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Title

Project Prometheus

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Project Prometheus

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Abstract

Project Prometheus aims to combat wildfires through early detection using low cost, solar powered, mass deployable sensor modules that communicate via LoRA. Data collected from these modules will be aggregated by an overhead UAV, where a series of advanced machine learning models are employed to analyze sensor data, in combination with local weather station data in order to provide a proactive approach to wildfire management, enabling timely intervention and mitigating property and environmental damage

Objectives

- Project Prometheus aims to develop low-power, rugged, and mass deployable sensor bundles for wildfire detection. These sensors will use ESP32 with LoRa for efficient data transmission, while UAVs collect and analyze data using logistics regression to assess wildfire risk. By optimizing power consumption and transmission range, the system enables real-time monitoring in remote areas with minimal infrastructure

Materials and Methods

Software used:
- Pandas – v2.0.3
- HTML – HTML5
- CSS – CSS3
- JavaScript – ES6
- Node.js - V20.0
- MongoDB – v6.0
- Python – v3.8.18
- SKLearn – v1.3.0
- TensorFlow – v2.8.0
- Keras – v2.8.0
- OpenCv – v4.x
- Anaconda - latest
- ESP32 for Arduino IDE

- MQ-2 Smoke Detector
- GT-U7 GPS Module
- ESP32 LoRa V3 Development Board
- Waveshare Dust Sensor Detector Module
- DHT22 Temperature/Humidity Sensor

