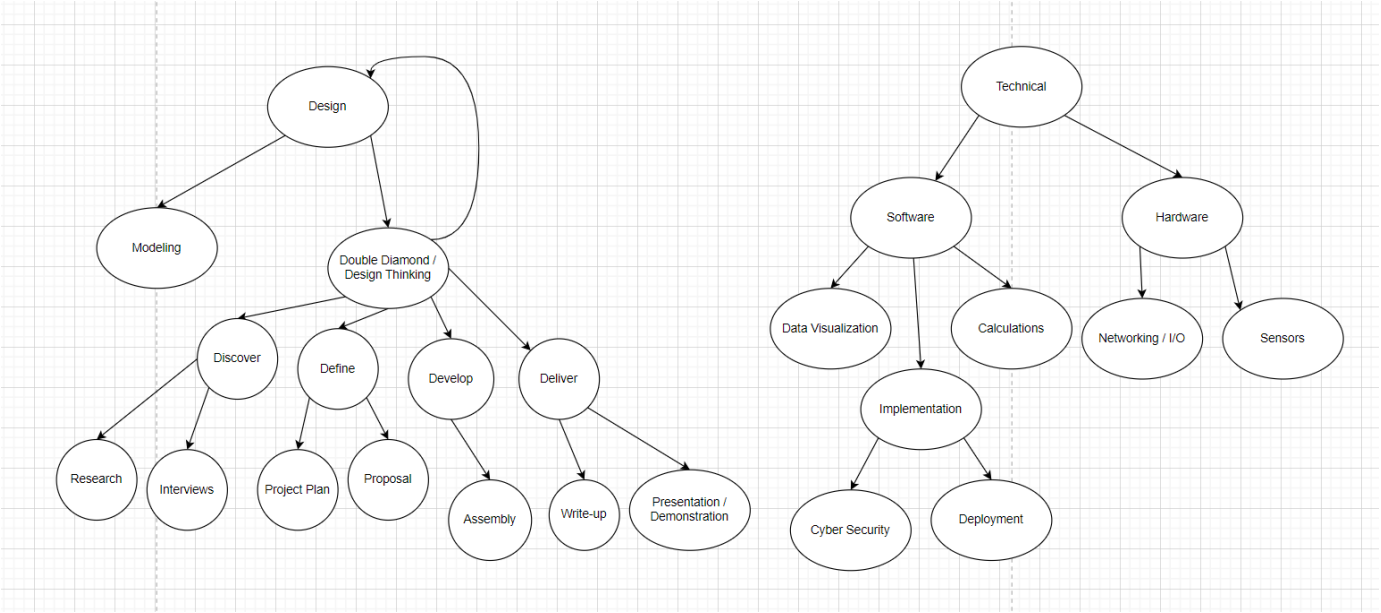
2 Project Plan

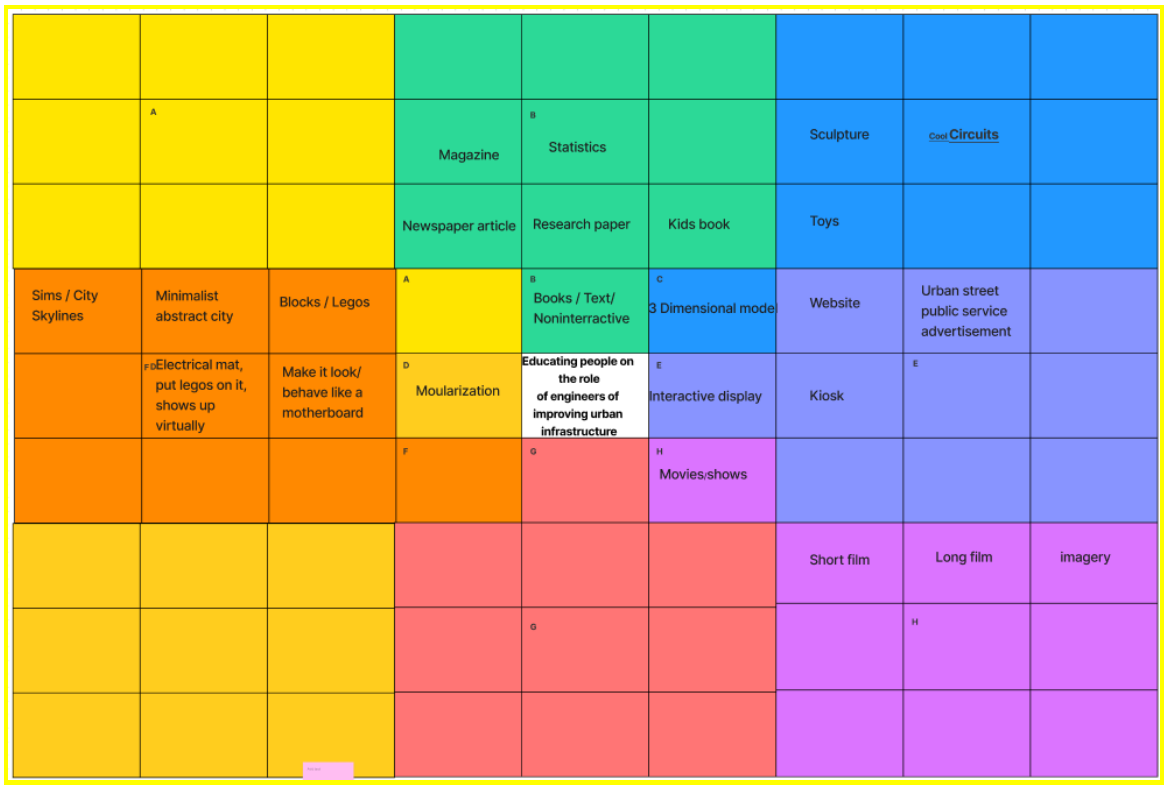
2.1 Task Decomposition

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. At minimum, this section should have a task dependence graph, description of each task, and a justification of your tasks with respect to your requirements. You may optionally also include sub-tasks.



- Design - Planning out the requirements that are derived from the project proposal
    - Modeling - Includes any artistic elements that enhance the final deliverable
    - Double Diamond / Design Thinking
        - Discover - Performing research on the topic we are given so we can make informed decisions regarding how we can build a solution to the problem statement
            - Research - Reading text sources that relate to the genre of problem
            - Interviews - Talking with experts on campus to learn more about what they would like to see out of our project
        - Define

            - Project Plan - We now contribute our findings from the Discover phase to culminate a plan that meets the needs and requirements of both the project and the client
            - Proposal - Verify with the client that the team's findings and project plan align with their interests and intent.
        - Develop
            - Assembly - Follow through with your project plan and verify that you are meeting expectations that were set by yourself, your teammates, and your client
        - Deliver
            - Write-up - Write thorough documentation that explains all the steps of the process necessary to operate your project
            - Demonstrate - Showcase your project to the client, using technical language that the audience understands
- Technical
    - Software - components that visualizes data from the hardware and calculations made on the backend
        - Data visualization - Show data that is expressive and informative that captures the attention of the target audience
        - Implementation
            - Cybersecurity - Cybersecurity that ensures the project will stay live without any major interruptions and low maintenance
            - Deployment- Deployment that is easy to configure, with simple teardown and setup, even for inexperienced users.
        - Calculations - Calculations that are essential to demonstrate the impacts of designed urban development
    - Hardware - components that capture the user input and enables the installation to be interactive for people of all ages
        - Networking- Networking which communicates the state of the system, whether that be user interaction or other state changes, in a timely manner so the software can perform the tasks needed with the lowest latency
        - Sensors - Sensors that are accurate and are tested and measured to gauge the correct amount of force or interaction before certain data is sent to the software.



2.2 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.

