

EE/CprE/SE 491 Weekly Report

11/05 - 11/11, 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 - 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/Cloud

Summary of Work:

Our team has started implementing different parts of the project that work together, and more of the actual system working as a whole is starting to show. We have a proper frontend-backend connection, and are implementing the AI service with the rest of the system this coming week. The project infrastructure is fully set up on AWS and will be supported there for the remainder of the project. We anticipate the drone parts being delivered in the coming week, and plan on having it flying and testing flight planning in the next 2 weeks.

Work Period Accomplishments:

- Frontend
 - Rotational carousel for crop images
 - Basic frontend-backend API integration
 - Carousel images zoom out when clicked on
 - username/password API and interface setup
 - Authentication methods
 - Authentication API frontend setup
 - Stringified JSON return values from the GET requests
 - AWS Cognito frontend setup
 - Google Maps JavaScript API implementation with codebase
 - Overlaying grid on top of the JS API
- Backend
 - Completed Unit Tests for Service layer, including data manipulation
 - Set up CI for backend
 - Set up CD for server
 - Implemented endpoint for Image transfer within API layer
 - Organized updated timeline for the rest of the semester
- Cloud
 - Deployed the Cognito User Pool & the Database in AWS (with some fun figuring out what is and isn't the free tier (oops))
 - Finalized terraform CI/CD Pipeline for deployment
 - Started working with front/backend people for integration with AWS
- Drone
 - Completed additional MSPv2 testing
 - Planned tasks for the remainder of the required work for the drone software with implementation details
 - Began work on camera integration
- AI
 - Finalized preprocessing scripts for image normalization, labeling, and augmentation.
 - Successfully loaded and verified dataset subsets for training.
 - Monitored model accuracy and performance metrics during early runs.

Plans for Coming Week + Action Items:

- Jongmin Lee - Continue model training to improve detection accuracy and test with multiple dataset variants. Begin developing the API endpoint for inference requests to connect with the backend once the data pipeline is confirmed stable.
- Z Harvey - Reformat the grid and coordinate system that I've added on top of the Google Maps JS API to take actual flight data while communicating with the other APIs that we have set up internally
- Andres Lopez - Implement drone software to take pictures and store them in files to transfer to a computer.
- Alex Pallan - Change the endpoint for the database to the provided AWS one so that it is used instead of the provided server. Also work with frontend/backend to get user registration and login/logout working.
- Camden Senneff - Create the data transmission software in the frontend. Update Pi image building to create a data partition with the remainder of the SD card and mount it on boot for the drone software to use.
- Caleb Zea - more authentication work once it's set up in the backend, otherwise working on finishing the Cognito implementation and ensuring data security. Running POST and GET requests to validate that the application is set up and connected to the database properly and is performing within expectations
- Srdan Kopunovic - Complete setting up user authentication for the backend, and communicate with the frontend to test functionality. Update the original models to allow defining the type of crop being surveyed.

Pending Issues:

- Jongmin Lee
 - Encountering incomplete or corrupted images in certain datasets, requiring additional data cleaning before full-scale training.
- Z Harvey
 - Having internal API connection issues with changing the parameters of the flight then showing it correctly on Google Maps JS API.
- Andres Lopez
 - Working with raspberry pi for the first time has been cool but working through struggles of working with one for first time.
- Alex Pallan
 - Getting users registered and added to the user group we created
 - Making the proper fields in the database to store the data we need for the drone
- Camden Senneff
 - We're still waiting on drone parts to complete testing on the drone software. Still going to make as much progress there as possible with virtual testing.
- Caleb Zea
 - Currently getting an error from the Cognito quickstart guide
 - Waiting for further progress in the authentication realm
- Srdan Kopunovic
 - Integrate AWS user authentication
 - Create connection frontend-backend-AI service

Individual Contributions:

Team Member	Contribution	Week Hours	Total Hours
Jongmin Lee	Implemented preprocessing and data validation pipeline, initiated training of the crop detection model using HPC resources, and started preparing integration scripts for backend inference communication.	6	40
Z Harvey	Added implementation of the Google Maps Javascript API, replacing the old Google Maps static API that we were using before. It allows for a much more in-depth map. Created a merge request for this and implemented overlaying JS code in the form of a grid on top of the map after taking in code suggestions.	8	37
Andres Lopez	Camden helped with sorting out the code that is needed for the drone for now to begin working on. Begun working with a Raspberry Pi and camera to get software working for when the actual parts arrive.	6	25
Alex Pallan	I officially created the Cognito user group and provided some example code that AWS gives us to other group members to start testing authentication. I also created the database and showed Srdan where to find the endpoint for it. I suspect much tweaking is in our future but the cloud groundwork has been laid for this project.	9	32
Camden Senneff	Implemented additional testing on MSP implementation. Planned and wrote issues for the future tasks that we'll be working on in the drone software. Met with Andres to set up some test Pi hardware while we wait for parts.	6	48
Caleb Zea	Created a rotating image panel for imported crop images, implemented basic frontend API functionality, made it so images in the carousel zoom out when clicked on, added and updated a branch for username/password testing later, Authentication, frontend/backend API integration, authentication API frontend setup, stringified the JSON return values from the GET requests, AWS Cognito frontend setup	12	53
Srdan Kopunovic	Organized portion of the GitLab and Project Planning section for respective responsibility. Created Unit Tests for Service layer that covers data manipulation. Created endpoint for image transfer for API layer. Set up CI for the backend. Started working on user authentication.	8	50