Exploring information issues in education for environmental health and safety data literacy

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Collecting and working with technical data requires both
1) an understanding of the scientific models being used to collect and interpret the data to form decision-making information and
2) an understanding of the sources and limits of those data.

For this reason, working with raw data requires information literature skills which are often underdeveloped as part of a chemistry education. This poster illustrates this concept using two use cases – 1 teaching and 1 resaerch.

Models

Lab Safety
Question: What are the risks of this lab procedure?

Data Sources
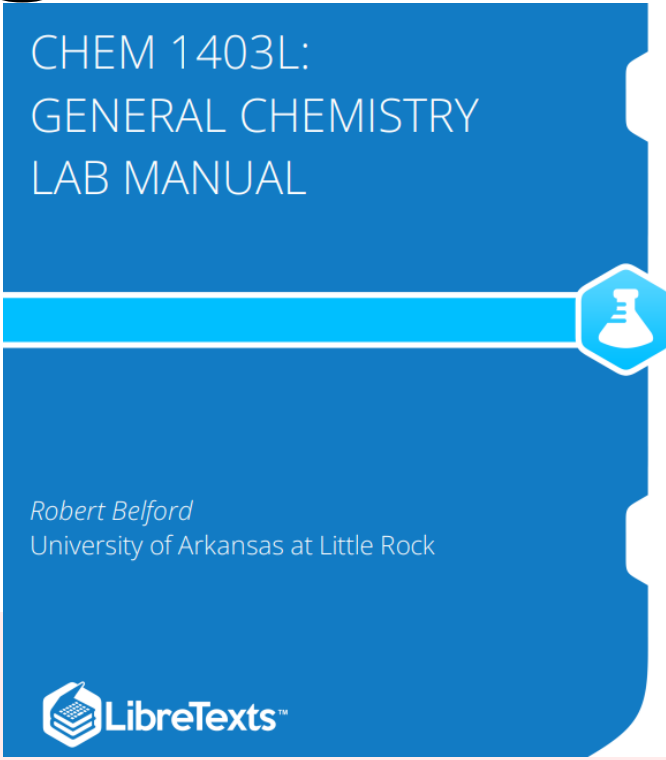
Legacy and Emerging Sources
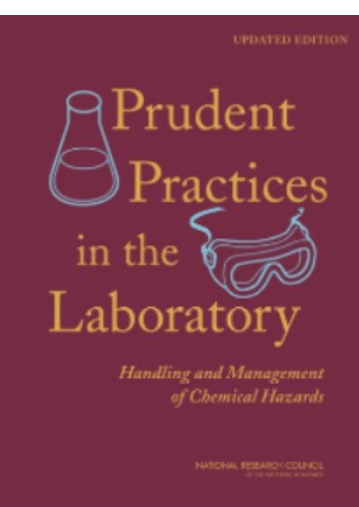

Information Literacy Tools

FAIR data

Safety Literacy in the Freshmen Lab:
Incorporating Information Literacy Issues in Academic Labs

