

# Environmental Monitoring System

By: Zara Moinuddin & Sofia Yang



# Problem Statement

Develop a monitoring and notification system for logging air quality statistics and pollution and alert when logged metrics fall to unsafe levels.

# Research & Investigation

Temperature & Humidity sensor:

- Digital Output relative humidity and temperature sensor
- Uses a capacitive humidity sensor and a thermistor to measure the surrounding air, and sends a digital signal on the data pin
- Power – 3-5V
- Max Current – 2.5mA
- Humidity – 0-100%, 2-5% accuracy
- Temperature – 40 to 80°C,  $\pm 0.5^\circ\text{C}$  accuracy

# Research & Investigation (cont)

## Air Quality Detection Sensor:

- