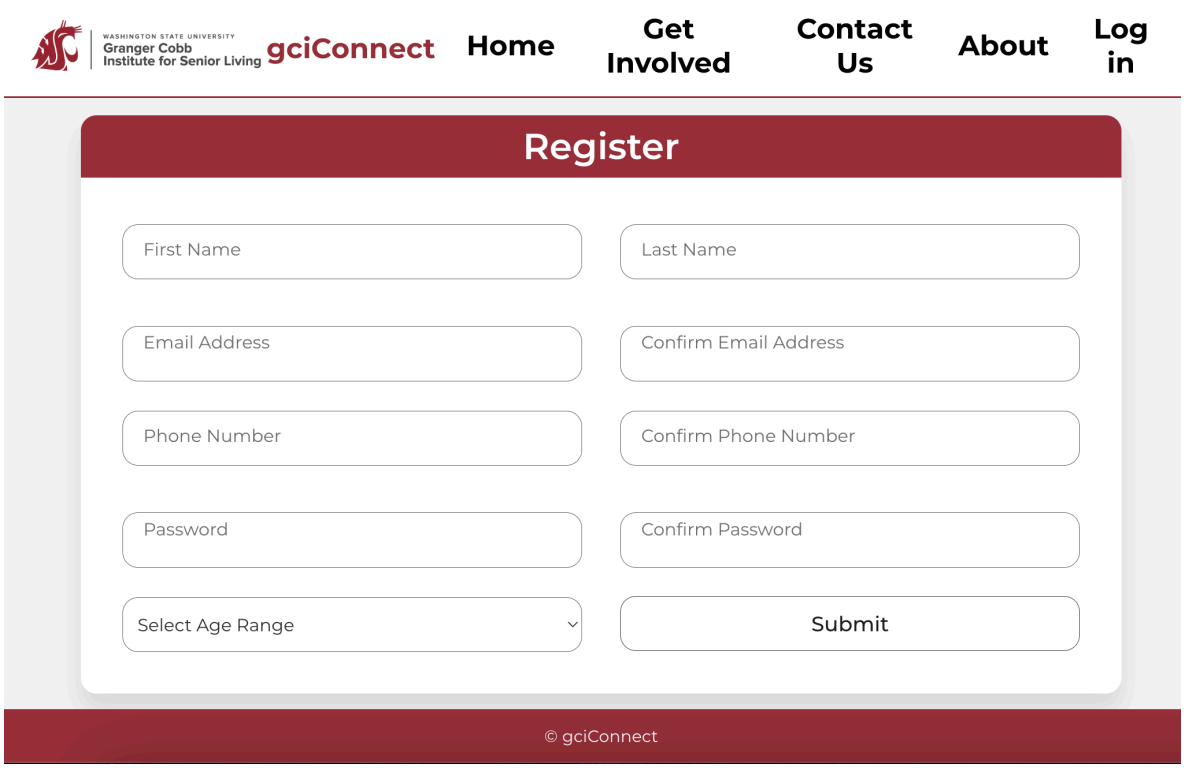

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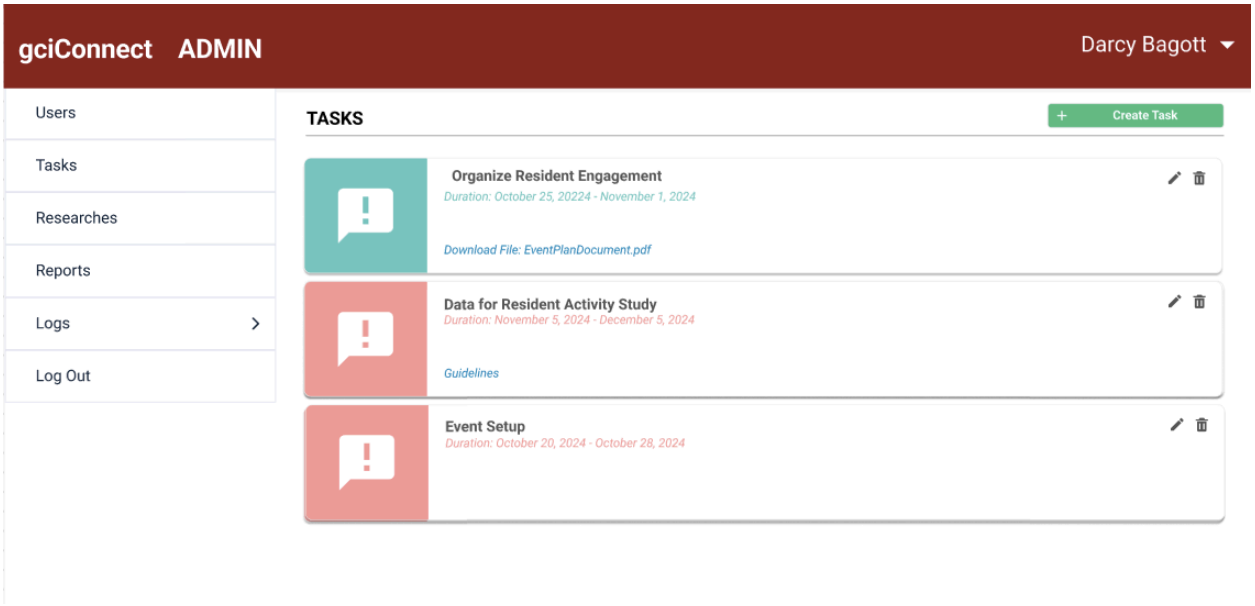
gciConnect ADMIN
Darcy Bagott
Users
Tasks
Researches
Reports
Logs
Log Out
TASKS
Create Task
Organize Resident Engagement
Duration: October 25, 20224 - November 1, 2024
Download File: EventPlanDocument.pdf
Data for Resident Activity Study
Duration: November 5, 2024 - December 5, 2024
Guidelines
Event Setup
