

Report Details:

Timeframe: 10/8/2025 - 10/14/2025

Group number: 21 (*sdmay26-21*)

Project Title: A Smart Aquatic Ecosystem

Client &/Advisor: Md Maruf Ahamed

Team Members/Role:

Griffin Urban — Frontend Developer

Daniel Pender — Hardware

Aden Koziol — AI Population Tracking

Ryan Holden — Backend/Frontend Developer

Marina Mannan — Embedded Systems Engineer

Carson Irving — Backend/Frontend/AI

Max Purvis — Hardware

Weekly Summary

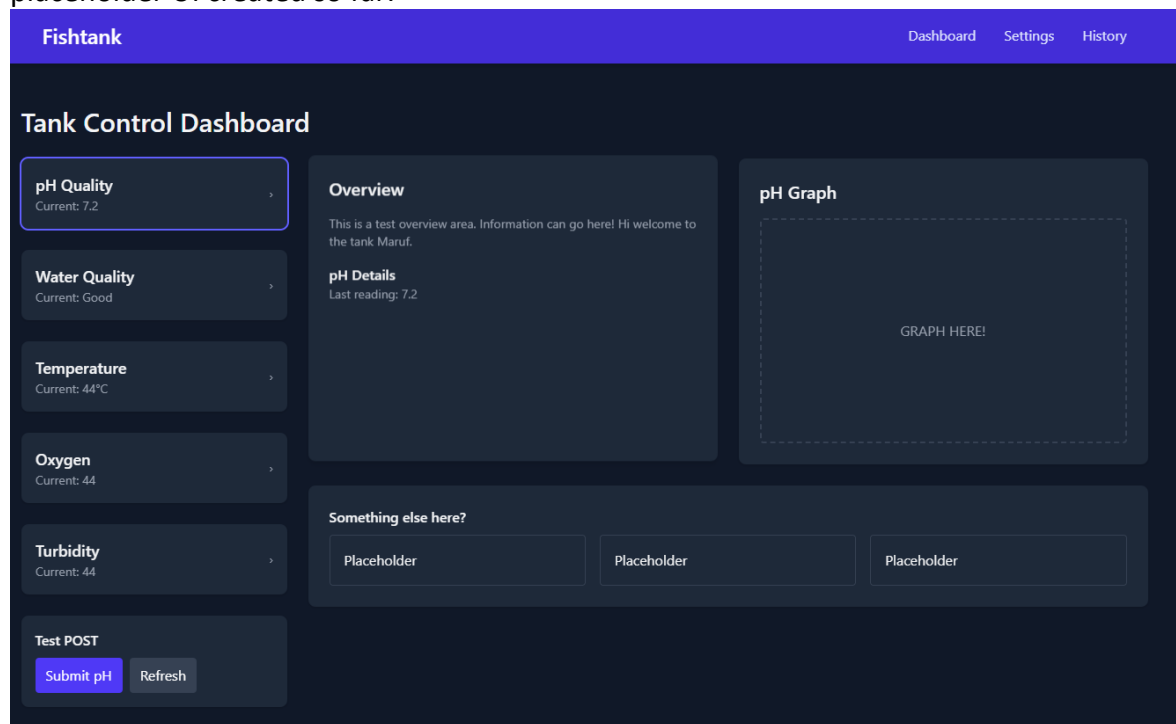
This week, our team's objective was to dive further into developing our respective components of the project. On the software side, we established communication between multiple systems, began training our AI model on fish images, set up server hosting for the backend, and prototyped the frontend UI. On the hardware side, we finally obtained the camera for AI usage and the tank itself after multiple delays and reorders. The team put in a great effort this week to make progress on multiple systems. Finally, we had a successful advisor meeting, which cleared up a few questions we had.

Past Week Accomplishments

- **Aden:** Kept working on AI population tracking. Did some testing and have decided to go the route of YOLO object detection. Found a few libraries to look into and test.
- **Marina:** Worked on Python HTTP requests to relay data from the Arduino to the backend. Implemented the POST and GET requests for temperature and verified that they are working in the terminal. Currently also have the (mock) data being saved to a .csv file and placeholder functions for turbidity, pH, and oxygen readings.
- **Carson:** Set up Azure VM Hosting for backend and database. I chose SQLite for the database as the free VMs have limited resources. I created Models (Objects) for all of the sensor readings that we will be needing. I created controllers for all of these models and worked on integrating them with the frontend. I configured the server with swap memory, as the VM only has 1GB of RAM, so swap will prevent our backend from being killed to save memory. I was also able to get a lot of styling and a basic theme for the frontend.
- **Max:** Looked into the feeding mechanism. Need to get an external power supply for a servo motor, as they can draw more current when rotating than the Uno can supply. Still figuring out how the actual mechanical part will work. I also looked into calibration for the pH and Dissolved Oxygen sensors. pH sensor has 4.0 and 7.0 buffer solutions along with a software library to calibrate the sensor. The Dissolved Oxygen sensor requires a 0.5 mol/L NaOH

solution for the probe to function properly. There are calibration steps in the guide, which should be simple because the temperature will be relatively constant. I also worked with the turbidity sensor to try and return actual NTU values by finding a trendline for the voltage vs percent graph, but the manufacturer's website has very limited and inaccurate information.

