HydroSentinel

Autonomous Water Level Monitoring Drone

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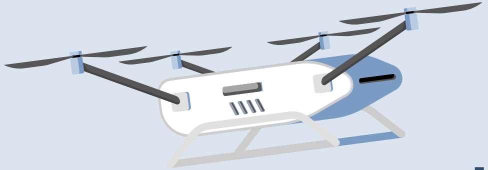
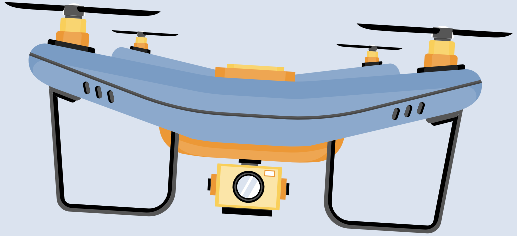
INDIAN INSTITUTE OF INFORMATION TECHNOLOGY DESIGN AND MANUFACTURING KURNOOL



Problem Statement

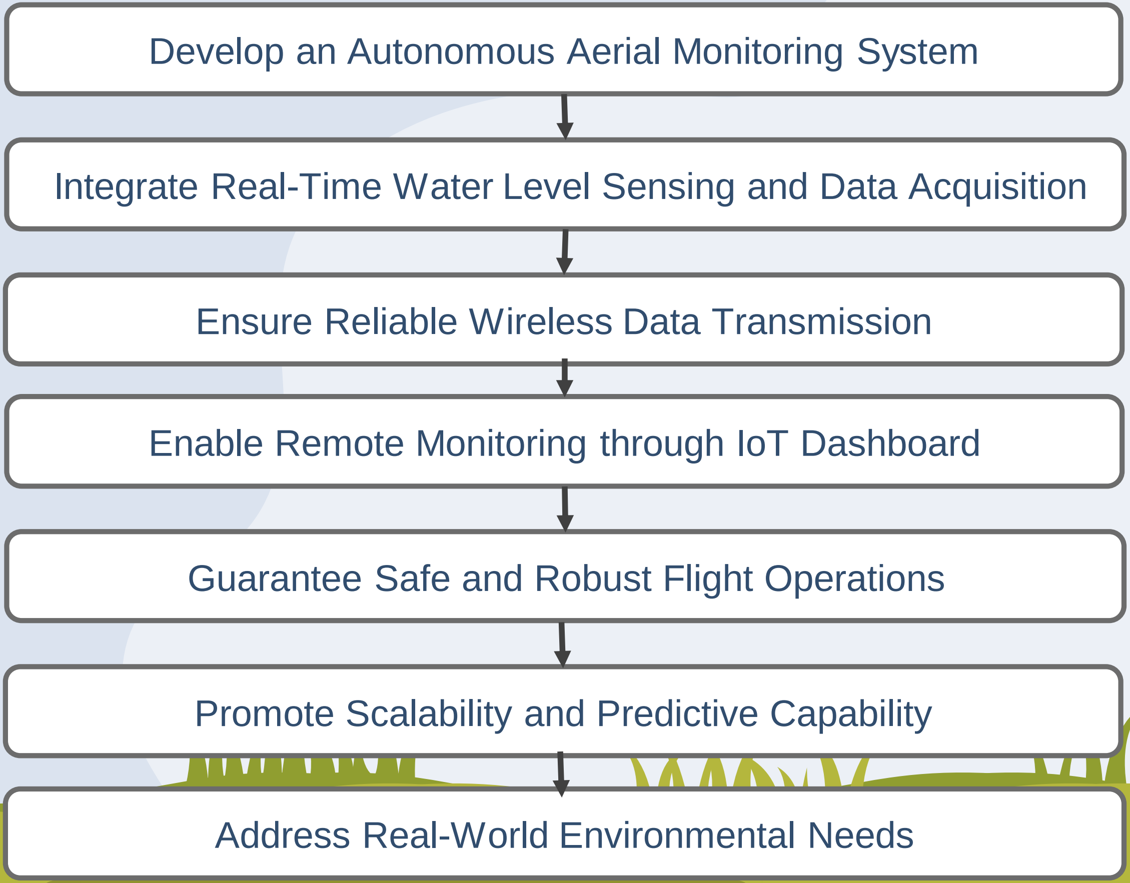
- Traditional methods of monitoring water levels are **manual**, **labor-intensive**, and **prone to human error**.
- **Lack of continuous monitoring** can lead to delays in detecting critical water level changes.
- Lack of real-time alerts and centralized data.
- Existing solutions often lack **mobility**, making it hard to monitor **remote or large water bodies**.
- Climate change has increased the unpredictability of water levels, requiring **smarter systems**.

Objective



- Design an **autonomous drone-based system** for water level monitoring.
- Collect the water level data daily and store all the information on a cloud server.
- Enable **prediction of water levels** for future dates.
- Show **alerts/warnings** for abnormal water level conditions.
- Assist in **disaster management** and **planning** with reliable data.

Flowchart



Develop an Autonomous Aerial Monitoring System

Integrate Real-Time Water Level Sensing and Data Acquisition

Ensure Reliable Wireless Data Transmission

Enable Remote Monitoring through IoT Dashboard

Guarantee Safe and Robust Flight Operations

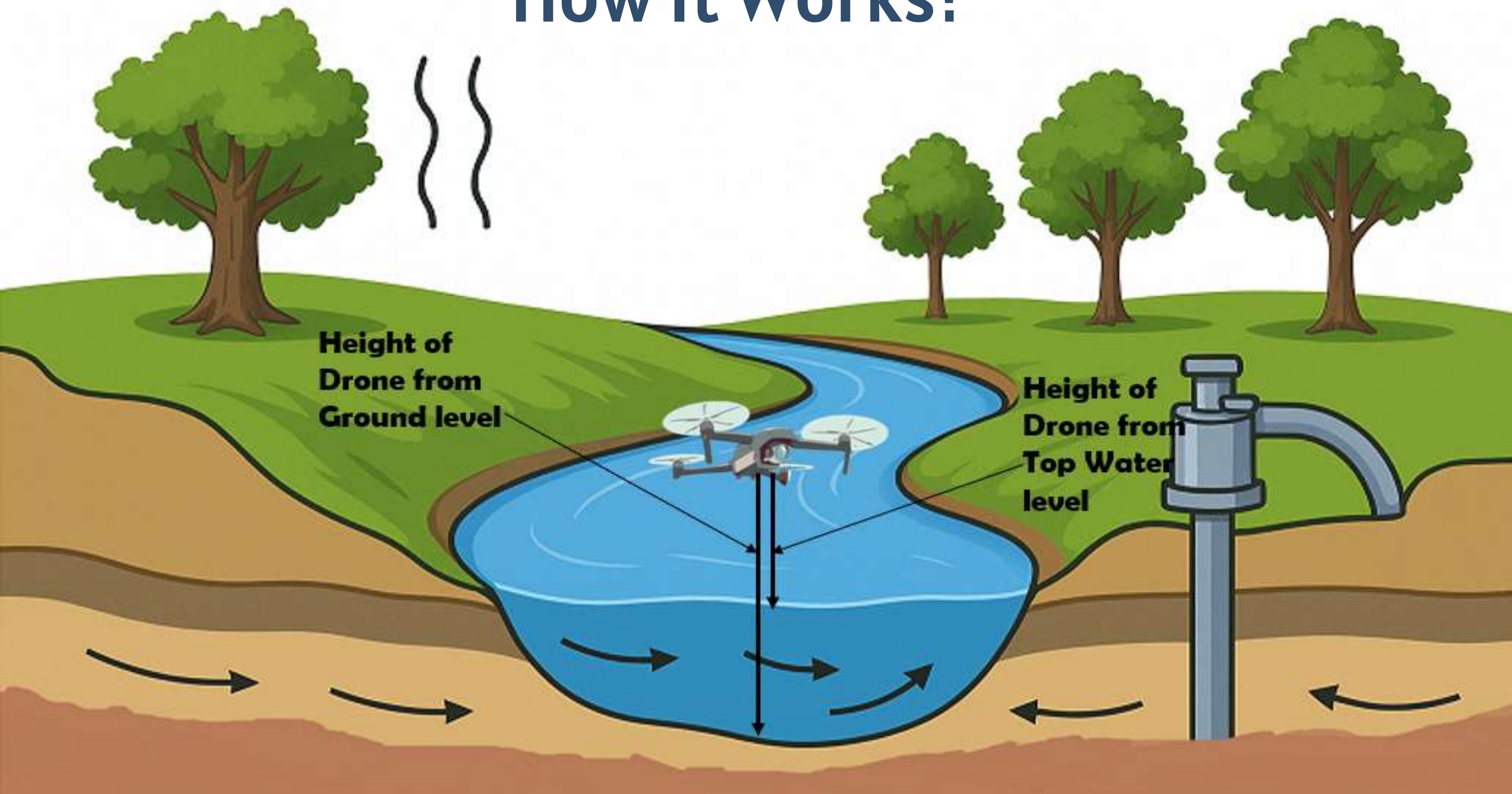
Promote Scalability and Predictive Capability