We are adopting waterfall management.
At the outset of our project, we referred to the "14 Grand Challenges for engineers" and selected "restore and improve urban infrastructure" as our primary focus. This decision marked the first phase of our project. In alignment with the characteristics of the Waterfall model, once this phase was set, we proceeded to the next step. Thus, our subsequent task was to delve into the specific issues associated with urban infrastructure.
After in-depth discussions, we identified six primary research areas:

-Power Group
-Energy sustainability
-Cybersecurity
-Civil
-Business
-Urban design

As part of the Waterfall model approach, we believe that a comprehensive review of the work from a preceding phase is vital before embarking on the next. This ensures that we don't overlook any crucial information or essential details.
Consequently, in line with the linear progression of the Waterfall model, the objective of our next phase is to interview experts within our campus who have notable research and insights in the

aforementioned areas. Through their professional feedback and opinions, we hope to refine our research directions and strategies, laying a solid foundation for the subsequent development and implementation phases.

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.

We will use Discord for quick communication and for short voice calls when there is an action that needs fast input from multiple members of our team. Figma will be used for visual collaboration in addition to idea generation. The instructor-provided GitLab repository will be utilized for version control of our software components with Git. Additionally, we will be keeping track of milestones and task progress using GitLab's built in Issues and Tasks tracker.

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 2.1. 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).

Some aspects of our project cannot be quantified, so we use words to describe the problems we are currently solving. For example, we make sure we have communicated with the professors and got their suggestions before the next group meeting, and then discuss how to choose what we want. Part of it provides information for the next stage of brainstorming.

2.4 Project Timeline/Schedule

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

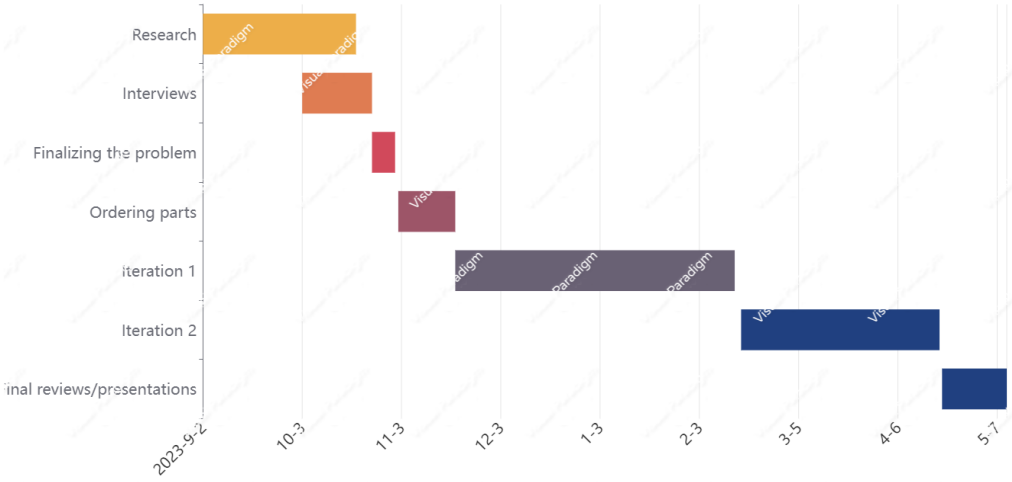
• Most scheduling errors occur as the result of either not properly identifying all of the necessary activities (tasks and/or subtasks) or not properly estimating the amount of effort required to correctly complete the activity

• 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. 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.



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?

During this early development stage the risks we face are of low to medium impact. Problems that might affect the long term success of our project are generally those that impede planning, clarity of vision, coordination, and execution of tasks.

Such risks are:

- Miscommunication
    - Different vision of project outcome
    - Different understanding of requirements
- Disagreement
    - Different design goals
    - Different ideas about implementation
- Misdirection
    - Planning towards a dead-end
        - Unuseable hardware
        - Ill designed software
        - Not seeing solutions
        - Accidental intellectual property theft

These risks are inherent in all team efforts. Our mitigation strategy is built into the waterfall+agile design management methodology. We will be using regular directed meetings and status updates integrated into each sprint to bring up misunderstandings or other issues as early as possible.

