

EE/CprE/SE 491 Weekly Report

10/15 - 10/21, 2025

sdmay26-20

AI Integrated Drone for Smart Crop Health and Growth Monitoring

Faculty Advisor/Client: Md Maruf Ahamed

Team Members:

- Jongmin Lee, jongminl@iastate.edu - Backend/AI
- Z Harvey, zdharvey@iastate.edu - Frontend/Backend
- Andres Lopez, andresl4@iastate.edu - Hardware/Firmware
- Alex Pallan, apallan@iastate.edu - Cloud/Security
- Camden Senneff, csenneff@iastate.edu - Frontend/Drone SW
- Caleb Zea, calebzea@iastate.edu - Frontend/Backend
- Srdan Kopunovic, srdank@iastate.edu - Backend

Summary of Work:

The team compiled and updated the drone list and desired parts based on updated requirements and rules sent out by the university due to updated safety measures. We have received our project server that will be used for both the backend, as well as communication with the microservice that will be used for AI processing, and need to work through this week to deploy our program. Created a UI for the login/registration, as well as worked to implement basic user authentication. Tested initial endpoints to help understand what data exchange we will need moving forward for our project solution.

Work Period Accomplishments:

- Frontend
 - Updated front page to include data images (using a temporary image for now) that will eventually link to their respective data pages.
 - Added a login page using React routing, with data pages to follow.
 - Added dynamic resizing of data images, as well as the gaps between them, to maintain UI/UX integrity with dynamic screen sizes.
 - Created each of the data image objects in their own frontPageData.ts class so they can have their own CSS rules and can have their own special rules.
- Backend
 - Restructured base backend for a more maintainable and intuitive design, as well as proper ASP.NET layout to follow best practices
 - Created base endpoints for testing database and server deployment and communication with frontend
- Cloud

- Created shared AWS account using mailing list for every team member to have access to
- Configured authentication for the CI/CD gitlab runner to work with terraform to deploy infrastructure to our cloud environment
- Started with cognito and database infrastructure
- Drone
 - Researched more drone options and submitted a new recommendation, including safety and feasibility details.
 - Set up automatic building of Raspberry Pi OS images with the drone software preinstalled, and set up in CI so that images are automatically created when drone software is merged into main.
- AI
 - Began exploring model architectures suitable for crop health analysis, including lightweight CNNs optimized for drone imagery.
 - Tested initial dataset preprocessing scripts (image resizing, normalization, and augmentation) to prepare for model training.
 - Evaluated public agricultural datasets such as PlantVillage and CropDisease to determine which can be adapted to Iowa crop types (corn and soybean).
 - Outlined the AI pipeline design, including how captured images from the drone will be transferred, stored, and processed through the backend for inference.
 - Coordinated with backend and cloud teams to plan how the AI microservice will connect with the existing AWS infrastructure.

Plans for Coming Week + Action Items:

- Jongmin Lee - Next week, I plan to finalize the dataset and begin training a baseline CNN model in PyTorch to test accuracy and inference speed. I will also start integrating the AI service with the backend, defining endpoints for image upload and prediction results. Additionally, I'll coordinate with the drone team to ensure captured images are compatible with the AI model's input format.
- Z Harvey - Finalize connection between frontend and backend. Send mock flight data from backend and try to display it on frontend. Also develop the UI for showing flight information. Test login features and develop baseplates of UI to get the base app developed more.
- Andres Lopez - Discuss with our advisor Maruf and with professor Dr. Jones to talk about what concerns they have and receive guidance from them. If the parts arrive then build it and start working on flying the drone.

