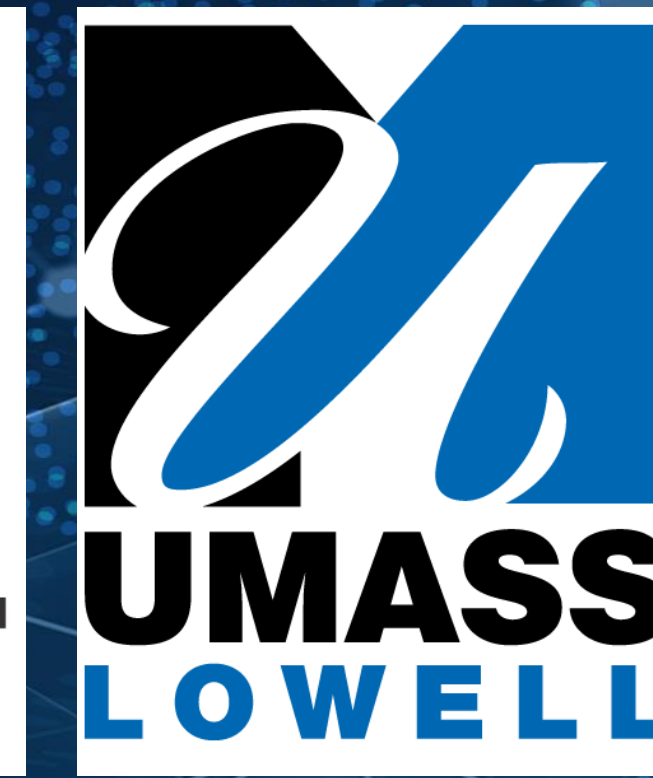


A Secure, Trustworthy, and Reliable Air Quality Monitoring System with Low-cost Sensors for Smart and Connected Communities

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Project URL: <https://cece.ucf.edu/AirQualityProject/>



Introduction

- Public administrators and researchers need to incorporate evidence and data into environmental decision-making
- We are establishing a secure, trustworthy and reliable air quality monitoring network in Orlando to better inform air pollution management strategies