Research into Real Time Environmental Monitoring Data Issues

What is the role of citizen science (i.e. "big", Low Cost sensor-based) in decision-making?
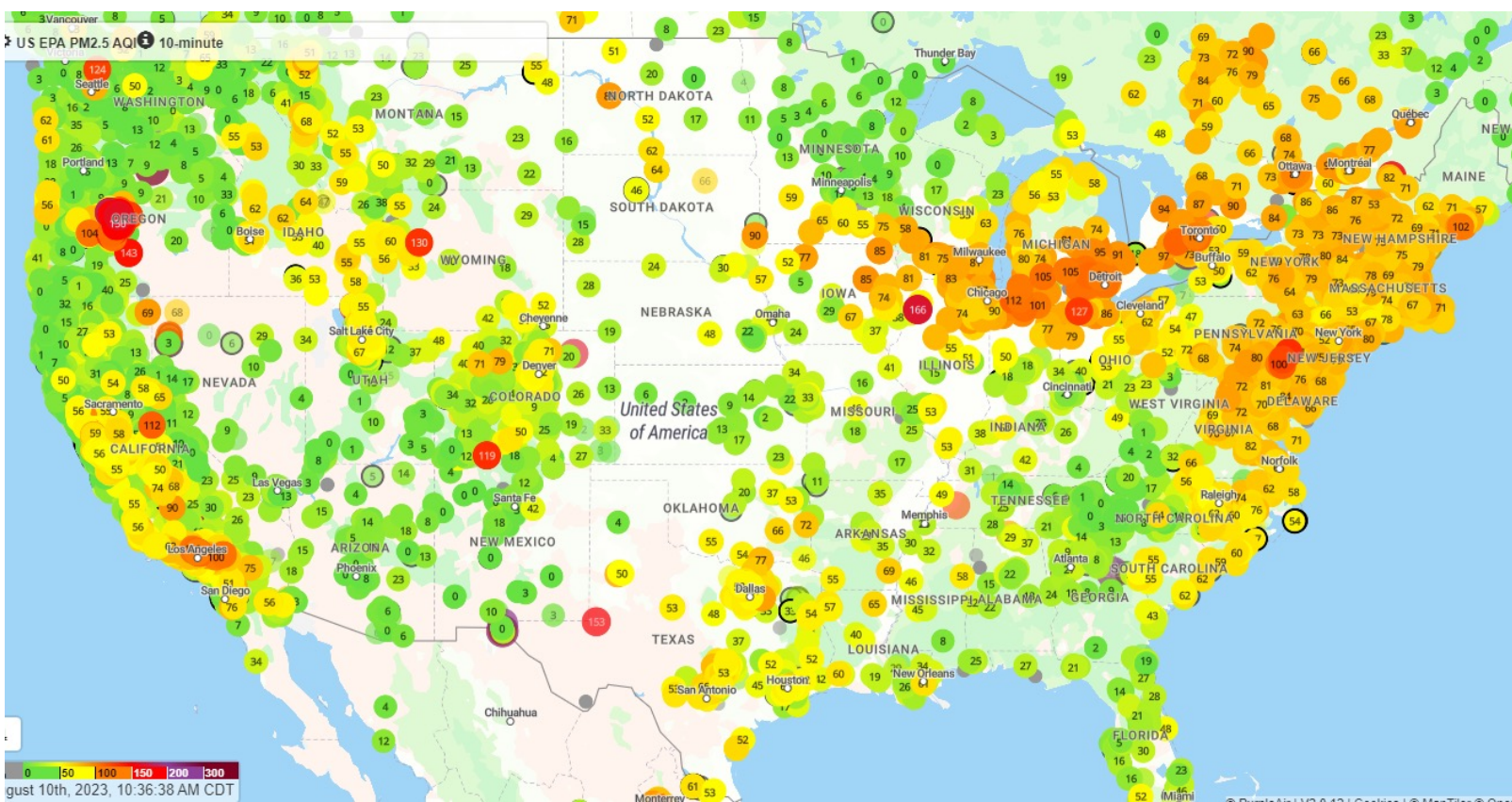
- **Data Quality/Assurance Issues**
  - Sensors respond to multiple compounds (is this a plus?)
  - Sensors respond to Temperature, Pressure, Humidity, Wind, etc.
  - Sensor poisoning/signal degradation issues

- **Calibration vs. Collocation**
  - Chemical calibration is expensive and often not practical
  - Collocation studies correlate sensor data to calibrated instrumental data
  - They enable AI/ML multivariable based correction algorithms, but require data features to build correlations with

- **FAIR Data Issues**
  - Need metadata standards
  - Sensor data are streams and not static values

