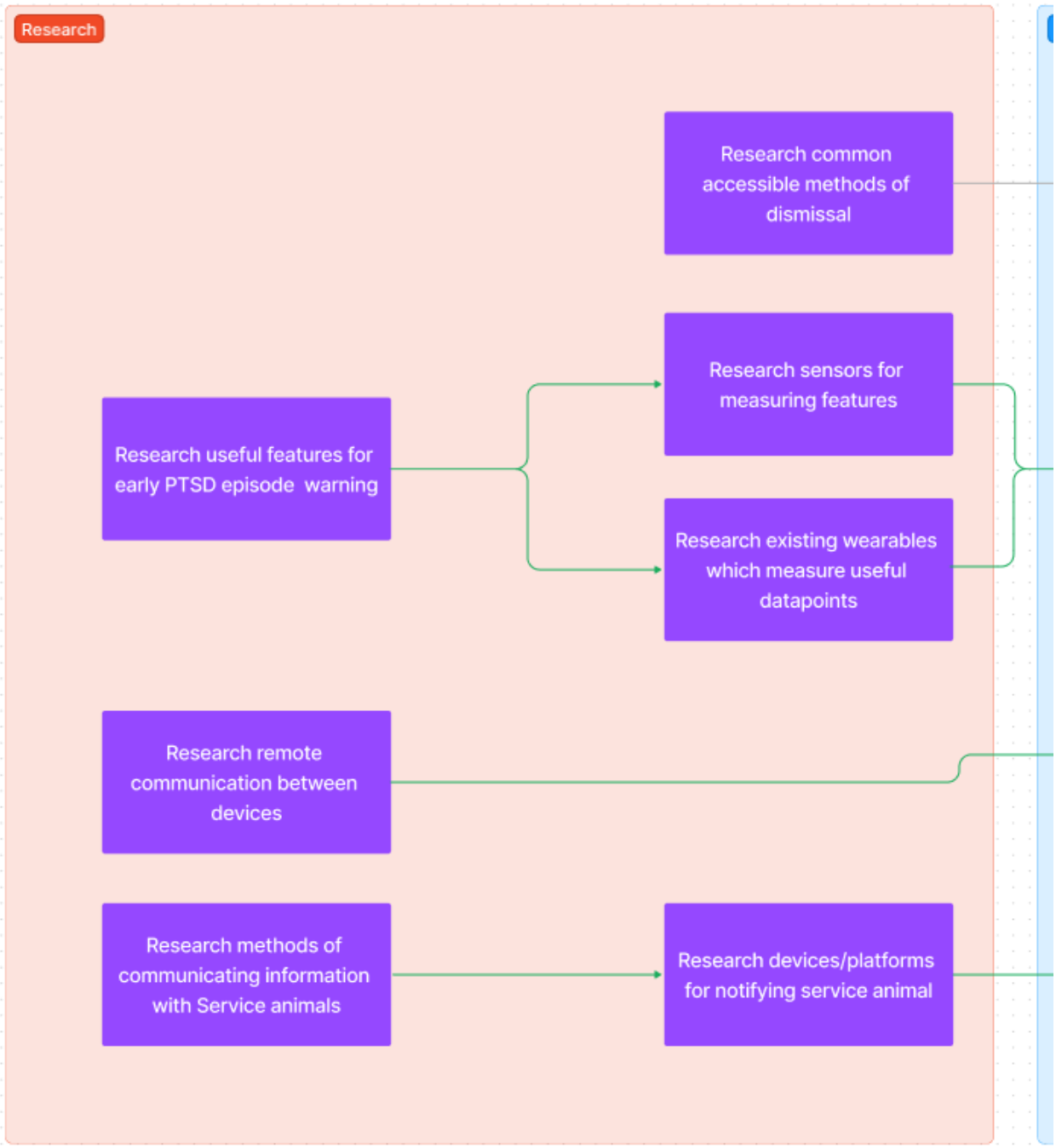
