Fall Project Proposal #1 – Collaborative Edge-Cloud Machine Learning For Wildfire Detection

Names of Team Members, Team Member Role, UCI email addresses:

1. Hussain Mahuvawala | Machine Learning Engineer | hmahuvaw@uci.edu
2. Rich Soong | Machine Learning Engineer | rsoong1@uci.edu
3. Zayd Ameen Salem | Machine Learning Engineer | zasalem@uci.edu
4. Muhammad Shahmir Shamim| Machine Learning Engineer | msshamim@uci.edu
5. Sidhartha Shah | Machine Learning Engineer | sidhars3@uci.edu
6. Sakaar Raina Sopori | Machine Learning Engineer | ssopori@uci.edu

Updated Project information

Name of Faculty (and other official) advisors:

1. Professor Hamid Jafarkhani | hamidj@uci.edu
2. Dr. Mohammad Reza Barzegaran | barzegm1@uci.edu

Weekly check-in mode (in-person, Zoom, email, mixed) and tentative day/time:

In-Person

Tentative Day/Time: Not set Yet

Updated Summary of Chosen Project

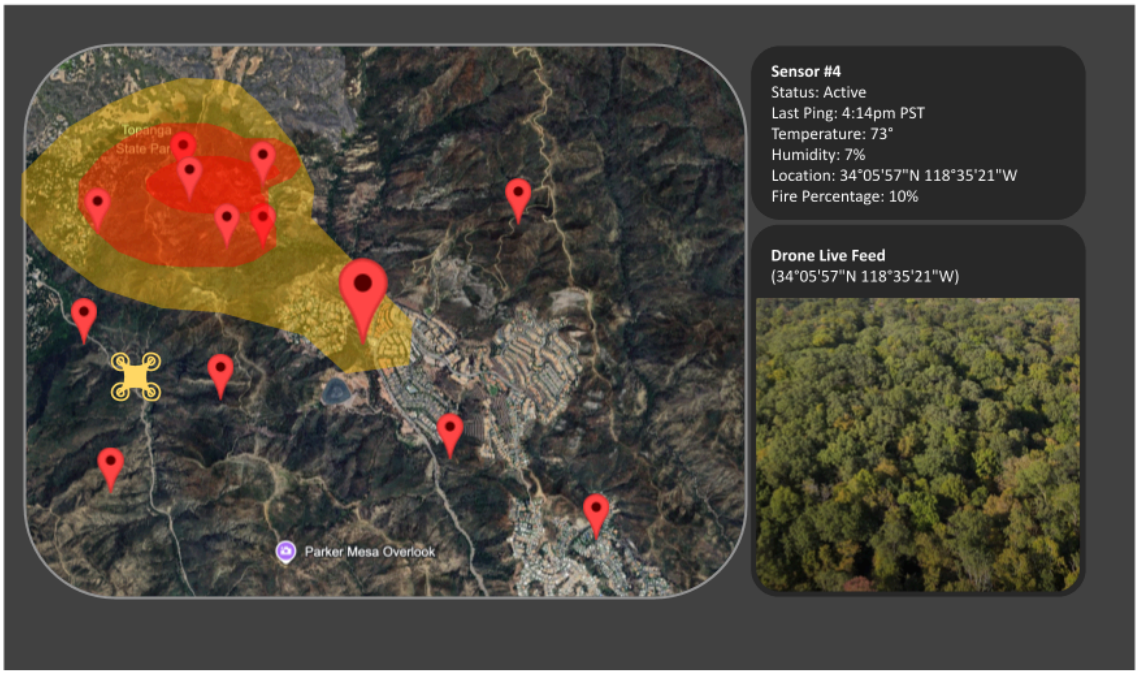
Individual research on various machine learning algorithms.

Need to create a dashboard to present the entire system:

- Develop a **dashboard** that integrates sensor and drone data for real-time fire monitoring.
- Show a **map of deployed sensors** with live drone movement tracking.
- Display **pop-ups** when the drone passes over a sensor, including latest image, timestamp, and fire likelihood percentage.
- Use **ML models on sensors** to predict fire likelihood, while the server/drone computes and visualizes the predicted fire radius.
- Employ an **edge-based approach** to reduce drone computation and enable faster, more efficient decision-making.