Address Real-World Environmental Needs

Hardware Components Used

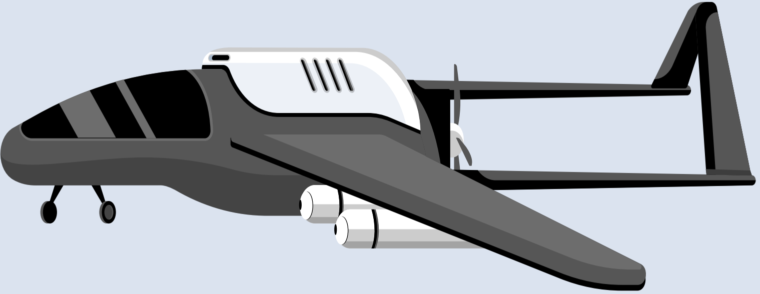
- Quadcopter Drone
- Ultrasonic Sensor (HC-SR04)
- DHT11 Sensor
- Arduino UNO
- NRF24L01 Antenna Module
- NodeMCU ESP32

How It Works?


Height of Drone from Ground level
Height of Drone from Top Water level

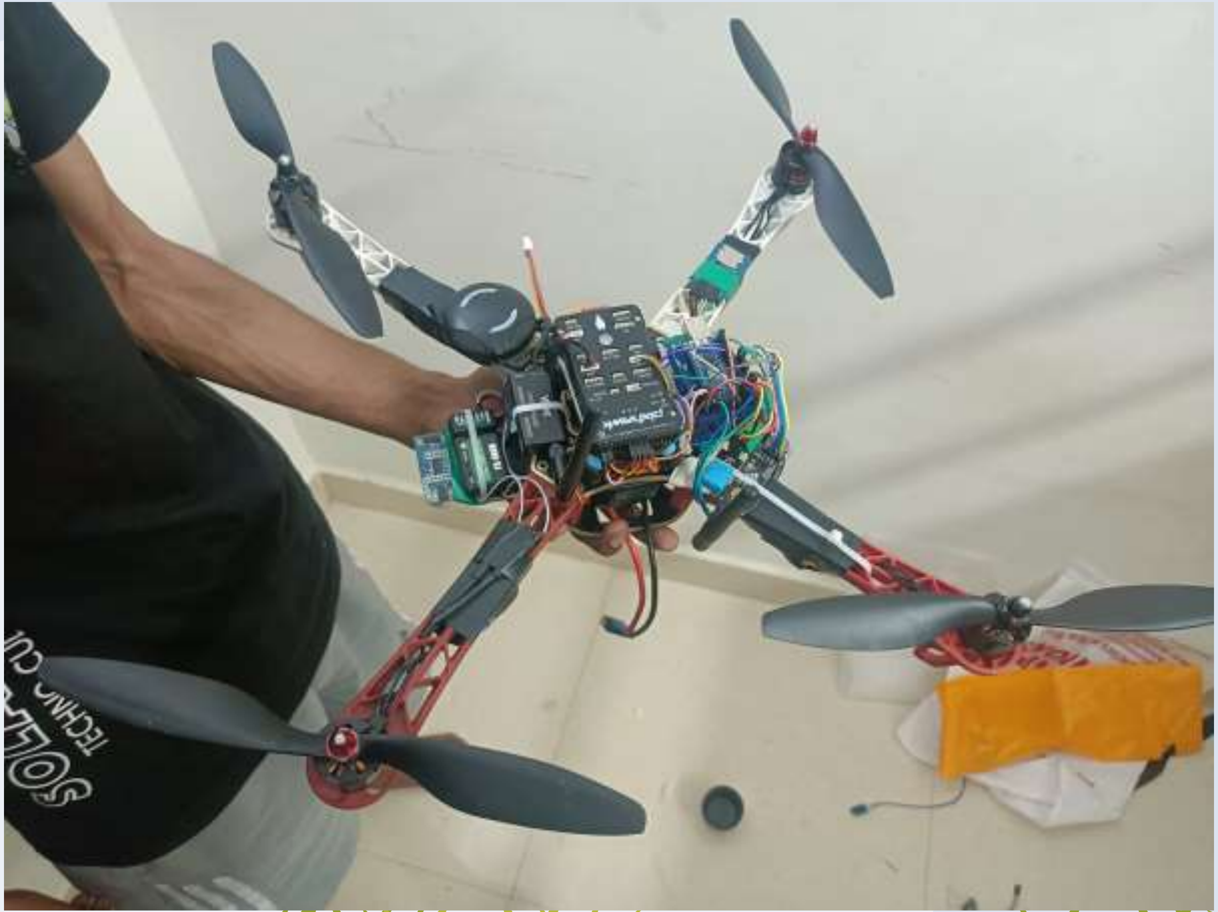
How It Works?

- The drone flies to a predefined GPS location.
- The Ultrasonic Sensor measures the distance to the water surface.
- Water-Level Calculation:
  Water Level = Drone Altitude- Sensor Distance

