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 group will adopt the waterfall methodology due to the time constraints of this project being two semesters. It makes more sense in our mind to start with a waterfall approach. The first semester will primarily be dedicated to the design and procurement of required parts (PCBs, servos, etc.), followed by our device's construction and eventual implementation in the second semester. This methodology also follows more in line with the expectations of the client/advisor so far in our biweekly meetings.

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.

Our group will use the Git framework and ISU ECpE Git Repository for project management. We will also keep the team website up-to-date with any relevant group information, along with meeting minutes. Regular assignments and updates to complete assignments for the upcoming weeks will be managed via discord.

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.

Design:

- **Determine which PCBs will work**
- **Design PCBs that we won't be able to procure**
- **Keep updated diagrams of projected design**
- **Decide which servos will achieve the desired result**
- **Design a rough idea of how the device will interface with labview program**

Procurement:

- **PCBs**
- **Suitable box that can hold a vacuum and block out outside light**
- **Gas regulators**
- **Photosensitive device to test**

- **DUT probes**

Construction:

- **Assemble the different components.**
- **Check vs project requirements**
- **Write software interface**

Implementation/Testing:

- **Attach software interface to device**
- **Test device output vs expected results**
- **Make adjustments accordingly**

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 sprints).

Design Milestones:

- **Design circuit schematic and PCB which pass KiCad DRC**
- **Select a servo motor based on size of PCB**
- **Make final parts list with projected cost**
- **General plan for labview program**

Procurement Milestones:

- **Order PCB**
- **Obtain a box that meets the requirements for the device**
- **Obtain gas regulators, probes, and photosensitive device**

Construction Milestones:

- **Solder parts to PCB**
- **Attach PCB to motor**
- **Assemble PCB, motor, gas regulators and probes within the box**
- **Finalize software interface to output desired data**

Testing Milestones:

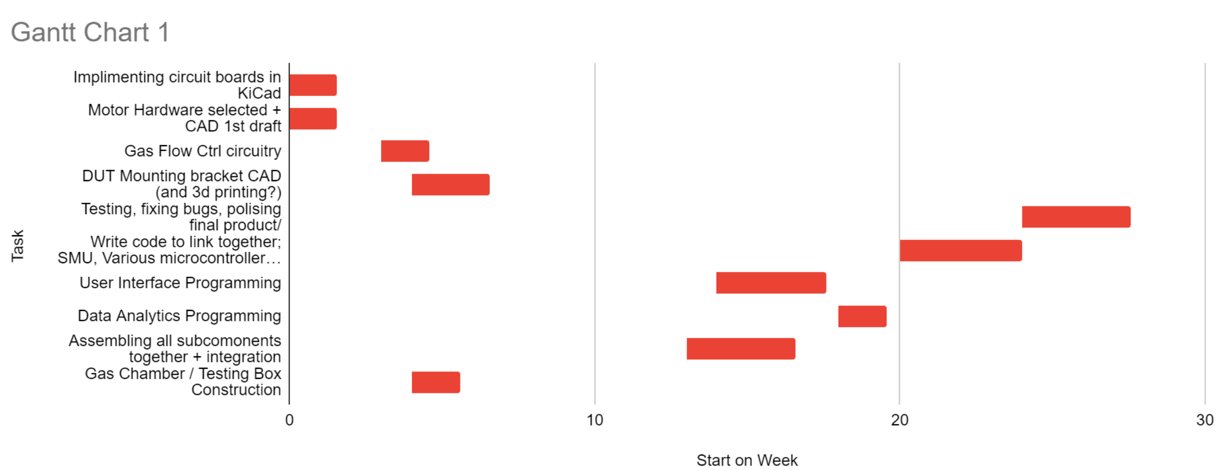
- **Software attached to device and outputs data as expected**
- **Calculate expected results and achieve 90% accuracy compared to device output**

- **Make any necessary hardware or software modifications**

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 models. For agile, a sprint schedule with specific technical milestones/requirements/targets will work.

1	Task	Start date	End date
2	Implimenting circuit boards in KiCad	Oct-17	Oct 28
3	Motor Hardware selected + CAD 1st draft	Oct 17	Oct 28
4	Gas Flow Ctrl circuitry	Nov 7	Nov 18
5	DUT Mounting bracket CAD (and 3d printing?)	Nov 14	Dec 2
6	Testing, fixing bugs, polising final product/	Apr 3	Apr 28
7	Write code to link together; SMU, Various microcontrollers controlling the device, User Program running on desktop.	Mar 6	Apr 3
8	User Interface Programming	Jan 23	Feb 17
9	Data Analytics Programming	Feb 20	Mar 3
10	Assembling all subcomonents together + integration troubleshooting	Jan 16	Feb 10
11	Gas Chamber / Testing Box Construction	Nov 14	Nov 25



2.5 Risks And Risk Management/Mitigation

Consider for each task what risks exist (certain performance targets may not be met; certain tools 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?

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

There is a risk when making a circuit on a PCB, as any mistake could destroy the component on the circuit. The first risk is that when soldering components onto the PCB, we might make a mistake that might cause the PCB to not work as we want. So, we should order more of the PCB before we start soldering to prevent us from paying an unnecessary processing fee for the manufacturer to send us a new PCB. Then another risk is when we make a microcontroller for our circuit. Building a microcontroller for our project could save us some cost from buying a ready-made microcontroller. However, there is a risk in building the microcontroller as the component for making the microcontroller is fragile and hard to solder onto the PCB. Therefore, if we cannot find any way to build our microcontroller, we could get a ready-made microcontroller which is called Arduino Uno, that would cost around 25 dollars each.

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 the total number of person-hours required to perform the task.

1	Task	Start date	End date
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In terms of weeks and working hours that is

Task	Start on week	Duration (weeks)	In terms of hours per member (5 project hrs/week)	Assuming average of 2 members dedicated per project
Implimenting circuit boards in KiCad	0	1.571428571	7.857142857	15.71428571
Motor Hardware selected + CAD 1st draft	0	1.571428571	7.857142857	15.71428571
Gas Flow Ctrl circuitry	3	1.571428571	7.857142857	15.71428571
DUT Mounting bracket CAD (and 3d printing?)	4	2.571428571	12.85714286	25.71428571
Testing, fixing bugs, polising final product/	24	3.571428571	17.85714286	35.71428571
Write code to link together; SMU, Various microcontrollers controlling the device, User Program running on desktop.	20	4	20	40
User Interface Programming	14	3.571428571	17.85714286	35.71428571
Data Analytics Programming	18	1.571428571	7.857142857	15.71428571
Assembling all subcomonents together + integration	13	3.571428571	17.85714286	35.71428571
Gas Chamber / Testing Box Construction	4	1.571428571	7.857142857	15.71428571

We had made estimates that on average our team members would be able to dedicate 5hrs of deliberate work to the project per week (1 hr per weekday). From there, members had decided which projects would likely be handled by who and made estimates when we would be able to start and comfortable deadlines for that project.

2.7 Other Resource Requirements

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

Resource requirements:

1. **PCBs**
2. **Servos**
3. **Probes for the DUT**
4. **Box that can hold a vacuum and block out light.**
5. **Gas regulators/valves & tanks**

UI requirements:

1. **Provide tables of processed data**
2. **Easy to navigate**
3. **Gives an option to view raw data**