- **Danny:** Last week, I ordered the remaining sensors we needed, so our hardware list is now complete. I also started working on converting the turbidity sensor readings into usable NTU values through a reliable conversion method. On top of that, I found an Arduino-based automatic fish feeder that could fit our setup, and I've been brainstorming ways to house all the sensors in a clean, professional-looking enclosure.
- **Ryan:** Worked on the new frontend prototype dashboard with Griffin. Created card displays for water quality stats like pH and temperature. Continued testing HTTP requests between the frontend and the backend to update data.
- **Griffin:** Worked on developing the frontend for the project. Created a new branch for frontend work prototyping and created a new homepage/dashboard to display statistics, notifications, graphs, and left room for potential future expansions. Migrated the normal CSS to TailwindCSS, easier live editing, and better supported features. See below for the placeholder UI created so far:



Pending Issues

- N/A

Individual Contributions

<u>NAME</u>	<u>Individual Contributions</u> (Quick list of contributions. This should be short.)	<u>Hours this week</u>	<u>HOURS cumulative</u>

Aden	● Did research on YOLO object detection libraries. ● Found a few libraries that have been tested and a few more to test.	8	17
Marina	● Implemented POST and GET with the backend ● Save readings in the database and a .csv file	6	15
Carson	● Database integration with the backend ● Models for all sensors on the backend ● Controllers for all models ● Frontend integration pulling the most recent sensor readings ● Cloud Hosting Setup For Database and API	10	21
Max	● Servo for the feeding mechanism ● Calibration and setup for pH and DO sensors. ● Worked with the turbidity sensor	6	17
Danny	● Found auto-feeder design ● Order the final sensors ● Working on finding a way to make a housing for sensors	7	16
Ryan	● Worked on frontend dashboard design ● Tested sending HTTP requests back and forth between the frontend and backend	7	15
Griffin	● Developed a prototype design for the UI of the webpage ● Worked on implementing live updates on sensor fetches from the frontend	7	15

Comments and Extended Discussion

- N/A

Plans for Upcoming Week

- **Aden:** Continue testing YOLO libraries until I find a suitable one. Look into fine-tuning. Continue the prototype AI population tracking scripts.
- **Marina:** Work with the hardware team to test reading and storing (real) data from all four sensors in the lab. Once we get that working, I intend to look into the software and help in any way I can. Also, set up the group's senior design website.
- **Carson:** I plan on catching the frontend and Arduino up with the backend and working with the hardware team on getting the Arduino reporting sensor information to the backend every so often. While I got most of the basic frontend functionality working, I would also like to flesh out more of it and get more dedicated mobile browser support.
- **Max:** If the pH and DO sensors get here, I plan to get them set up and calibrated so we can start testing with them. I am also going to set up a servo motor and hopefully get started with the feeding. I also might look into different turbidity sensors if we decide we need to read actual values. There is one that is the same brand as the pH and DO sensors that has better information available on how to get real NTU values.
- **Danny:** Max and I will get all the sensors up and running, then hopefully get the values to get sent and received. Either find a housing online that would work for our sensors or figure out how to get the housing 3D printed. As Max suggested, our turbidity values are not making much sense when we try to convert to NTU, looking into finding a formula that can normalize the value to a usable NTU.
- **Ryan:** I plan to begin setting up the live sensor updates on the frontend. I want the frontend display to update any time the backend receives new information from the sensors. If possible, work with Griffin to set up graphs displaying the current and past data for each variable we are measuring in the water.
- **Griffin:** I plan on expanding the design of the frontend I have going so far. I need to get the notifications working with the backend to send emails (or possibly phone numbers in the future) to users. I'd also like to set up an account login page for the dashboard. Additionally, I would like to implement the history function to enable viewing of past readings. This will be very useful for plotting information on a graph.

Summary of Weekly Advisor Meeting

We had a few questions about how the water filtration system would work, and some more general project expectations. All of our questions were answered, and while we are still waiting on some ETG orders, we were able to communicate the progress we have already made. The meeting helped us get a better understanding of the scope of the project and mainly cleared up some confusion about the automated water filtration.