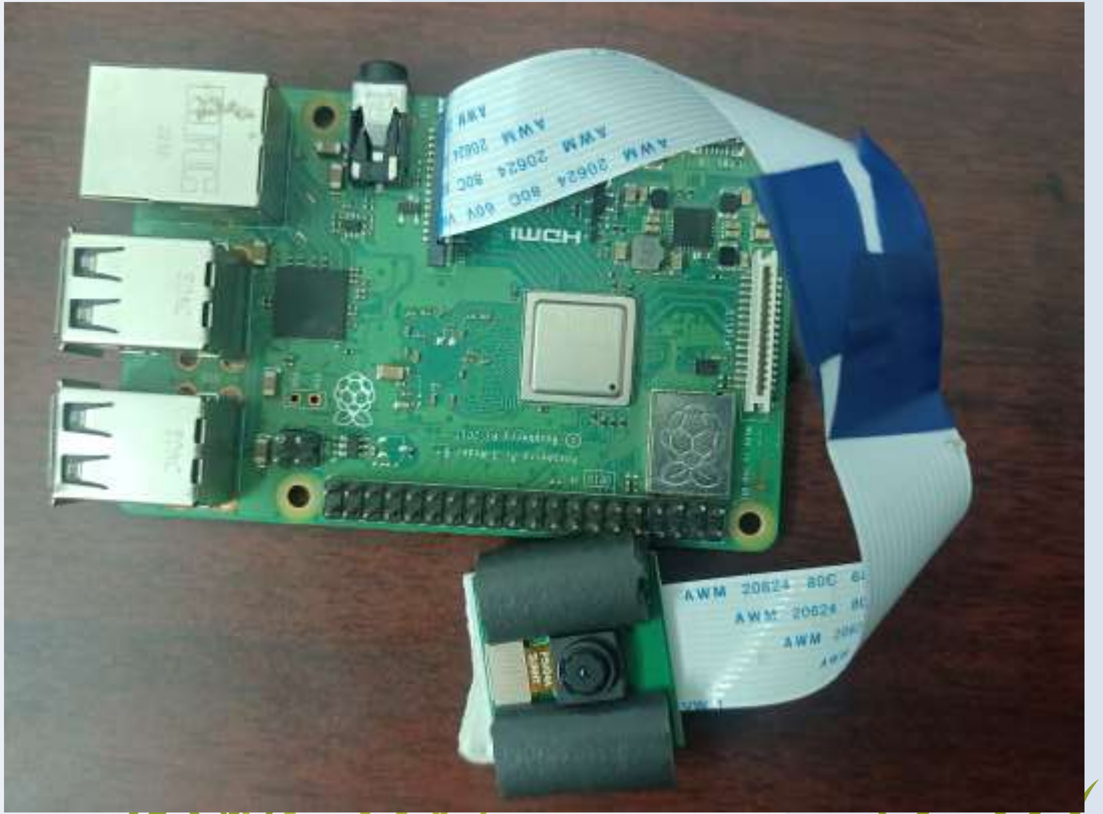


Development

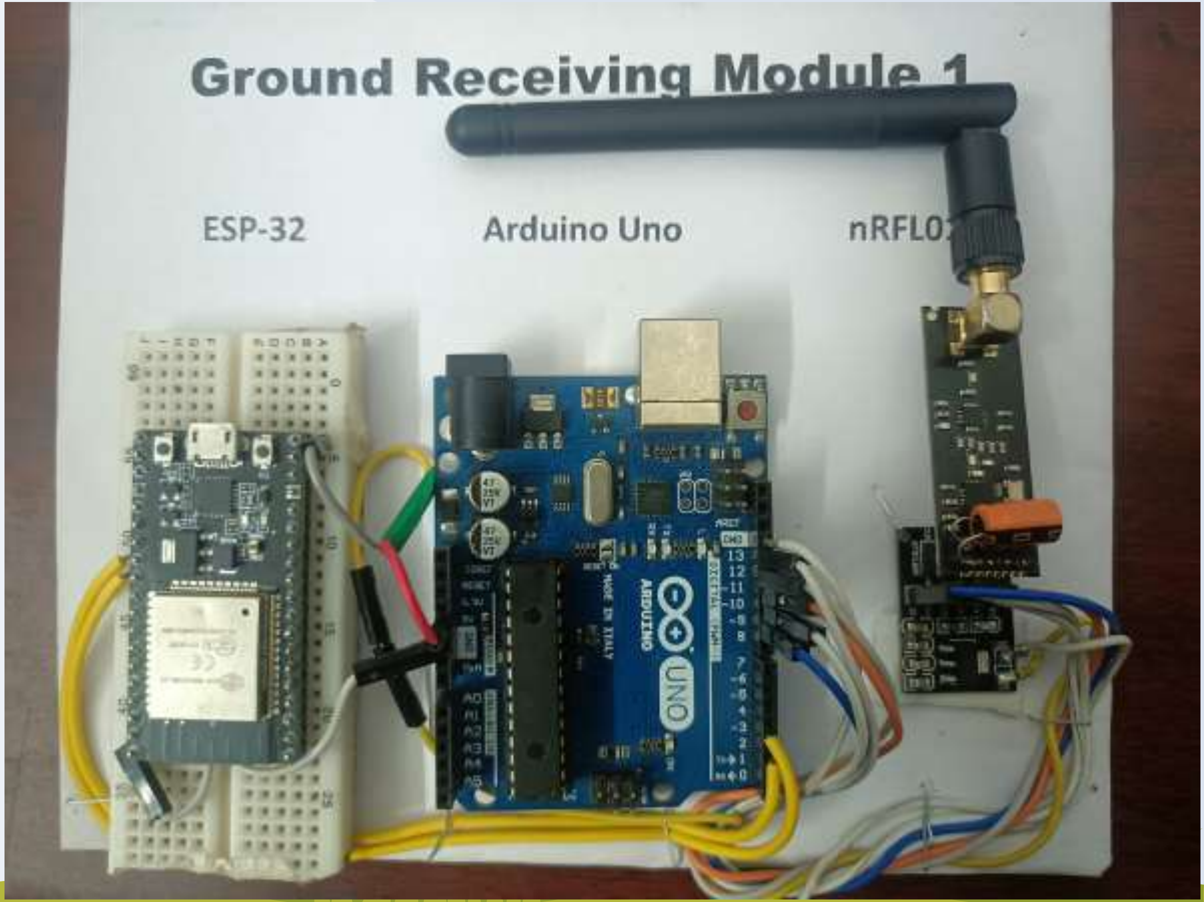
Drone



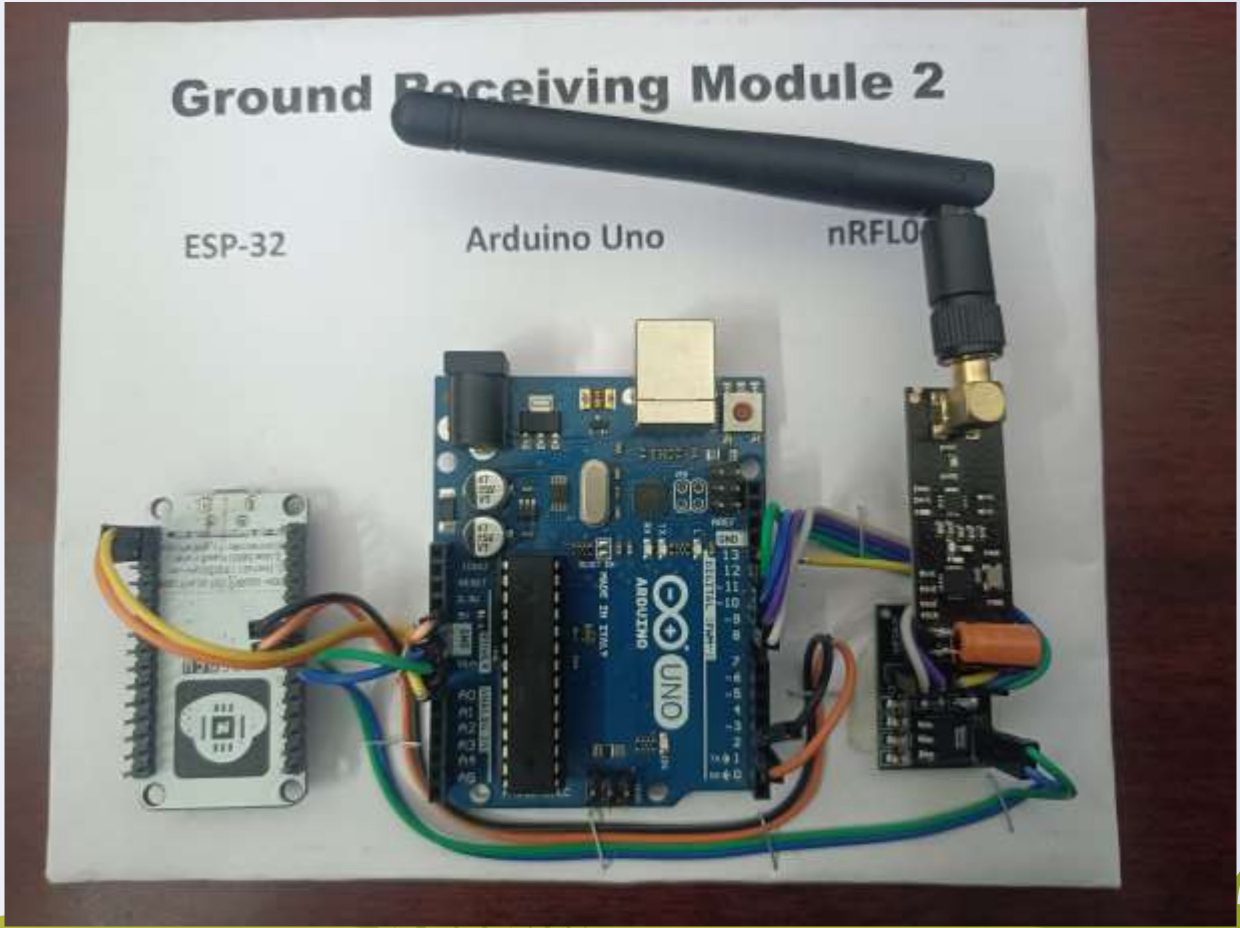
Camera Module



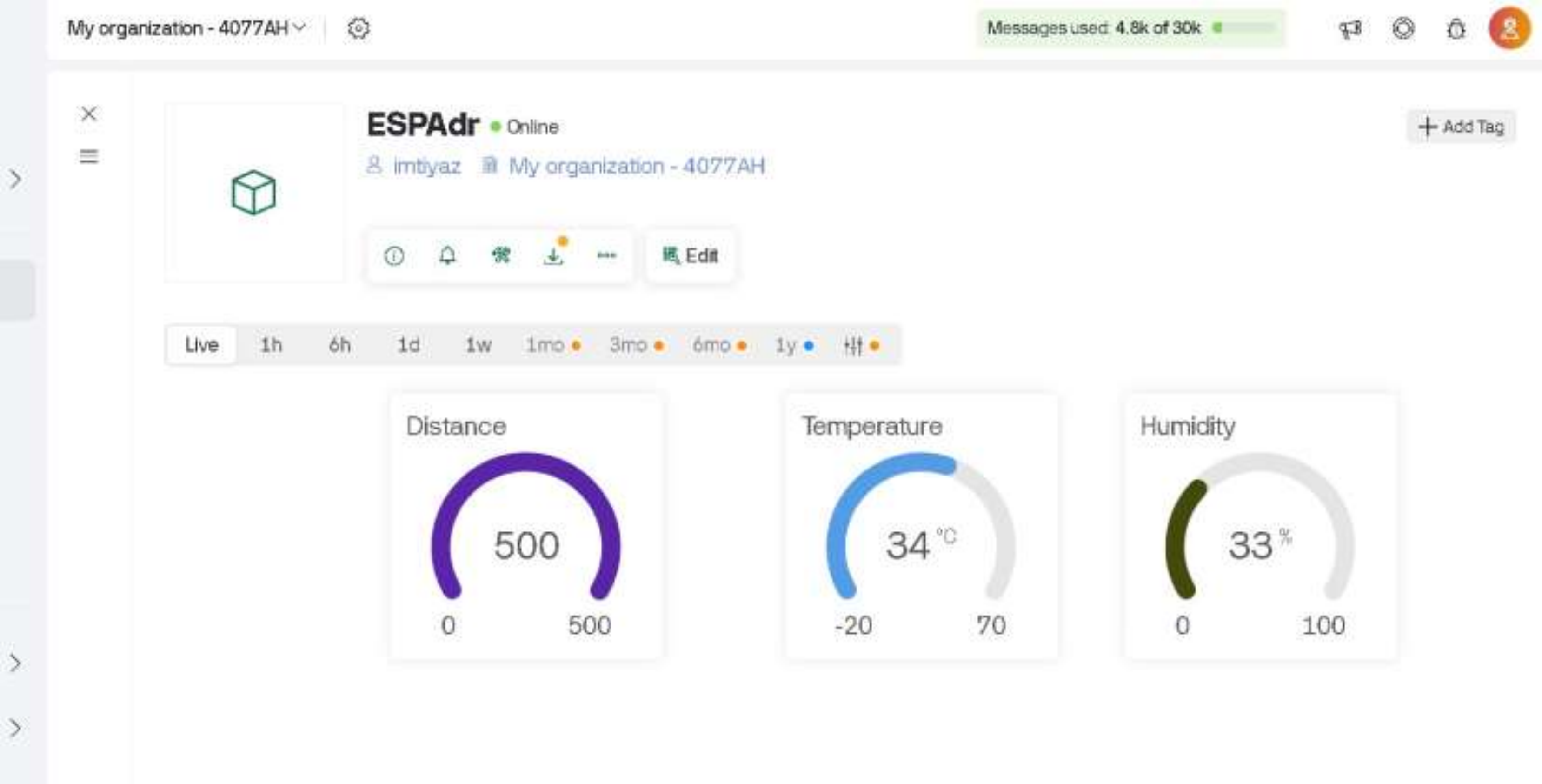