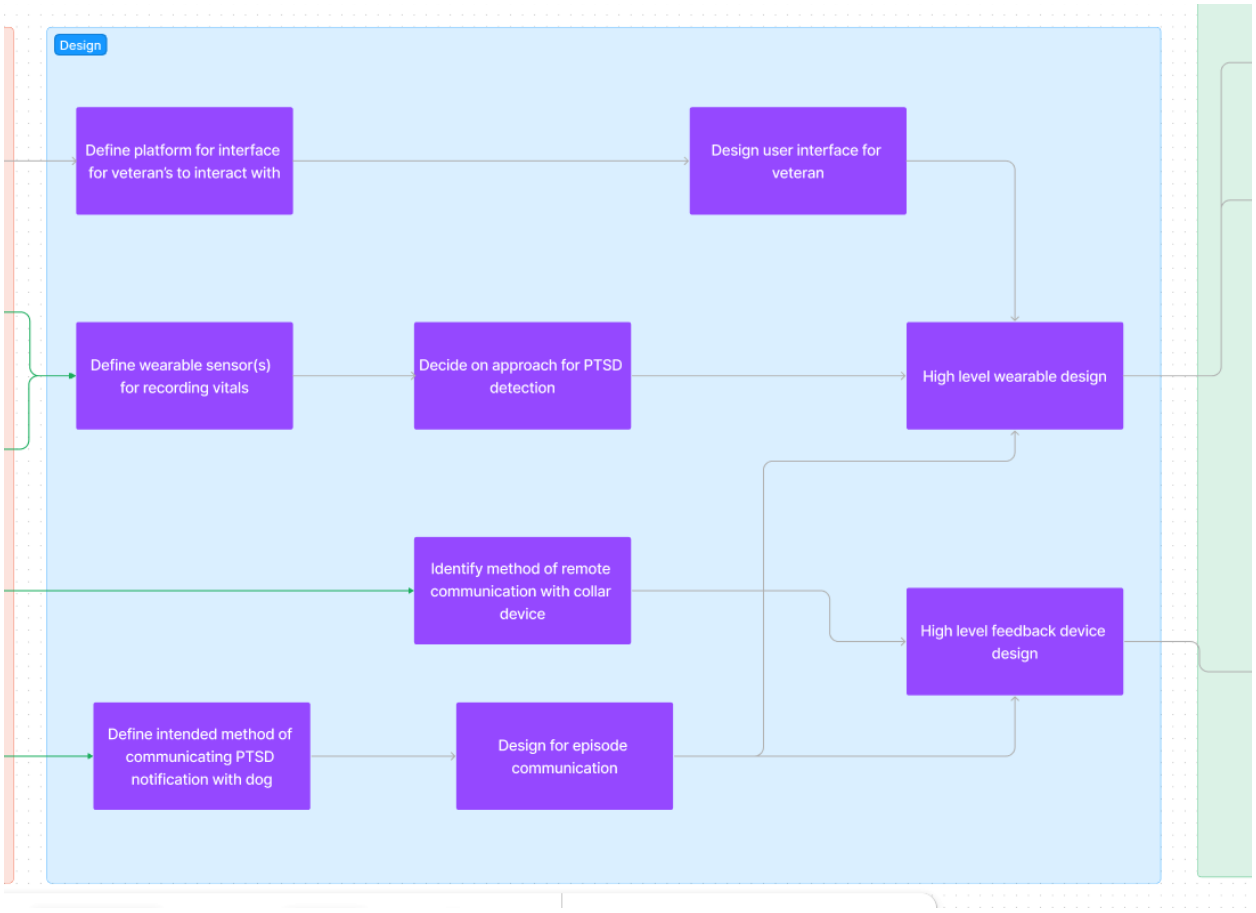
