

Week 4

Team Contract Discussion

- Some of our initial thoughts and project goals below

Project Goals:

At the start of the semester, our team set out to design and build **AquaSense**—an affordable, ESP32-based water-quality monitor that would:

1. **Continuously measure pH, temperature, and dissolved oxygen** at 5–10 s intervals with specified accuracy (± 0.2 pH, ± 0.5 °C, ± 0.5 mg/L)
2. **Wirelessly stream real-time data** to a cloud-hosted dashboard with trend graphs and alert notifications
3. **Incorporate basic ML-based anomaly detection** on historical sensor data to proactively notify users of abnormal water conditions
4. **Maintain low power consumption**, allowing at least 30 days of battery-powered operation

By the end of the semester, we had:

- Completed **hardware integration** of pH, temperature, dissolved oxygen, and turbidity sensors on the ESP32 prototype board
- Launched a **React-based dashboard** with real-time charting, user-configurable thresholds, and push/email alerts
- Trained and validated a **Random Forest anomaly detector** on collected sample data, achieving >90% event-detection accuracy in controlled tests

We were able to meet a majority of our originally set out HLRs. In some cases (e.g. anomaly detection), we delivered a minimum viable solution rather than a fully production ready

model, but the foundational functionality is complete. This production ready gap can be accounted to our limited budget and timeframe

Expectations:

Our team contract laid out these ground rules:

- **Weekly stand-up meetings** every Monday.
- **Peer code reviews** on every GitHub pull request.
- Response time of **< 12 hours** for Slack messages during weekdays.
- **Equal division of labor**, with each member responsible for one subsystem and cross-review for another.

Throughout the semester, we:

- Held **13 of 14** scheduled stand-ups (one was canceled due to holiday).
- Conducted **100% of PRs** with at least two reviewers before merging.
- Maintained an average Discord response time of **4 hours** on weekdays.
- Tracked tasks in Trello and kept workload balanced within 10% per member.

In short, we met or exceeded the expectations in our contract. The only deviation was one missed stand-up, which we made up for with an extra pairing session the following day.

Roles:

Anurag Ray Chowdhury: Firmware and backend architect. Wrote the ESP32 sensor-read and cloud-upload code; set up the Node.js API

Michael Yan: Data scientist. Collected sensor data, developed the Random Forest and XGBoost models, and integrated ML inference into the dashboard

Arnav Garg: Hardware and PCB designer. Handled schematic capture, PCB layout, and power-management circuit