A Real World Use Case: Comparing two PM maps

EPA PM map

"Citizen Science" PM map

https://www.airnow.gov/

https://map.purpleair.com/
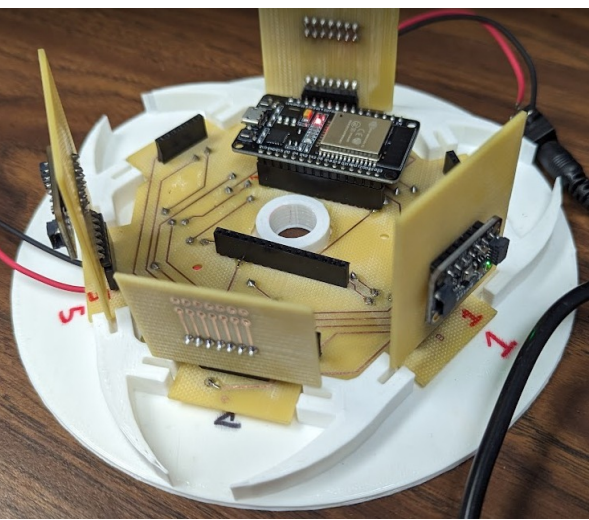
The EPA network of Federal Reference Monitors (FRM) has holes where no data is obtained. FRM monitors are only required to measure EPA Criteria Pollutants and so there are many states where other Hazardous Air Pollutants are simply not measured.
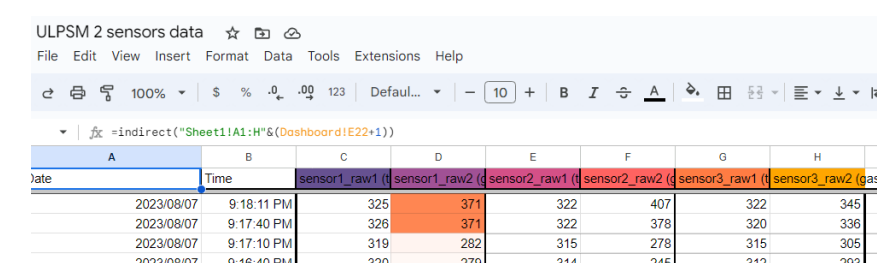
Configuration Vector is an artifact of sensor locations in a POD. This enables New Features for AI/ML.