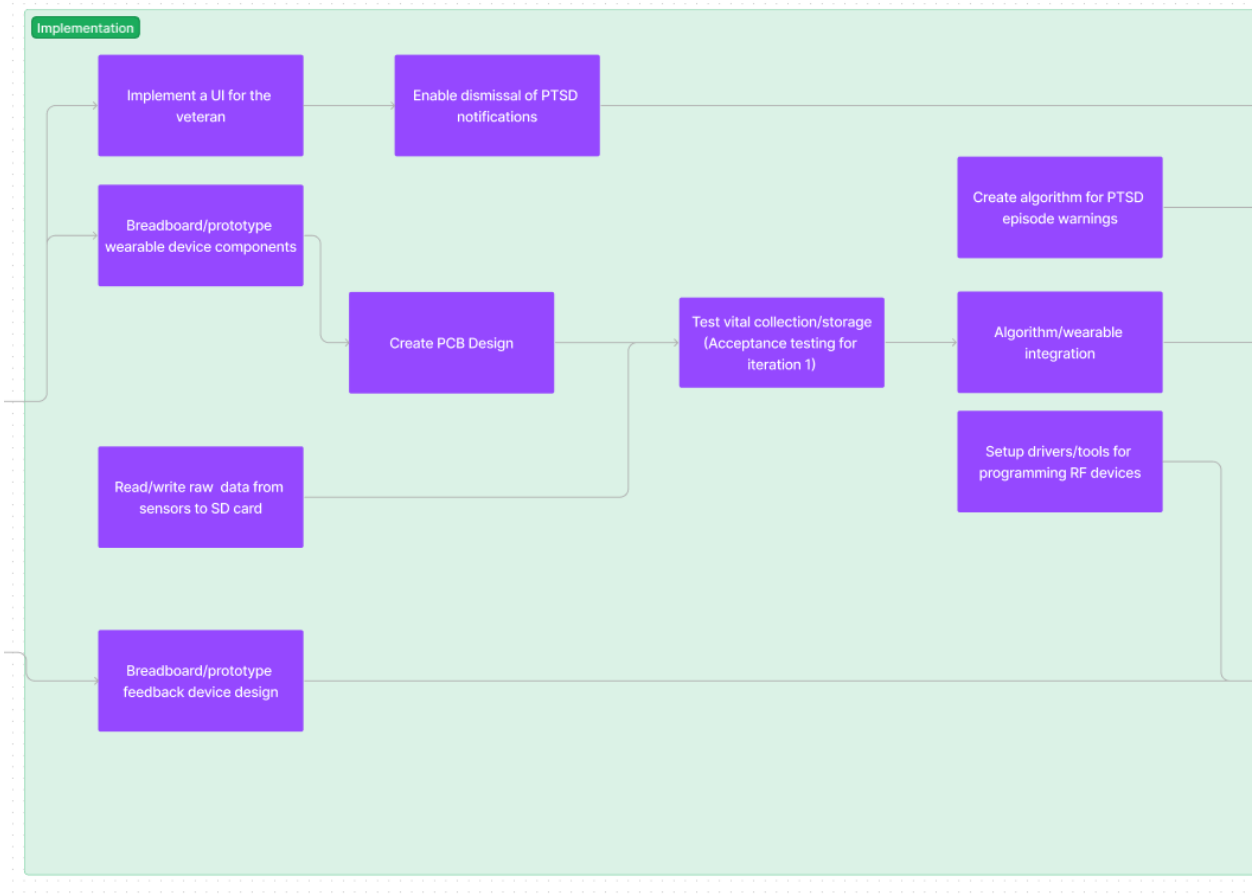