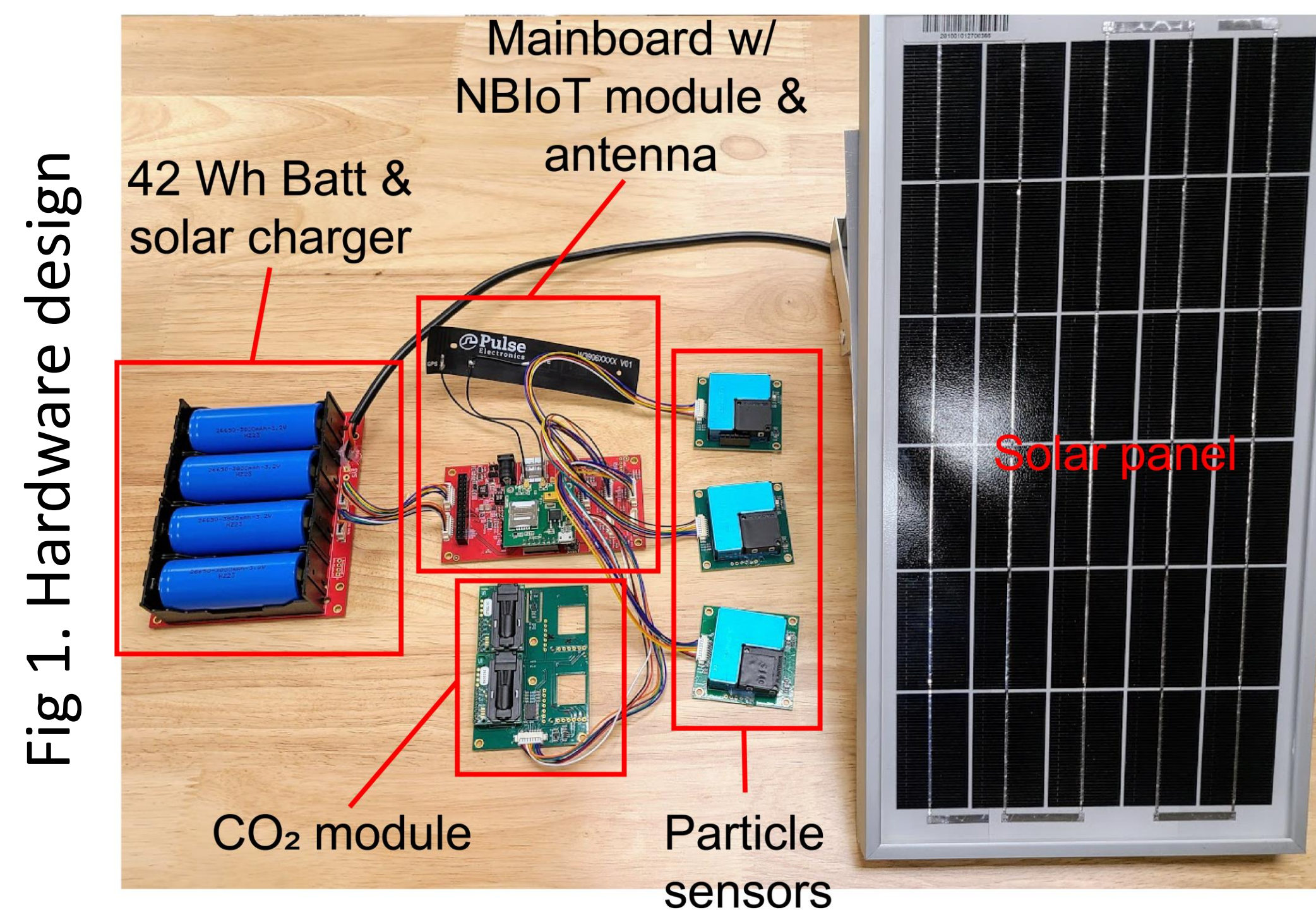


Fig 1. Hardware design



Fig 2. Field testing

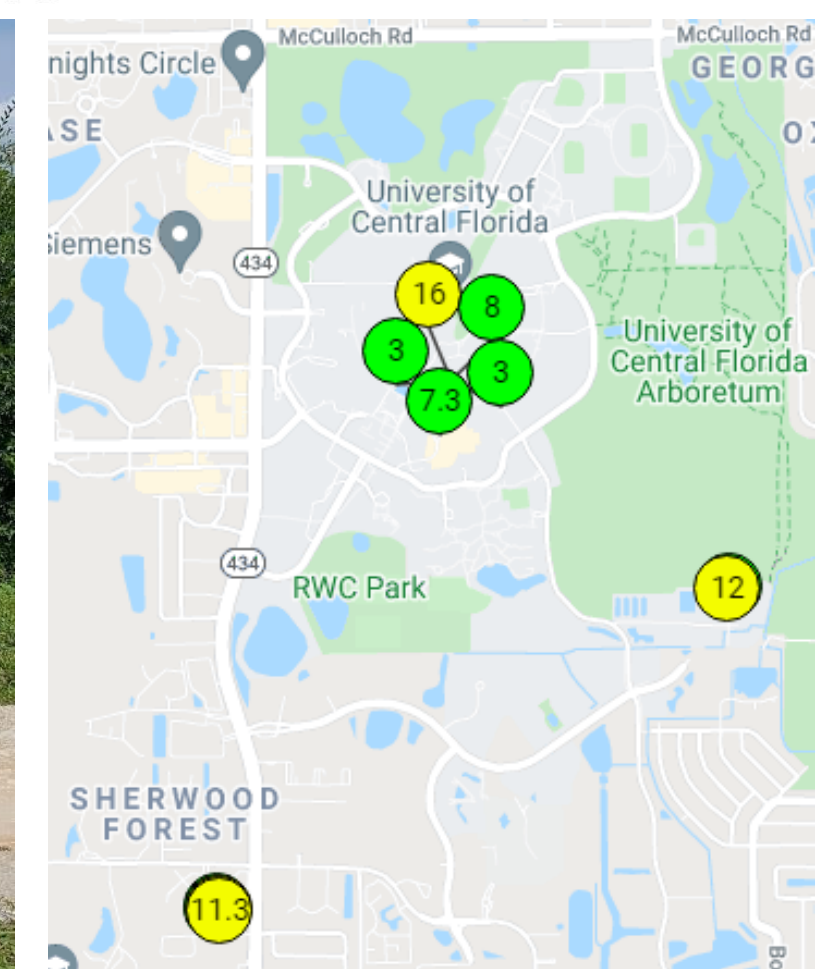


Fig 3. Web interface

Key Challenges

- **Sensing quality.** Unpredictable performance of low-cost sensors
- **IoT security.** Cyber security rarely considered
- **Data quality.** Noisy, mixed-labelled, or even compromised data
- **Citizen efficacy & trust in governance.** Disadvantaged citizens are often impacted the most by air pollution, but often feel neglected

Scientific Impact

- Generalizable approach for improving sensing quality of low-cost sensor
- Secured environmental IoT
- Sensor big data & machine learning based environmental prediction
- Further understanding and improve governance

Technical Approach and Intellectual Merits

- **Sensing quality**
 - Air quality models + multi-sensor system for remote sensor calibration, drift correction and malfunction detection.
- **IoT security**
 - Trustworthy monitoring devices based on Arm TrustZone
- **Data quality.** Air quality prediction model based on a two-stage semi-supervised deep learning framework over noisy data
- **Citizen efficacy & trust in governance.** A four-stage data accessibility framework to measure inclusion and trust of local government

Broader Impact

Society

- Help reduce exposures of sensitive population
- Provide key resources for local regulators to design mitigation plans on air pollution
- Assist with tracking the effectiveness of the City's current sustainability practices
- Educate public on the City's sustainability efforts

Education & Outreach

- Incorporated outcomes into courses across multiple disciplines
- Provide research & educational opportunities for college and K-12 students
- Train cybersecurity workforce for critical cyber infrastructures and environment

Assessment

- Increased participation of women and URMs in computing related majors and existing computing related K-12 outreach programs
- Recruitment of women and URM undergraduate students in this research project.