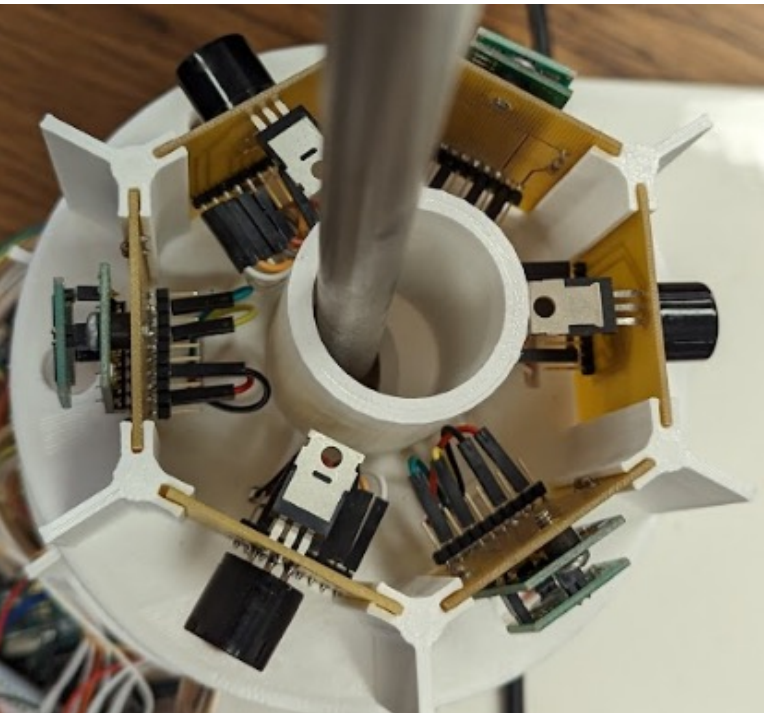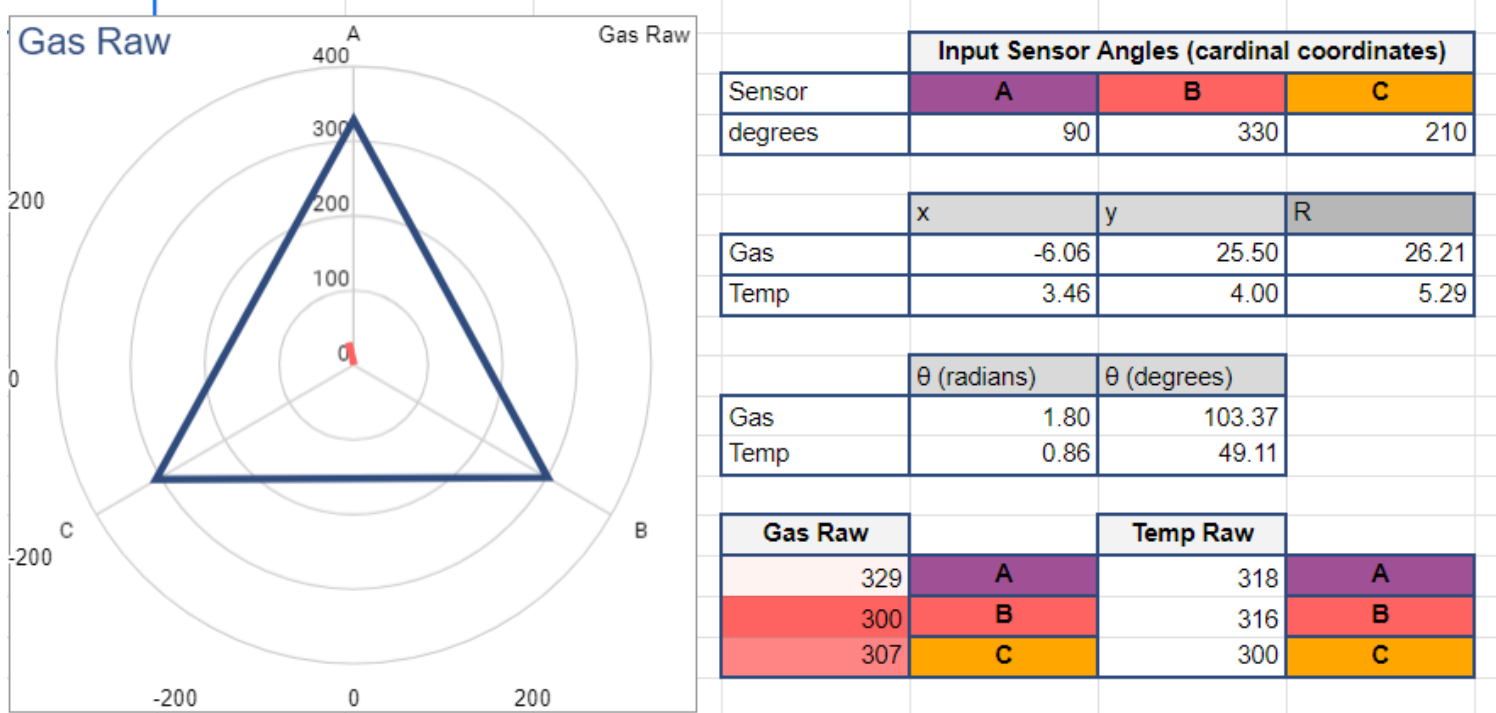

ESP32 microcontroller generate IP address displaying data from three trigonal planar sensors
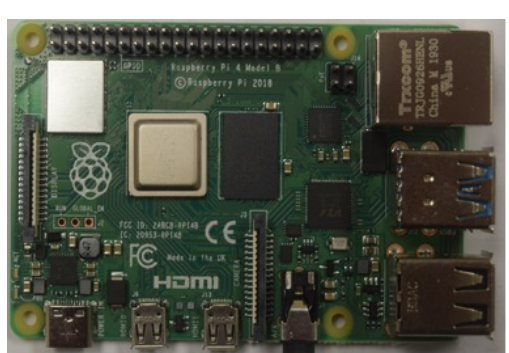
Raspberry Pi Python Scripts pull data from IP address, assign values to variables and uploads them to Google Sheet on Cron

Google Sheet converts scalar signals to a vector and displays it on a dashboard

Work in progress for collocation studies with FRM units run by ADEQ in North Little Rock.
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