Ground Receiving Module I



Ground Receiving Module 2



Blynk IOT



Distance 500 (0 – 500)

Temperature 34 °C (-20 – 70)

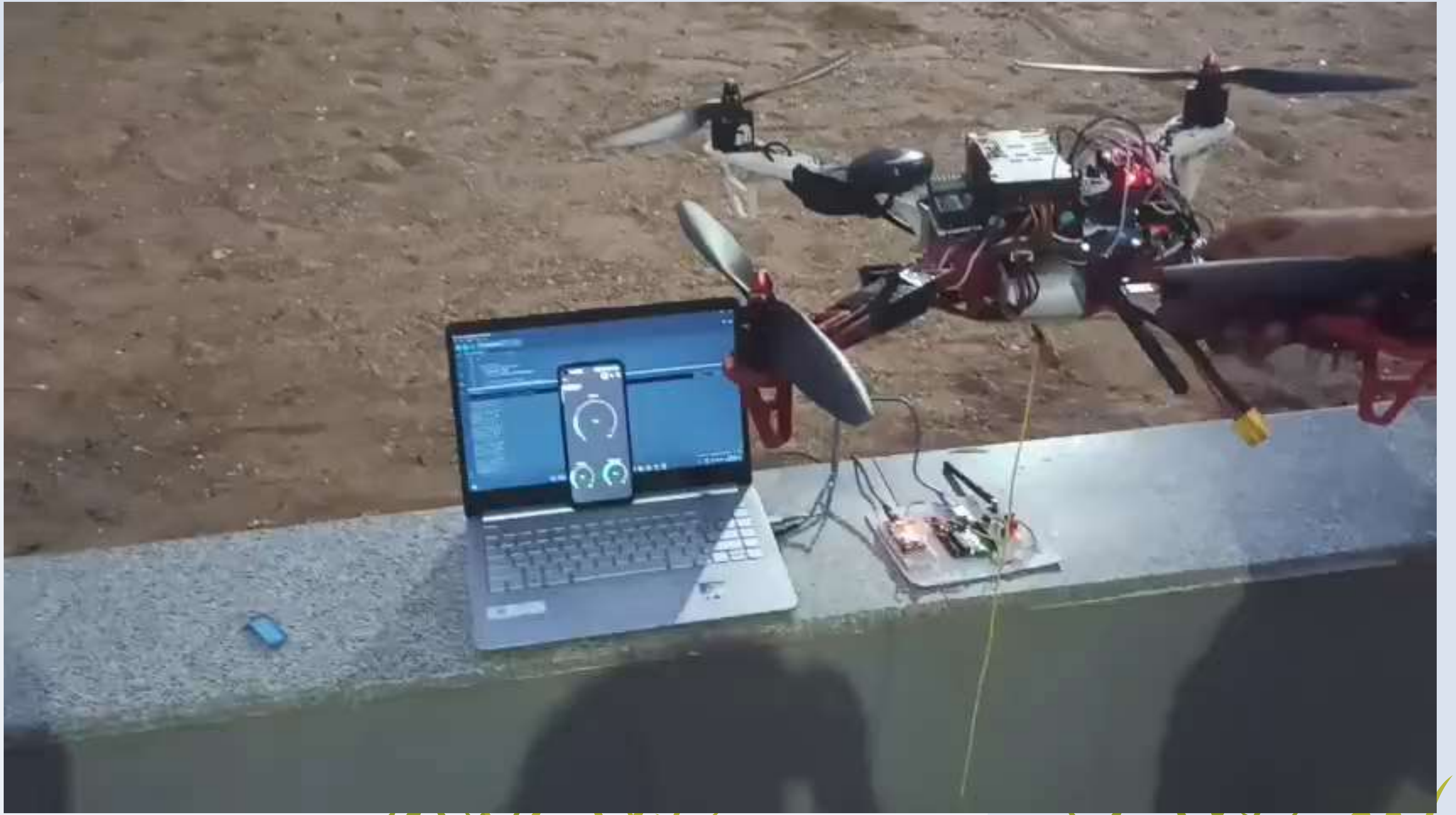
Humidity 33 % (0 – 100)