The nature of these risks is that they will always be present and no risk management control will be able to completely eliminate them, but the Agile project methodology allows the reassessment of risks and risk mitigation with each sprint, therefore we will be able to regularly reassess these issues.

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.

Member Name	**Task**	**Hours Spent**
Everyone	Research - Everyone is to research areas of our project. ● Read 14 Grand Challenges For Engineers and find a topic that we are interested in. ● Conduct additional research on those topics of interest. ● Select a topic to pursue as a group (we have selected Restore and improve urban infrastructure as our topic). ● Conduct research on said topic.	● 5-8 hours spent reading documents and conducting research on topics that interest us. ● After selecting a topic as a group, spend roughly 5-8 hours researching our topic.
Everyone (individually)	Faculty meeting - Everyone is to research their specific area and meet with a professor in that area to discuss our project as it pertains to their specific field. ● Karandeep - engineering sustainability ● Ally - business (recommendations for public services they'd	Everyone is expected to spend roughly 5-8 hours researching and meeting with their respective professors. The meeting doesn't have to be very long; however it is expected that the group member has conducted sufficient research in the topic to be able to ask the professor/advisor detailed questions.

	like to see development in) ● Zheyuan - Power group ● Austin - cybersecurity ● Grant - urban design (college of design) ● Bahar - civil	
Everyone (together)	Finalizing the problem - As a group we will meet and discuss the information we have gathered by meeting with our respective faculty members. We will then decide on how we want to proceed moving forward into the Define phase of our project.	1-3 hours
Everyone (together) and for ordering parts we will select someone during the meeting to do it.	Design brainstorming and ordering parts - We will meet and discuss the design of our project and then begin to order parts. We will select someone during these meetings to conduct research on where these parts can be purchased and order them.	We will discuss our design over the course of 2-3 weeks and will meet regularly during those 2-3 weeks and order the parts as needed. Roughly 3 hours per week will be spent weekly on this.
Everyone	Iteration 1 - This will be the design planning section where we have parts ordered and will conduct testing as needed. It will be very modular to ensure that components of our design are coming together and we will constantly be updating and implementing our design during this phase.	As of right now we don't know because we have not reached this phase in our project. When we reach this phase we will update this section however for right now it is expected that all group members try to contribute at least 5-8 hours a week.
everyone	Iteration 2 (second semester) - This will be a mix of continuously updating our design as we encounter issues and also implementing our design. There haven't been any specific tasks assigned yet for this portion because we have not yet reached this phase in our project. When we reach this point we will update this	As of right now we don't know because we have not reached this phase in our project. When we reach this phase we will update this section however for right now it is expected that all group members try to contribute at least 5-8 hours a week.

	section to become more specific.	

2.7 Other Resource Requirements

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

- **Access to fabrications tools such as 3d printers in the Student Innovation Center and a PCB printer. We may also need to utilize woodworking and other forms of manufacturing.**
- **Input from faculty experts so the project can be designed to be as relevant and useful as possible as an education tool.**
- **A space for our team to assemble, store, and use the components of our project. Our team's project will be relatively large so we most likely need a dedicated studio or a designated space where we can work, store parts, and collaborate in-person.**

Generally, the public lacks awareness of engineering problems, specifically the 14 Grand Challenges for Engineering, and their states of development. The understanding that the public has of the Grand Challenges (what they are and current state) influences their enthusiasm and engagement. If they do not understand the Challenges, then they will not have enthusiasm or engagement with their solutions. If they understand them then they will (more likely) have enthusiasm and engagement with their solutions. To address this issue, we aim to develop an interactive installation that appeals to people of all ages and effectively conveys Grand Challenges and their current states of development. An enthused and engaged public is a source of funding, research (new minds) and application. If the public is more educated, then Grand Challenges are more likely to be solved in a faster time. We will use an artistic demonstration to engage and educate the public in the state of urban infrastructure development as a means to ensure they support the research and development of Grand Challenges.