We are also tasked with creating the machine learning model on the edge devices so that the computation can be made easier and the algorithm computation on the drone can be less computationally heavy

Updated Visual Representation of Project



[Github Repository Link]

Updated Major Tasks and Planned WorkLoad Split

We will breakdown milestones to individual weekly tasks and assign each task to 1 responsible member
If multiple members needed for a task we will break down that task into sub-tasks

Weeks 1–2: Research & Foundations

- Literature review of wildfire ML methods.
- Collect and organize datasets (FireNet, SEN1-2, MODIS, NWPU).
- Define project scope & key metrics (accuracy, recall, inference time).
- Familiarize group with existing nodes and drone data to be used.

Weeks 3–5: GUI + System Blueprint

- Design simple UI mock-ups (upload image → wildfire/not wildfire + confidence).
- Decide what outputs to display (alerts, probability scores, heatmaps).
- Document the high-level pipeline: dataset → preprocessing → model → UI.

Weeks 6–8: Light ML Model

- Build a very lightweight baseline ML model (e.g., small CNN or pretrained MobileNet).
- Train/test on a **small subset** of wildfire datasets.
- Connect the dummy model to the UI for demo purposes (not production-level, just proof of concept).

Weeks 9–10: Documentation & Deliverables

- Summarize research findings + architecture design.
- Document dummy model implementation + results.
- Finalize slides, UI screenshots, and demo video.

Role Assignment Example

- **Hussain Mahuvawala (Research Lead):** Literature review & related work.
- **Rich Soong (Data Lead):** Dataset collection & preprocessing framework.
- **Zayd Salem (Architecture Lead):** System pipeline diagrams & workflow.
- **Muhammad Shahmir Shamim (UI Lead):** UI/UX wireframes and mock-ups.
- **Sidhartha Shah (Documentation Lead):** Reports, slides, and integration of all work.

Estimated Deliverables at Major Milestones (i.e. every ~100 hours of development)

Here's a basic plan for our project checkpoints. This breaks down the project into a few phases, with a clear list of what we'll have to show at the end of each one to make sure we're on track.

Milestone 1: Research & Planning (End of Week 2)

- Basically, this phase is about making sure we've done our homework and have a solid plan before we dive into the main work.
- Research Summary: A short write-up of our background research. This will cover the key information we found and explain the overall approach we've decided to take.
- Resource & Data Plan: A list of the key datasets, materials, or software we'll need for the project. We'll include links and a quick note on how we plan to use them.\
- Project Scope Document: A simple one-page doc that clearly states our main goal. It will list the core features we are definitely building and, just as importantly, a few things we've decided not to include to keep us focused. We'll also define what "success" looks like for our project.

Milestone 2: Design & Blueprint (End of Week 5)

- At this point, we'll have a complete visual and technical plan. This is about figuring out how we're going to build it before we actually build it.
- Design Mockups / Sketches: A visual plan for what we're making. For a software project, this will be UI mockups in a tool like Figma. For a hardware project, this will be detailed sketches and diagrams. It will show what the final product should look like.
- Architecture/System Diagram: A simple flowchart showing how all the different parts of our project fit together. This makes sure everyone on the team understands the big picture.
- Technical Plan: A brief document outlining the nitty-gritty details. This might be a list of key functions for a coding project or a list of parts and components for a hardware project.

Milestone 3: First Working Version (Proof of Concept) (End of Week 8)

- This is when we'll have the first real, working version of our project. It won't be perfect, but it will prove that our main idea works from start to finish.
- Functional Core Component: The most important part of our project will be up and running. For example, the main algorithm will be working, or the primary electronic circuit will be functional.
- Initial Prototype: A working, end-to-end version of the project that can perform its main function. It might be clunky, but it will be a complete system.
- Proof-of-Concept Demo Video: A quick video showing our prototype in action. This is the easiest way to demonstrate our progress and prove that our concept is solid.

Milestone 4: Final Project & Wrap-up (End of Week 10)

- This is the final stretch where we polish everything, finalize our work, and prepare for the final presentation and submission.
- Final Report & Documentation: A complete document that brings everything together: our initial research, the design, technical details, final results, and a conclusion about what we learned.
- Final Presentation Slides: The slide deck we'll use for the final presentation, summarizing the entire project.
- Completed Project & Source Files: The final, polished version of our project. All our files will be cleaned up and organized, with a simple README file explaining what the project is and how to run it.

Additional Comments / Advisor Feedback