Diagrams/Figures/Experiments
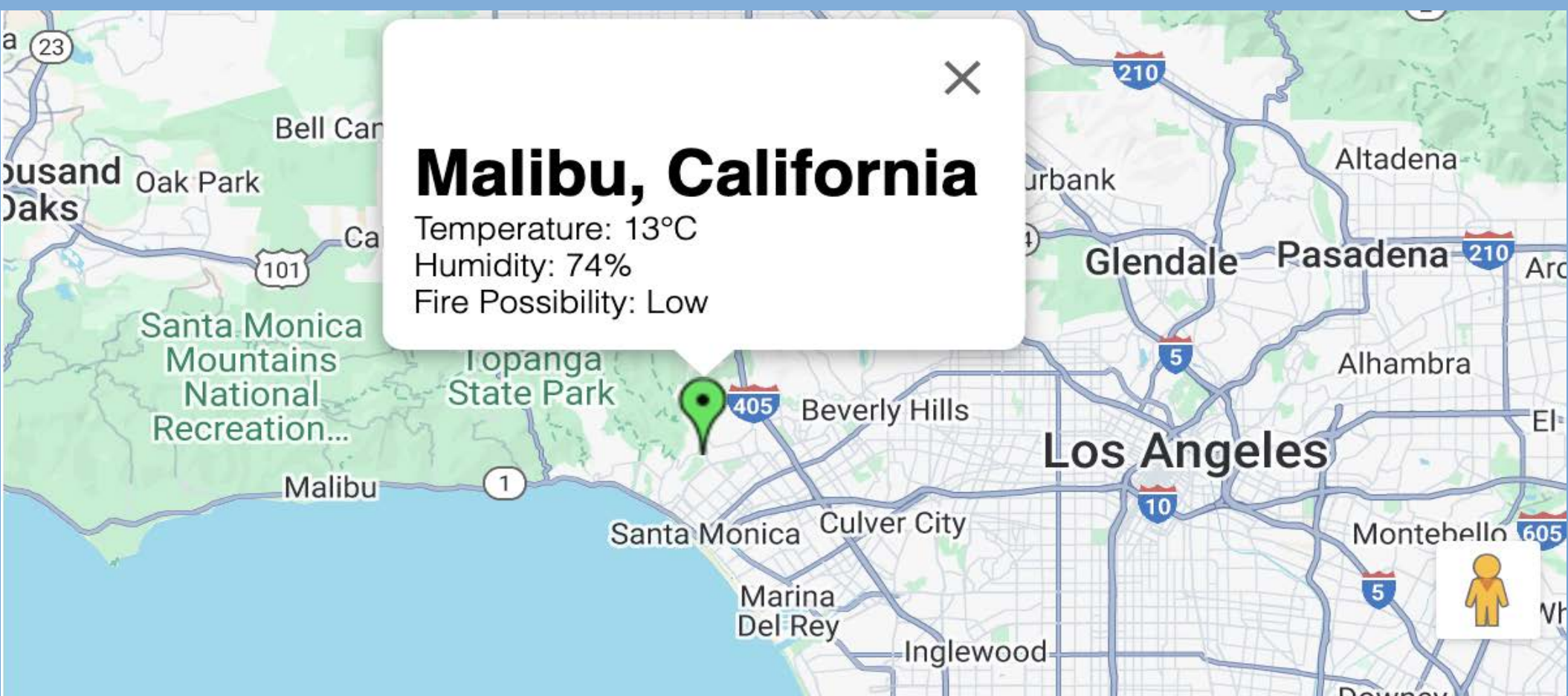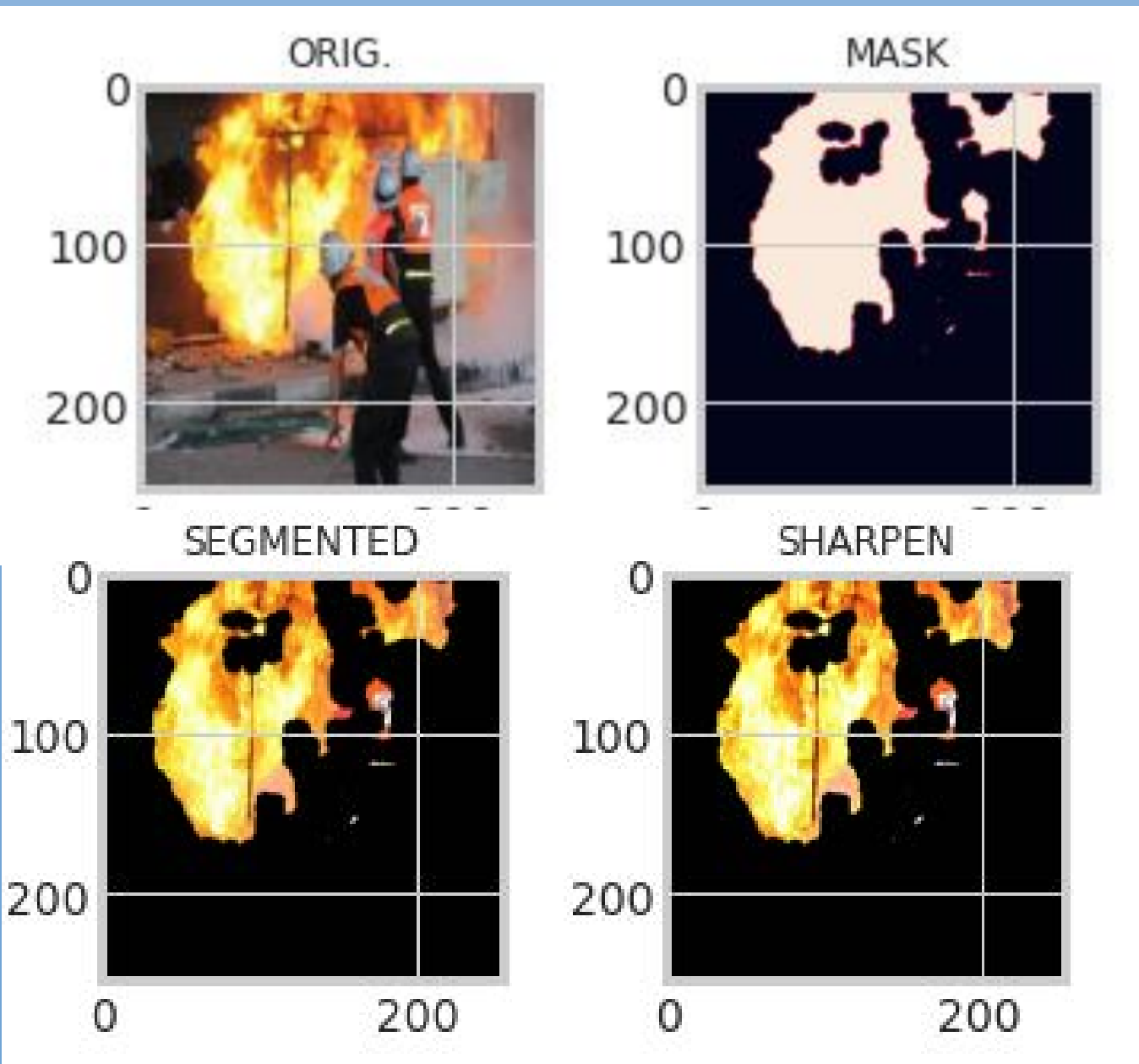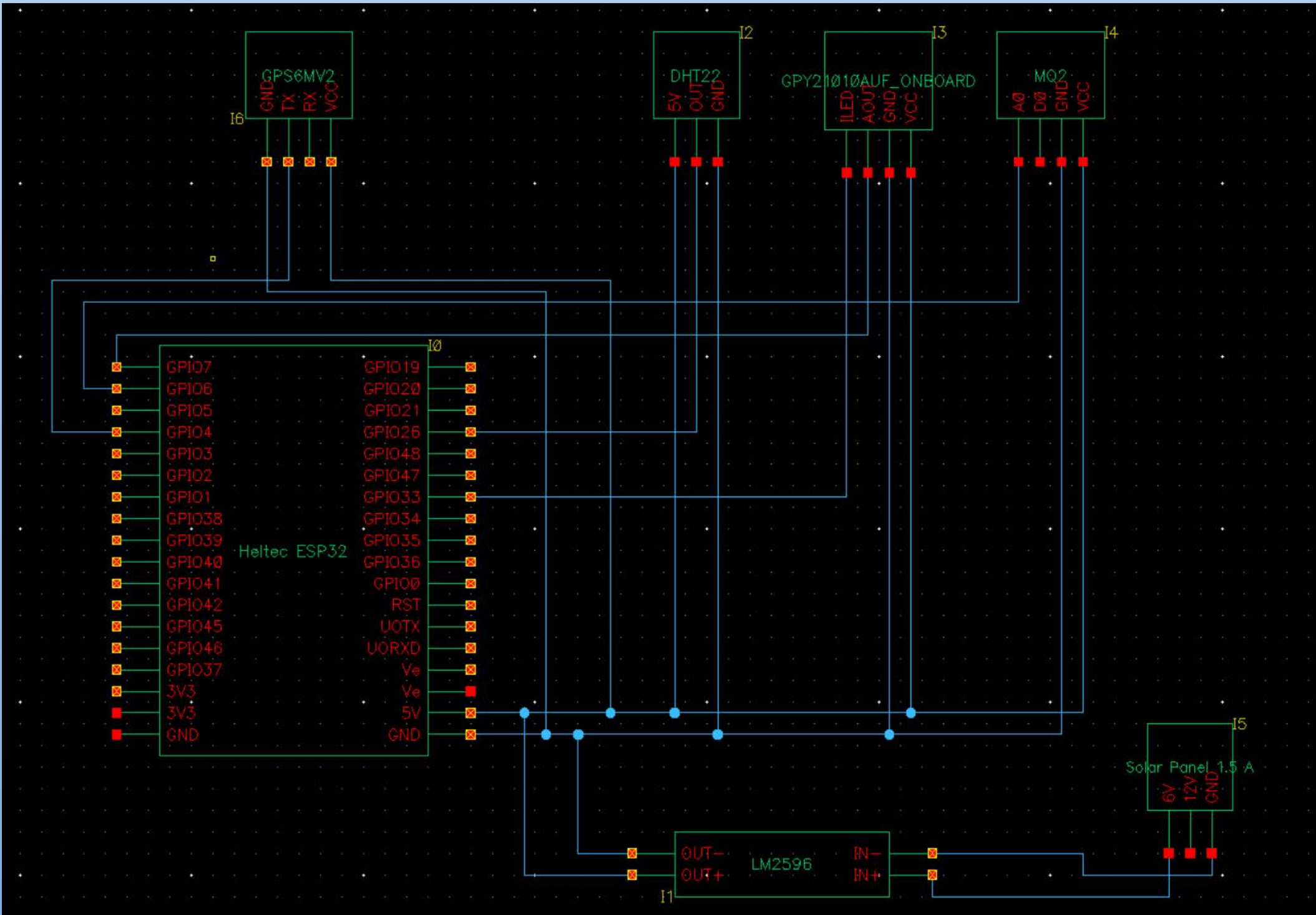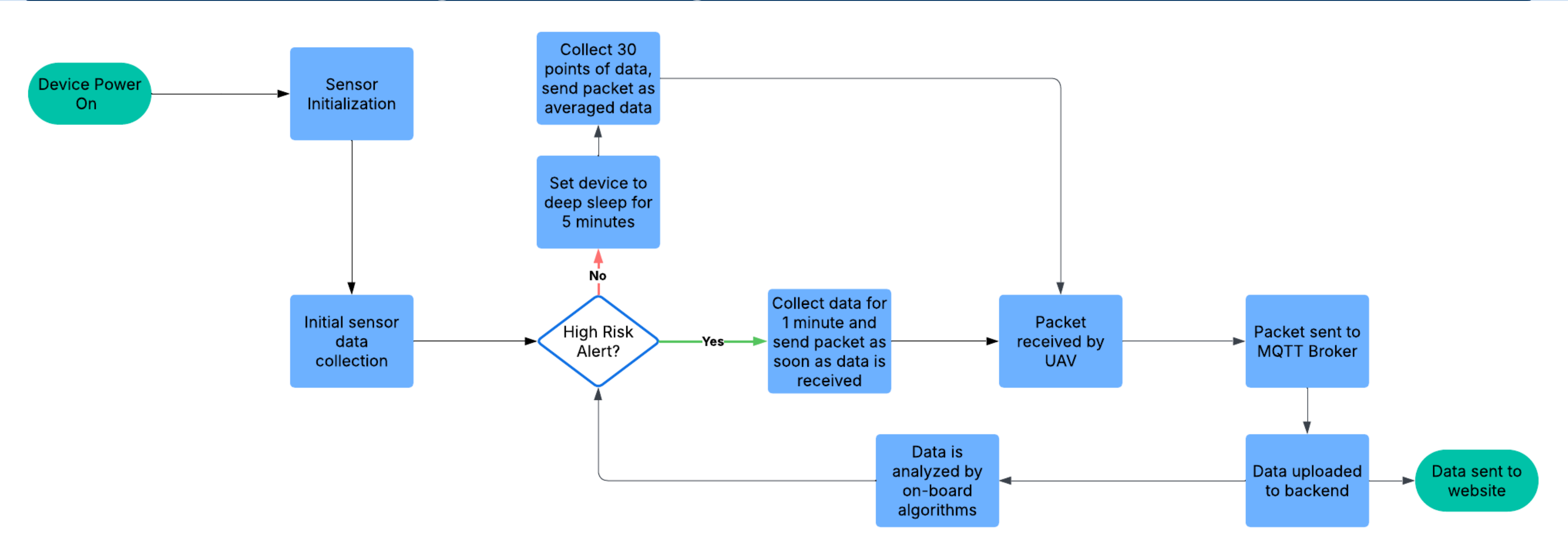
Results

- Website functionality was tested using unit testing and edge cases. As a result of these tests, the website will be further fine tuned and refined.
- We used a dataset [1] to train a machine learning model that performs fire detection. The model will be tested using the first prototype and the performance of the model will be evaluated.
- Unit testing of individual sensors for functionality and validating output data

Additional Information

References

[1] Nazir, Amril, et al. "Early Fire Detection: A New Indoor Laboratory Dataset and Data Distribution Analysis." MDPI, Multidisciplinary Digital Publishing Institute, 18 Jan. 2022, www.mdpi.com/2571-6255/5/1/11.