Testing

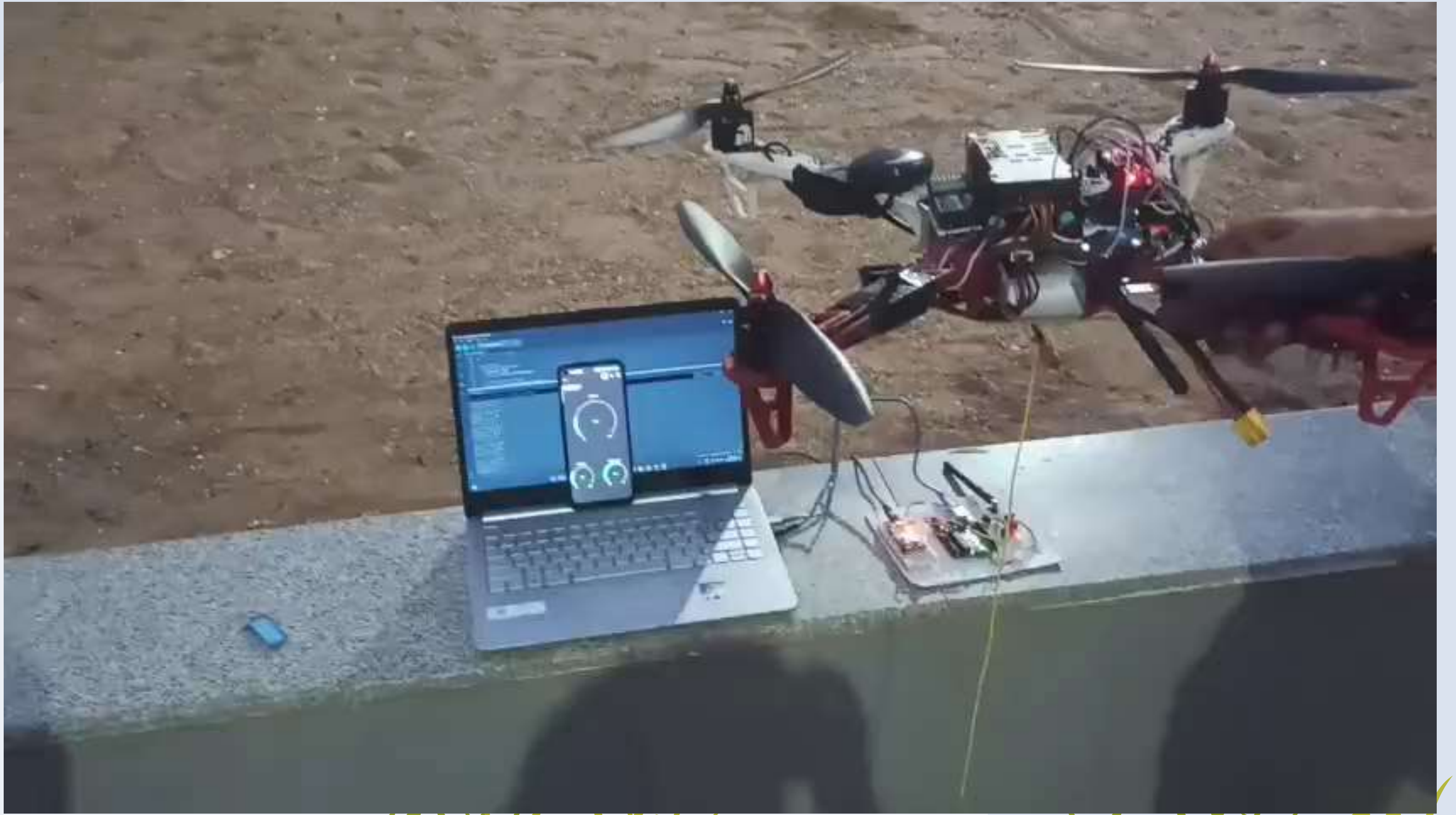
Testing

Testing

Testing



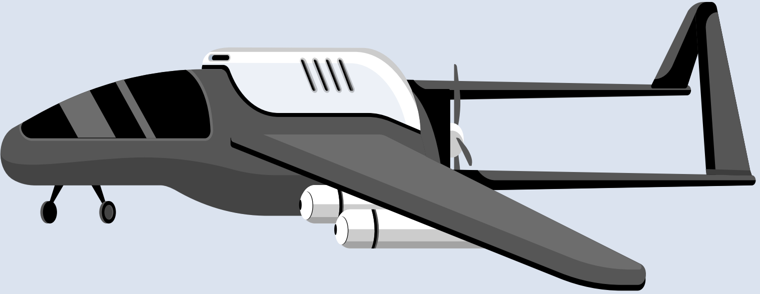
Testing



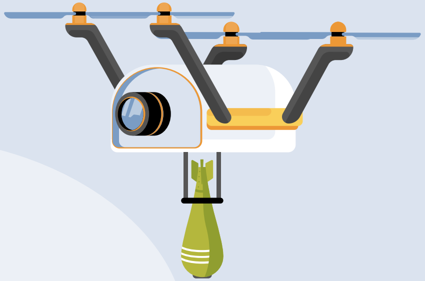
Testing

Testing

Testing



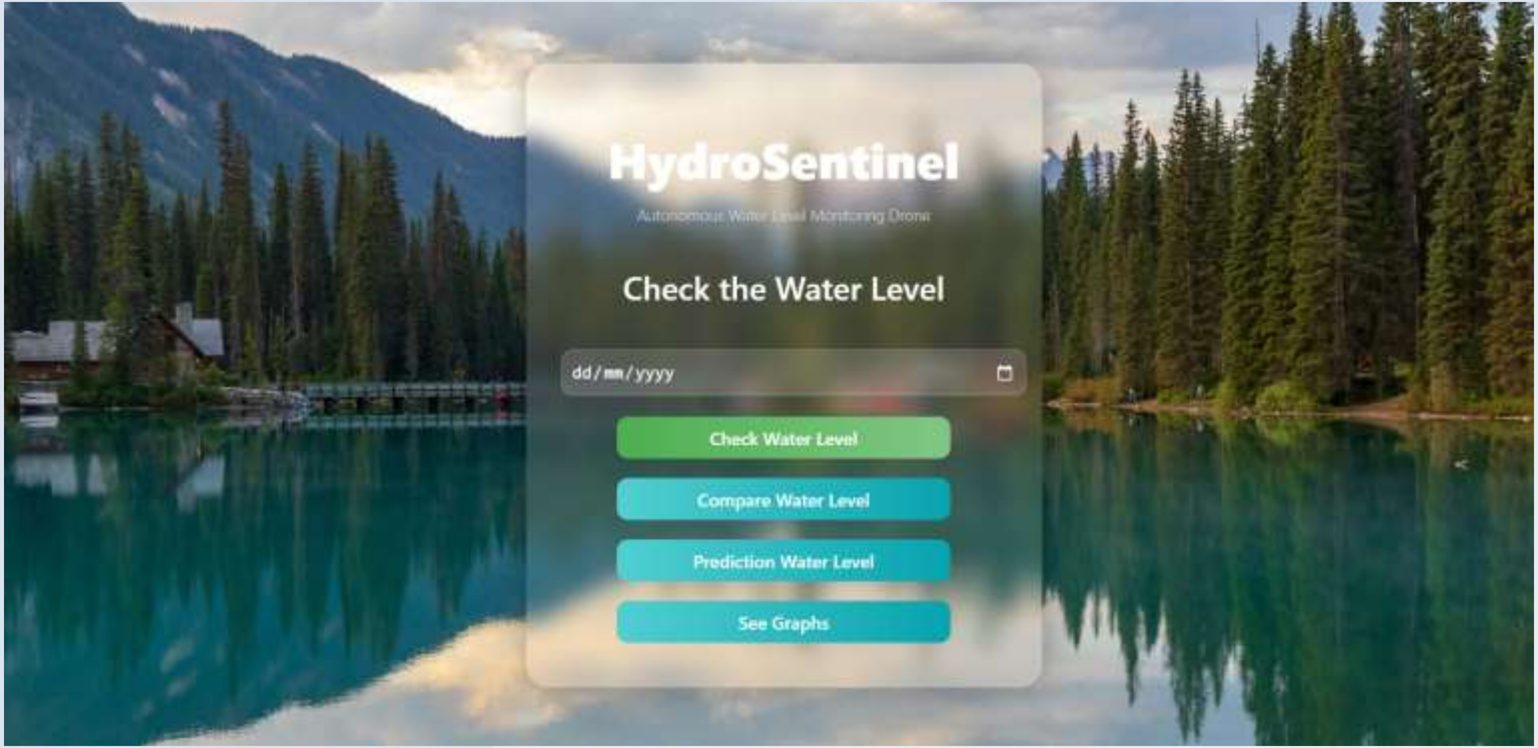
Result



Software Components

- **Frontend**: React (Date-based UI, Data Display, Navigation)
- **Backend**: Python +Flask (API for predictions, data handling)
- **Data Source**: data.json + live sensor data
- **Arduino IDE:** Embedded C/C++
- **Blynk Cloud:** IOT Application
- **Extra**: Toast warnings, clean UX, responsive design