- Alex Pallan- Fully migrate the database into our AWS environment and make sure every team member is able to deploy and access infrastructure using terraform on every gitlab push.
- Camden Senneff - If the drone parts arrive, I will help assemble it. I will also get UART communication working in our drone software.
- Caleb Zea - Add remaining data pages and revisit the design document to determine the number of different primary data types we may want to display on the home screen. Clean up the home page and plan the rest of its layout.
- Srdan Kopunovic - Implementing AWS authentication for user login, and start implementing PostgreSQL for the database now that our test database is set up properly and we made sure it is working with the API calls. Help Alex configure our cloud system, and work with the frontend team on brainstorming the layout for the flight planning UI.

Pending Issues:

- Jongmin Lee
 - Additional AI progress is limited by the lack of diverse, crop-specific datasets and pending access to GPU or cloud resources for training. Inconsistent image quality from uncalibrated drone cameras may also affect preprocessing accuracy. Coordination on data formats and AWS integration timing will be essential to ensure smooth data transfer between the AI system and backend services.
- Z Harvey
 - Frontend/Backend communication, other than that, just spending time developing the software.
- Andres Lopez
 - I want to look into more about other drone projects as we get closer to building the drone to perhaps receive information going forward.
- Alex Pallan
 - API endpoints are not defined and neither is the cloud functionality. We will need to work as a team to figure out what that will look like and what is the best way to go forward.
- Camden Senneff
 - I need to continue making progress on the drone software so we're ready to fly ASAP, but it is difficult to know the specifics of the implementation while we still do not have a drone.
- Caleb Zea

- Frontend/Backend communication. Once receive endpoint information will be working on that for the end of the week instead of whatever was otherwise planned in order to maintain project cohesion
- Srdan Kopunovic
 - Now that our group got our team server from the department, the main focus is establishing communication between the frontend and backend, and ensuring database consistency.

Individual Contributions:

Team Member	Contribution	Week Hours	Total Hours
Jongmin Lee	Completed Section 4.1.3 of the design document, detailing the project's technical complexity and outlining the scientific and engineering principles behind each subsystem. I focused on developing the foundation for the AI vision subsystem. I researched suitable crop health classification models, evaluated public agricultural datasets, and began preparing image preprocessing scripts for training.	5	26
Z Harvey	Worked on Design Document Part 4, and weekly report. I set up Github and created my own branch and workspace. Finalized an update to frontend to get the API endpoints to receive data from the backend. Added Basebone UI to continue developing next week. Added template for documentation for the API endpoints, will be added in either README or another documentation file in github.	6	21
Andres Lopez	Edited a document that Camden drafted that addresses concerns that the department has with drone projects. Researched more into drone systems to ensure that the document is polished. This document was sent to Maruf so he could forward our message to others in the department.	5	14
Alex Pallan	Worked on the design document part 4 with my team. Created a shared AWS account using the mailing list provided to us. Set up permissions and authentication for the CI/CD Gitlab runner. Gave some starter terraform and configurations for our AWS environment. Started on moving our database to AWS and thinking of API endpoint prototyping.	10	23
Camden Senneff	Completely reworked RPi image building and got it working in CI. Continued extensive research into if any other drone options existed; found a few and compiled them into a document. Additional research into the MSP protocol that will be used over UART to control the drone. Improved CI so we can keep larger artifacts (the frontend and Pi images) which are over the GitLab CI limit.	13	36
Caleb Zea	Design Document work. Added page routing and links in React, as well as a navigation bar that stays at the top center of the page regardless of which page you are on. Added home page CSS rules for window resizing in order to maintain image scaling, as well as scaling the space between images. Added rules for frontpage data in order to have 2 data images on the same line, and maintain similar sizing	11	32

	between images that are side-by-side, as well as images that are in the next line. Embedded links to their respective data pages in each data image. Added a login page that currently just contains a username and password text entry field and a submit button in order to test POST commands with the backend once endpoints are available.		
Srdan Kopunovic	I have remade the backend project for better and more intuitive structure, including separating components in API, Infrastructure, Test, and Core (Models), which allow for better architecture planning, and decoupling. Additionally, I have started working with Alex on implementing AWS services, including authentication, and cloud database integration and synchronization.	9	34