2 Project Plan

2.1 Project Management/Tracking Procedures

Which of agile, waterfall or waterfall+agile project management style are you adopting. Justify it with respect to the project goals.

Our team will be utilizing a hybrid style in order to continually test various software and hardware components. Our goal is to confirm the testing and functionality of a singular component before moving to the next component.

What will your group use to track progress throughout the course of this and the next semester. This could include Git, Github, Trello, Slack or any other tools helpful in project management.

In order to track our team's progress throughout the course of this and the next semester, our team will be utilizing the Monday.com platform. It will allow functionality such as creating, assigning and managing tasks as well as time tracking, file sharing, and automated updates.

2.2 Task Decomposition

In order to solve the problem at hand, it helps to decompose it into multiple tasks and subtasks and to understand interdependence among tasks. This step might be useful even if you adopt agile methodology. If you are agile, you can also provide a linear progression of completed requirements aligned with your sprints for the entire project.

1. Phone Application
    a. Decide necessary functionality
    b. Application Design
    c. Baseline Application
    d. Back-end
2. Hardware Components
    a. Temperature sensor
    b. Compatible microcontroller, power supply, and communication modules
    c. Prototyping and testing of the temperature sensing element
    d. Data retrieval hardware
    e. Prototyping and testing of data transmission and retrieval
    f. Sensor hardware housing

2.3 Project Proposed Milestones, Metrics, and Evaluation Criteria

What are some key milestones in your proposed project? It may be helpful to develop these milestones for each task and subtask from 2.2. How do you measure progress on a given task? These metrics, preferably quantifiable, should be developed for each task. The milestones should be stated in terms of these metrics: Machine learning algorithm XYZ will classify with 80% accuracy; the

pattern recognition logic on FPGA will recognize a pattern every 1 ms (at 1K patterns/sec throughput). ML accuracy target might go up to 90% from 80%.

In an agile development process, these milestones can be refined with successive iterations/sprints (perhaps a subset of your requirements applicable to those sprint).

- Sensor Metrics
  - Reusable
  - Can measure temps 25 – 110 F
  - Accurate to within 1 degree
  - 8-hour battery life
  - Moisture resistant (IP64 rating)
  - 1” diameter
- Housing Metrics
  - Ability to withstand the force of fall or collision
  - Ability to withstand temperatures in the range of -20 to 110 F
  - Dust/Moisture resistance (IP64 rating)
- Communication Metrics
  - 99% uptime while in range
  - 200 yard connection range

2.4 Project Timeline/Schedule

• A realistic, well-planned schedule is an essential component of every well-planned project

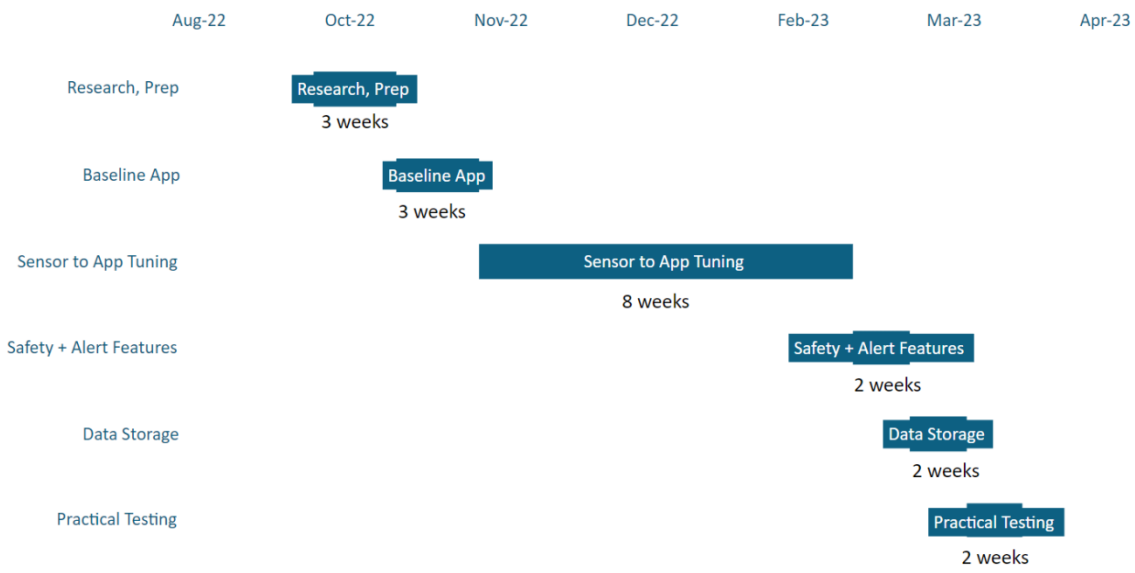
• Most scheduling errors occur as the result of either not properly identifying all of the necessary activities (tasks and/or subtasks) or not properly estimating the amount of effort required to correctly complete the activity