Website



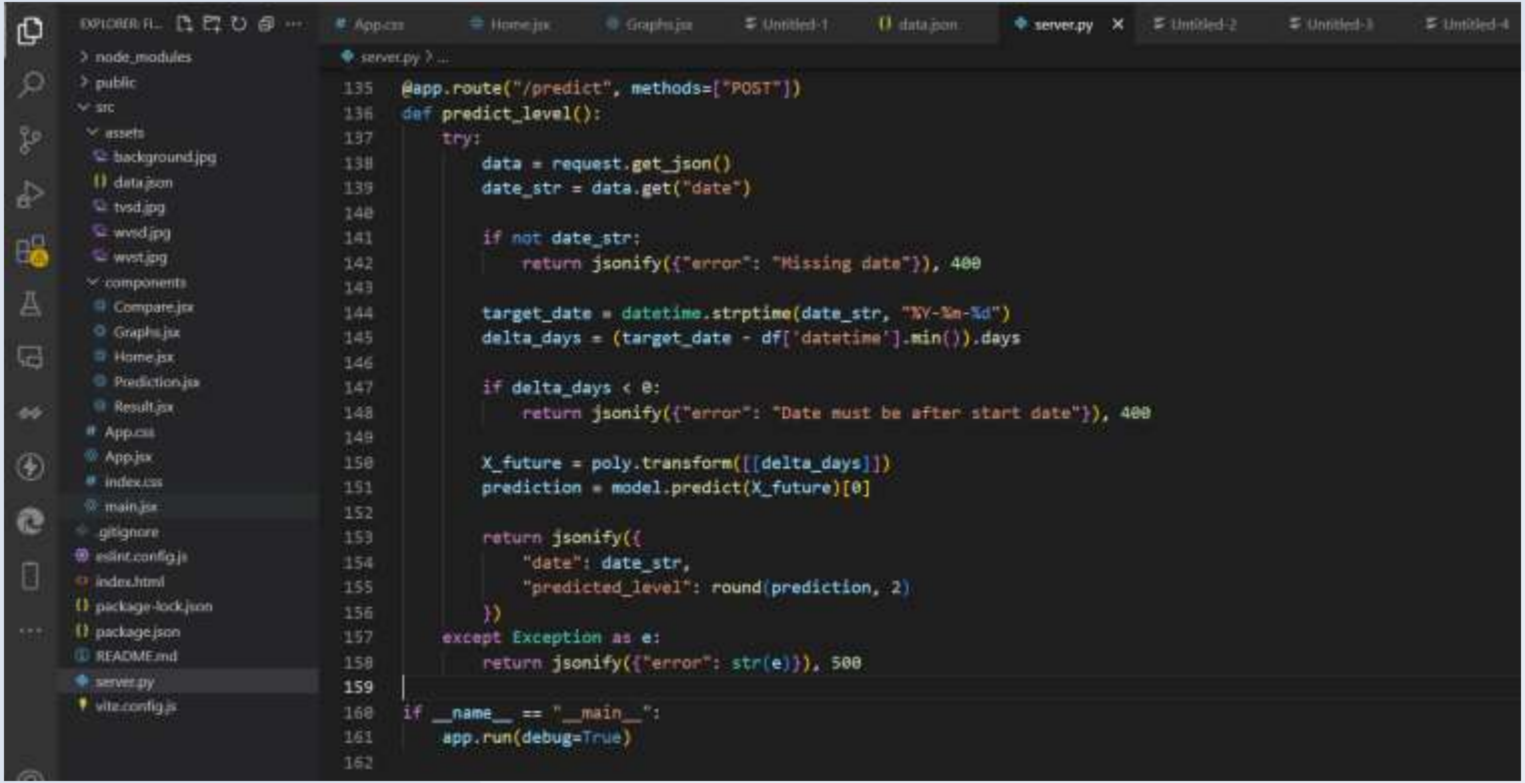
HydroSentinel

Autonomous Water Level Monitoring Drone

Check the Water Level

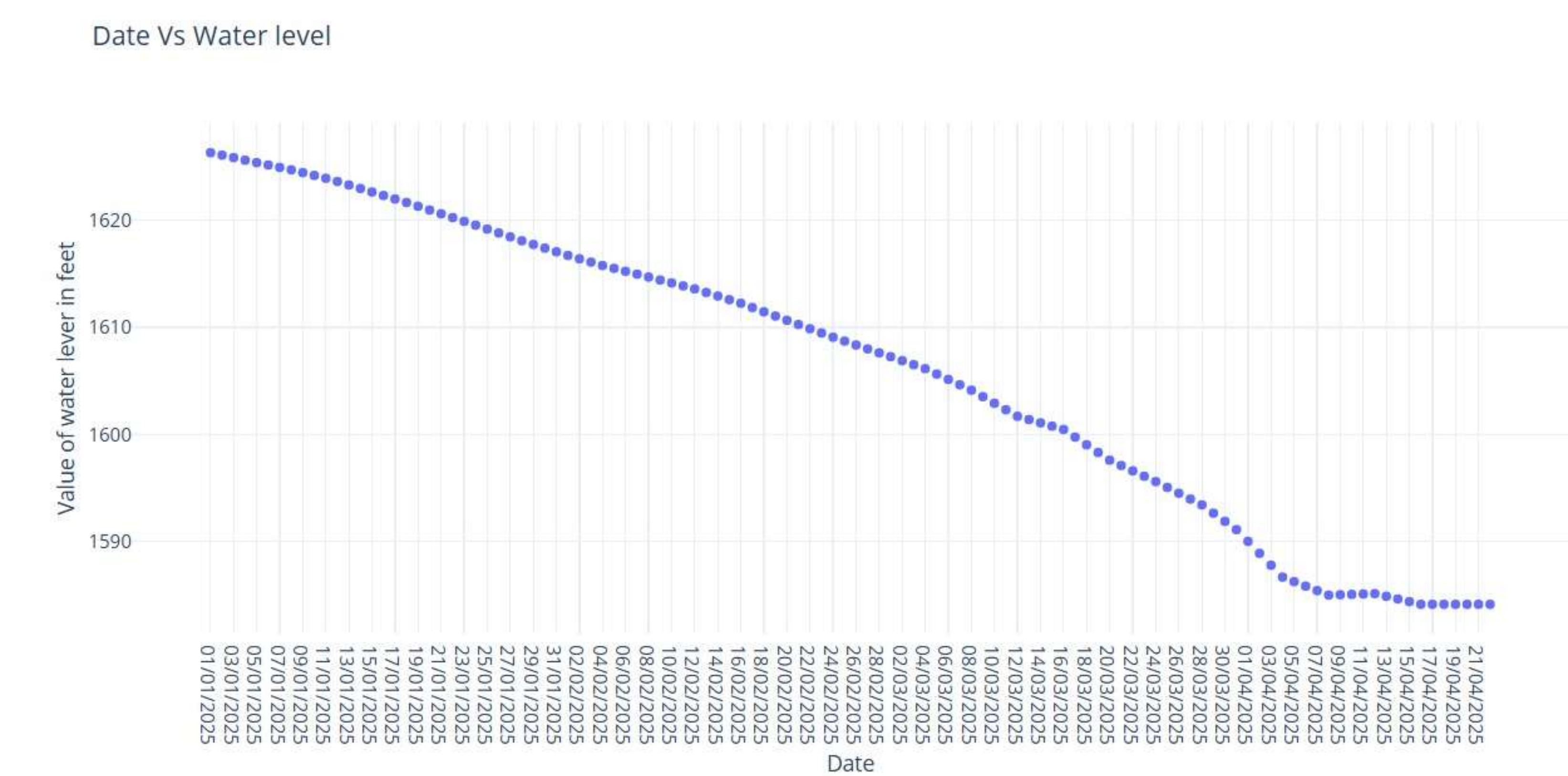
dd/mm/yyyy

ML Model

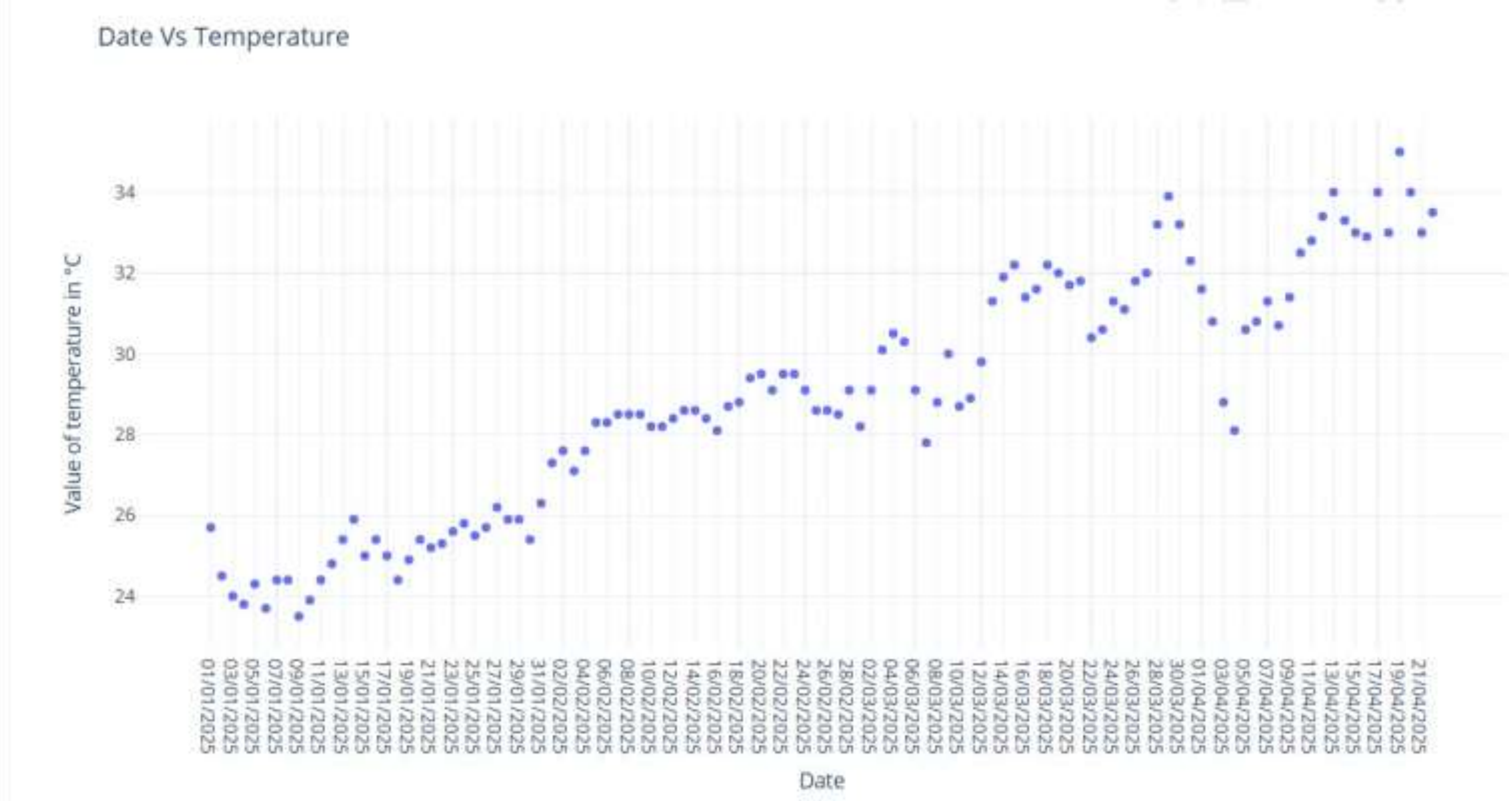


```python
@app.route("/predict", methods=["POST"])
def predict_level():
    try:
        data = request.get_json()
        date_str = data.get("date")

        if not date_str:
            return jsonify({"error": "Missing date"}), 400

        target_date = datetime.strptime(date_str, "%Y-%m-%d")
        delta_days = (target_date - df['datetime'].min()).days

        if delta_days < 0:
            return jsonify({"error": "Date must be after start date"}), 400

        X_future = poly.transform([[delta_days]])
        prediction = model.predict(X_future)[0]

        return jsonify({
            "date": date_str,
            "predicted_level": round(prediction, 2)
        })
    except Exception as e:
        return jsonify({"error": str(e)}), 500

if __name__ == "__main__":
    app.run(debug=True)
```

Graph


Date Vs Water level
Value of water lever in feet
1620
1610
1600
1590
01/01/2025
03/01/2025
05/01/2025
07/01/2025
09/01/2025
11/01/2025
13/01/2025
15/01/2025
17/01/2025
19/01/2025
21/01/2025
23/01/2025
25/01/2025
27/01/2025
29/01/2025
31/01/2025
02/02/2025
04/02/2025
06/02/2025
08/02/2025
10/02/2025
12/02/2025
14/02/2025
16/02/2025
18/02/2025
20/02/2025
22/02/2025
24/02/2025
26/02/2025
28/02/2025
02/03/2025
04/03/2025
06/03/2025
08/03/2025
10/03/2025
12/03/2025
14/03/2025
16/03/2025
18/03/2025
20/03/2025
22/03/2025
24/03/2025
26/03/2025
28/03/2025
30/03/2025
01/04/2025
03/04/2025
05/04/2025
07/04/2025
09/04/2025
11/04/2025
13/04/2025
15/04/2025
17/04/2025
19/04/2025
21/04/2025
Date