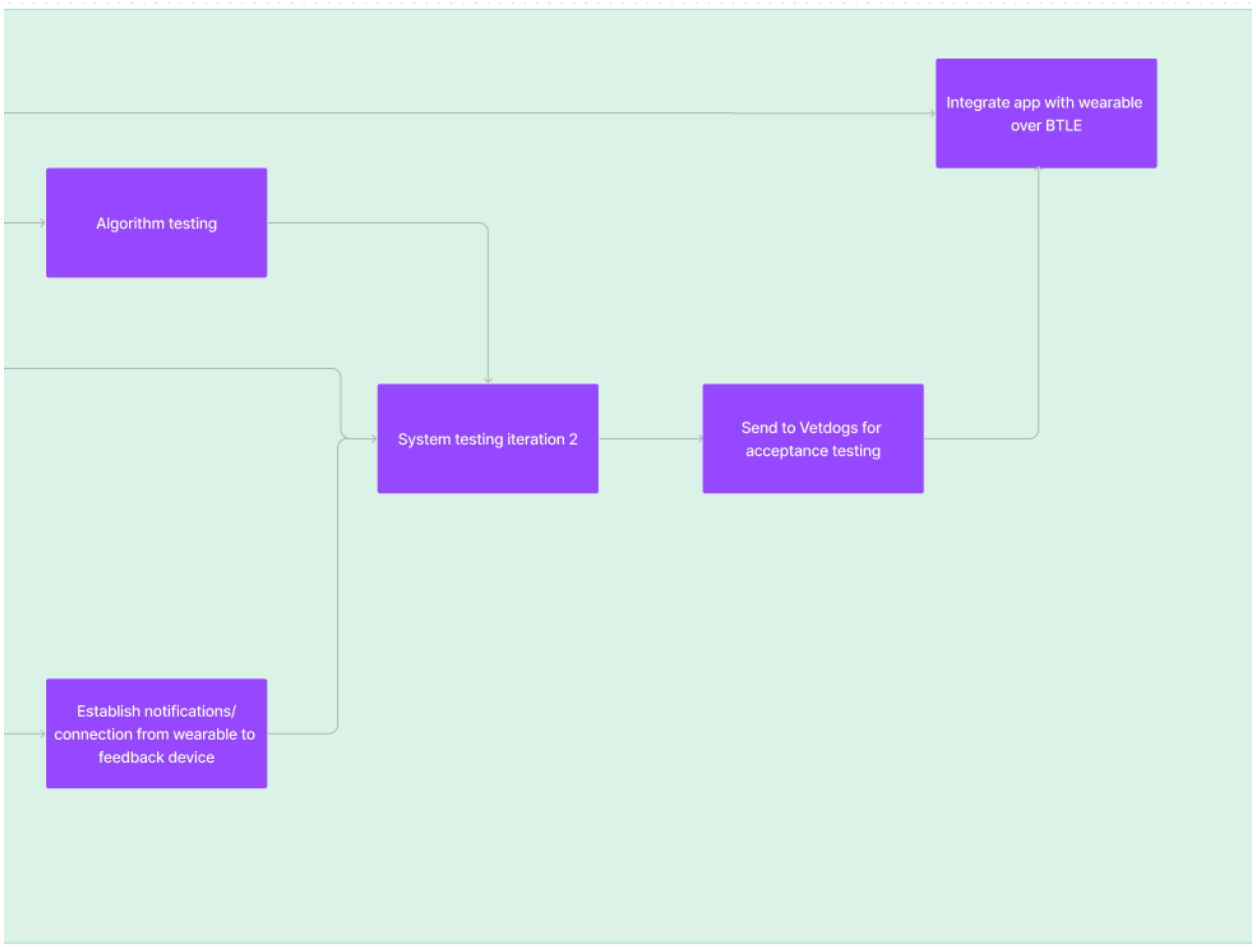
2 - Project Plan