• A detailed schedule is needed as a part of the plan:

– Start with a Gantt chart showing the tasks (that you developed in 2.2) and associated subtasks versus the proposed project calendar (including both 491 and 492 semesters). The Gantt chart shall be referenced and summarized in the text.

– Annotate the Gantt chart with when each project deliverable will be delivered

• Project schedule/Gantt chart can be adapted to Agile or Waterfall development model. For agile, a sprint schedule with specific technical milestones/requirements/targets will work.



- Research , Prep: short phase to find suitable hardware and software design that can be applied to project.
- Baseline App: App to test interface as well as basic ommunication capability with sensor, can be started while research and prep are still in progress.
- Sensor to App Tuning: Most involved task in project, bulk of work to get full compatibility between app and sensor. Will need to deal with backend development, communication systems, and potential modifications to hardware.
- Safety + Alert Features: Fine-tune alert to users for cold temperatures, additional alerts for communication/hardware failures.
- Data Storage: Storage of user data and temperature trends.
- Practical Testing: Test product in a variety of environments to ensure functionality.

2.5 Risks And Risk Management/Mitigation

Consider for each task what risks exist (certain performance target may not be met; certain tool may not work as expected) and assign an educated guess of probability for that risk. For any risk factor with a probability exceeding 0.5, develop a risk mitigation plan. Can you eliminate that task and add another task or set of tasks that might cost more? Can you buy something off-the-shelf from the market to achieve that functionality? Can you try an alternative tool, technology, algorithm, or board?

1) Users aren't satisfied with comfort and interaction with hardware
    a. Mitigation: Take consideration from client on user needs and personal experiences. Prototype with multiple hardware options to arrive at the best solution while meeting user needs.
    b. Risk Probability: 50%
    c. Severity: Moderate
2) Can't find appropriate temperature sensor
    a. Mitigation: Determine what is necessary to meet user needs and communicate with mentors/conduct research to determine what is feasible hardware-wise.
    b. Risk Probability: 20%

    c. Severity: Minor
3) App doesn't satisfy user needs
    a. Mitigation: Gather client input and expectation during weekly meetings. Base application around these functions.
    b. Risk Probability: 50%
    c. Severity: Moderate
4) Interface issues between app and hardware
    a. Mitigation: Prototype transmitters and develop early-stage app to determine functionality.
    b. Risk Probability of resolvable issues: 80%
    c. Risk Probability of unresolvable issues: 5%
    d. Severity: Moderate
5) Wireless communication issues between sensors and RF gateway
    a. Mitigation: Research and select the best form of wireless communication to overcome distance and obstacle issues.
    b. Risk Probability of resolvable issues: 65%
    c. Risk Probability of unresolvable issues: 5%
    d. Severity: Moderate

Agile project can associate risks and risk mitigation with each sprint.

2.6 Personnel Effort Requirements

Include a detailed estimate in the form of a table accompanied by a textual reference and explanation. This estimate shall be done on a task-by-task basis and should be the projected effort in total number of person-hours required to perform the task.

Milestone	Number of Weeks	Expected Hours
Buy, plan, and research sensors	3	168
Develop a baseline application	3	168
Work on application-sensor communication	8	448
Alert + safety features implementation	2	112
Data storage implementation	2	112
Practical testing	2	112
Total	18	1120

Our team is expecting to spend 8 hours per member per week contributing to the design project. With 7 members, this gives us 56 hours to work in a given week. Our schedule is divided into tasks on a week-by-week basis, so each task is easily divided into 56 hour increments.

2.7 Other Resource Requirements

Identify the other resources aside from financial (such as parts and materials) required to complete the project.

- Rental equipment - Embedded system/microcontroller rental from ISU library for prototyping, soldering equipment from TLA or ETG
- Multiple different thermocouples, thermistors, and ICs to test which is best for this project
- Multiple RF modules to test which has the best range: LoRa, Generic 433Hz transmitter/receiver, NRF24, HC12
- Additional hardware components: Bluetooth module, power supply, jumper wires, resistors, etc.
- Equipment for sensing hardware enclosure