Graph


Date Vs Temperature
Value of temperature in °C
34
32
30
28
26
24
Date
01/01/2025
03/01/2025
05/01/2025
07/01/2025
09/01/2025
11/01/2025
13/01/2025
15/01/2025
17/01/2025
19/01/2025
21/01/2025
23/01/2025
25/01/2025
27/01/2025
29/01/2025
31/01/2025
02/02/2025
04/02/2025
06/02/2025
08/02/2025
10/02/2025
12/02/2025
14/02/2025
16/02/2025
18/02/2025
20/02/2025
22/02/2025
24/02/2025
26/02/2025
28/02/2025
02/03/2025
04/03/2025
06/03/2025
08/03/2025
10/03/2025
12/03/2025
14/03/2025
16/03/2025
18/03/2025
20/03/2025
22/03/2025
24/03/2025
26/03/2025
28/03/2025
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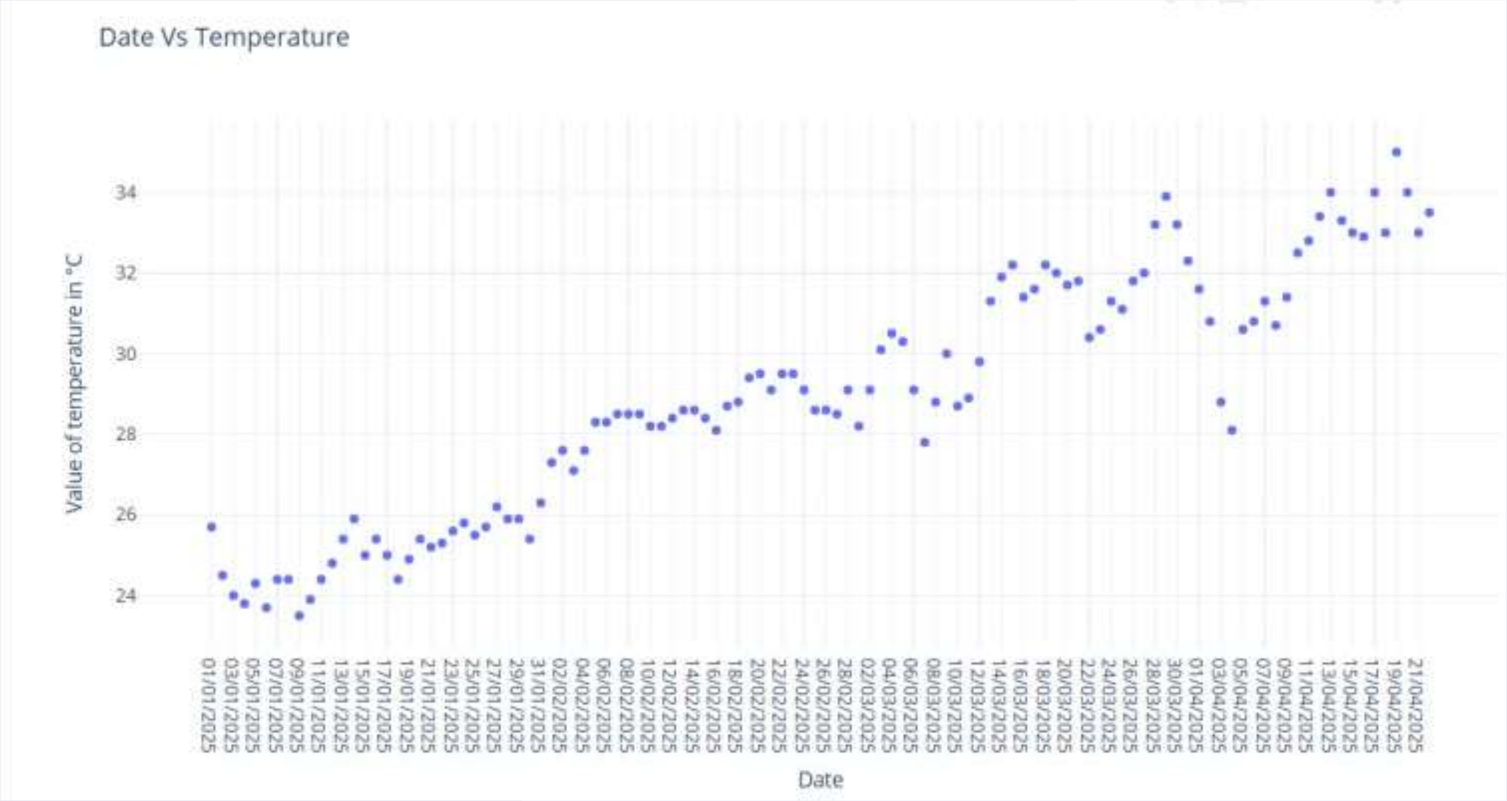
03/04/2025
05/04/2025
07/04/2025
09/04/2025
11/04/2025
13/04/2025
15/04/2025
17/04/2025
19/04/2025
21/04/2025

Graph


Date Vs Temperature
Value of temperature in °C
34
32
30
28
26
24
01/01/2025
03/01/2025
05/01/2025
07/01/2025
09/01/2025
11/01/2025
13/01/2025
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07/04/2025
09/04/2025
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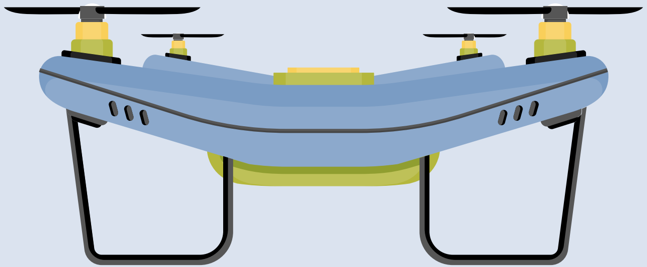
21/04/2025
Date

Future Work



🔌 Enable the drone to autonomously land and recharge without manual intervention.

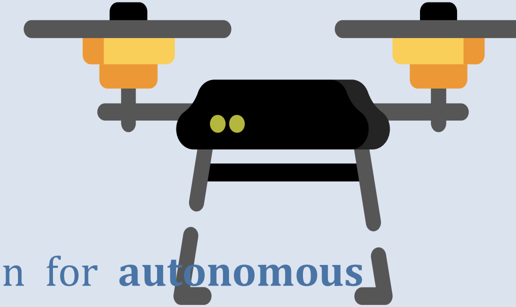
☒ Schedule flights, data collection, and return-to-base without human control.

☒ Predict future water levels more accurately based on historical trends and weather data.

🌐 Store data in real-time on the cloud and create dashboards for long-term analysis.

☒ Protect hardware from rain or accidental water contact during flights.

Conclusion



- **HydroSentinel** presents a smart, efficient, and scalable solution for **autonomous water level monitoring**.
- It combines **hardware innovation** (drones + sensors) with a **powerful software stack** (React + Flask) to deliver **real-time data and predictions**.
- The system reduces dependency on manual efforts, enhances accuracy, and enables **data-driven decision-making**.
- With planned future upgrades like **full automation**, **machine learning integration**, and **cloud connectivity**, HydroSentinel has the potential to become a **game-changer in water resource management**.
- It is a step forward in building **tech-driven solutions** for **climate resilience** and **environmental monitoring**.

Thank You