2.1 Task Decomposition




Design
Define platform for interface for veteran's to interact with
Design user interface for veteran
Define wearable sensor(s) for recording vitals
Decide on approach for PTSD detection
High level wearable design
Identify method of remote communication with collar device
High level feedback device design
Define intended method of communicating PTSD notification with dog
Design for episode communication


Implementation
Implement a UI for the veteran
Enable dismissal of PTSD notifications
Breadboard/prototype wearable device components
Create algorithm for PTSD episode warnings
Create PCB Design
Test vital collection/storage (Acceptance testing for iteration 1)
Algorithm/wearable integration
Setup drivers/tools for programming RF devices
Read/write raw data from sensors to SD card
Breadboard/prototype feedback device design



2.2 Project Management/Tracking Procedures

We will be utilizing a waterfall/agile hybrid. Pure agile doesn't make sense due to the relatively low amount of person-days of work there are and the infeasibility of meeting as often as pure agile calls for. Also, most tasks should be independent enough that a task or group of tasks can be assigned to someone, and they can complete it on their own without checking in until the end. On the spectrum of waterfall to agile, we aim to be closer to agile.

We will use a GitLab board to track progress throughout the project's duration. Milestones are defined as established in the task decomposition.

2.3 Project Proposed Milestones, Metrics, and Evaluation Criteria

Milestones

(10/31/2023) - Research Phase Complete

(11/20/2023) - Spotlight Research Deadline

(12/10/2023) - Design Phase Complete

(01/20/2024) - Initial Redesigns Deadline

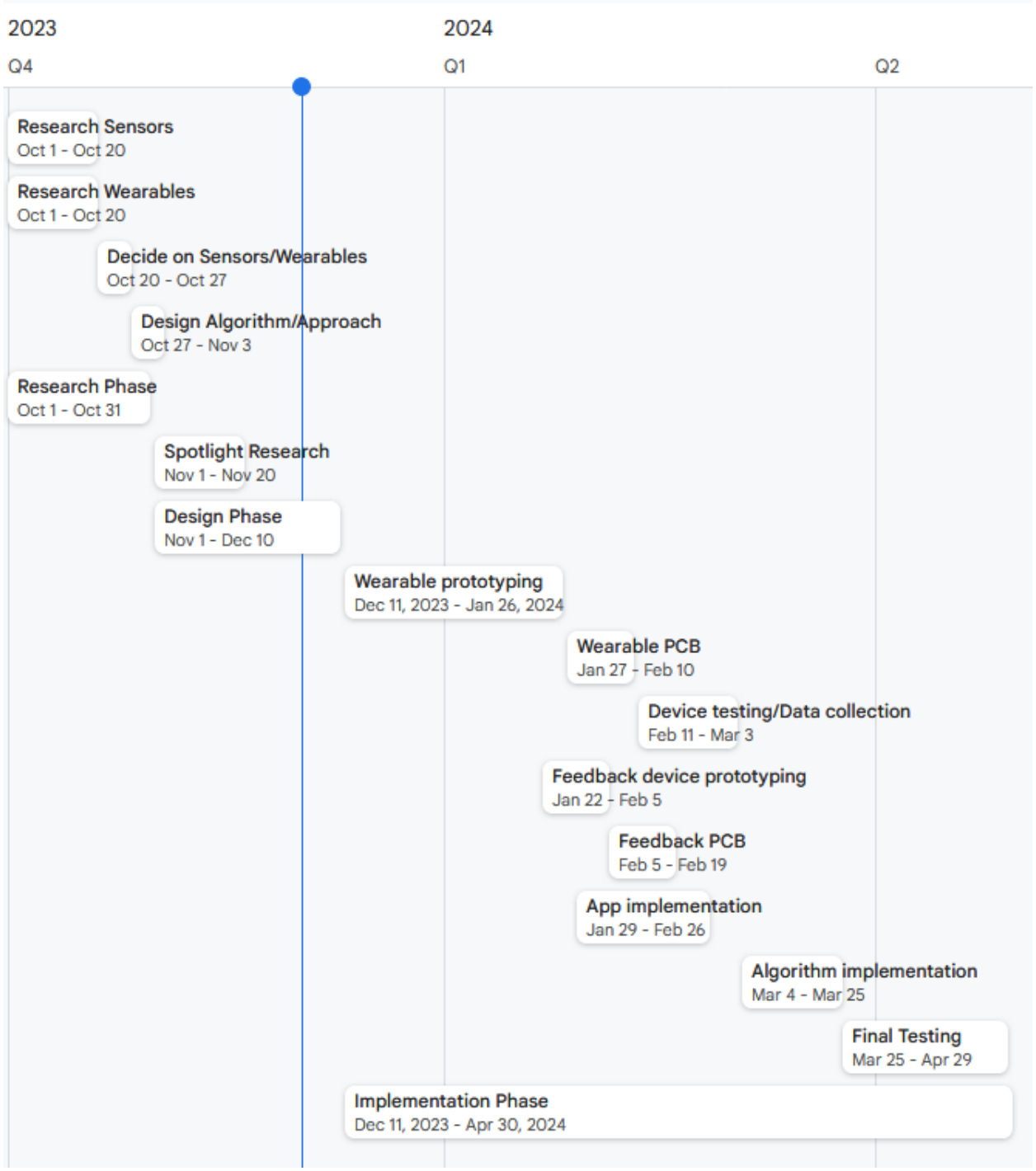
(02/28/2024) - Implementation Phase Complete