Duration: October 20, 2024 - October 28, 2024

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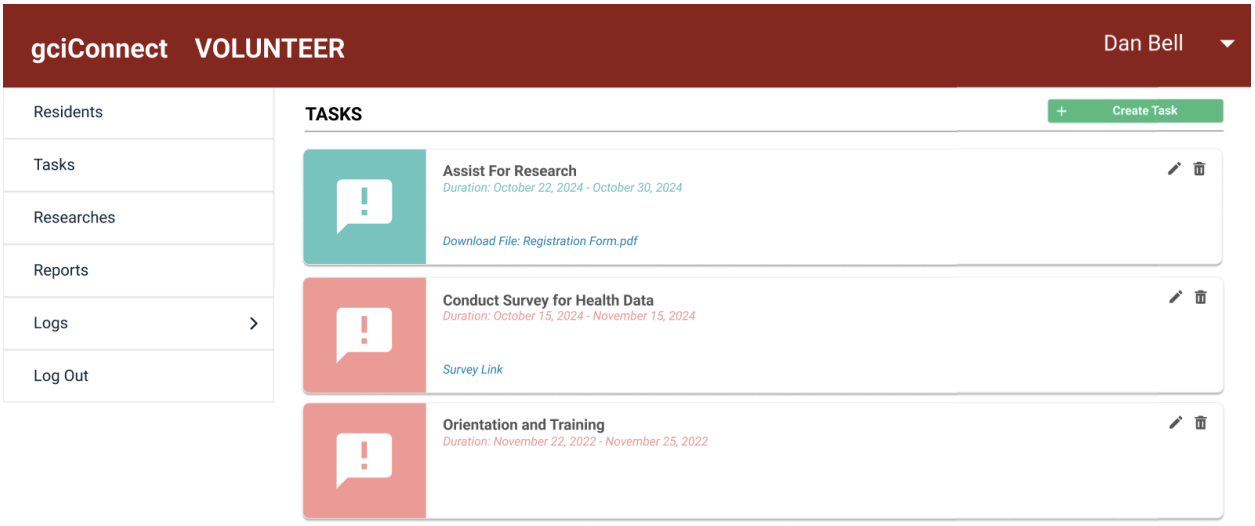
gciConnect VOLUNTEER
Dan Bell
Residents
Tasks
Researches
Reports
Logs
Log Out
TASKS
Create Task
Assist For Research
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Conduct Survey for Health Data
Duration: October 15, 2024 - November 15, 2024
Survey Link
Orientation and Training
Duration: November 22, 2022 - November 25, 2022