(05/01/2024) - Final Project Complete Deadline

Metrics/Evaluation Criteria

- For the research phases, each task is considered ‘Complete’ when our design can be fully realized based on what we’ve found from research. A general rule of thumb is to answer all questions related to our research’s guiding question.
- For the design phases, each task is considered ‘Complete’ when the design can be fully realized as a working prototype.
- For the implementation phase, each task is considered ‘Complete’ when our implemented prototype works to the specifications we laid out in our design phase.

2.4 Project Timeline/Schedule



2.5 Risks And Risk Management/Mitigation

One such tool or hardware that would pose a risk factor in our project would be the integration of the blood pressure sensors. Based on our research and findings, we have found out that the commercially available blood pressure sensors uses inflatable cuffs, which are not comfortable to wear for prolonged periods of time. Additionally, to measure the blood pressure, the user needs to keep their arm stationary. Since this is a wearable device that the user would have on at all times, the blood pressure readings wouldn't be accurate.

An alternative to using a cuff-based blood-pressure sensor is to use a Photoplethysmogram (PPG) device. PPG is a measurement of how light is reflected by the skin. As veins/arteries expand and contract with heart beats, the volume of blood under the skin changes in unison. This causes skin to reflect different amounts of light. Using PPG we can easily estimate blood pressure, measure heart rate, and even predict oxygen saturation, non-invasively.

A big risk for wearable devices for collecting physiological data is security. The identities of the users cannot be associated with the device (since their association infers that they have PTSD). The data on the watch could be used to extract information about their medical conditions. This is private information and should be thoroughly protected.

In practice or any commercial release of this device, all data should be encrypted both in-place, and in transit. Users should be thoroughly authenticated for accessing any data associated with them. However, with the workload of designing and building the wearable and collar device, as well as implementing an algorithm for early detection, it would not be possible for our group to implement sufficient security, safety, and encryption protocols to meet this requirement.

2.6 Personal Effort Requirements

Task	Estimated Number of hours
Research for early PTSD warning	20
R&D on vital sensors	30
Research on existing wearables	15
Research on Methods for communicating with service dogs	20
R&D of cross product Communication	60
Integration of sensors with Prototype device	40
R&D for Service Dog notification device	40
Integration of all devices	80

Testing	100

2.7 Other Resource Requirements

Information Requirements

- **Connections to the Vetdogs of America veterans group:**

This project requires our group to create a device worn by veterans and people who suffer from PTSD-induced episodes. As such, it is important to be able to communicate and ask questions to veterans who can provide valuable feedback in both our research of PTSD and our designs of our wearable device.

- **Connections to Service Dog Trainers:**

In order to ensure that our PTSD Detection Device works, we need to have connections to service dog trainers to test that the device accurately alerts the service dog. These connections will also help our team to design the device to accurately fit a service dog.

- **Access to Iowa State University Studies on PTSD:**

Having access to scientific studies on PTSD that are archived in Iowa State University's library will be necessary to get accurate data on the effects of PTSD and how PTSD episodes occur.

- **Access to biometric data from previous studies:**

Having access to scientific studies on PTSD and the biometric data provided will be necessary in order to create an accurate algorithm for our wearable device. The team has reached out to multiple sources to gain access to their studies, and currently await a response.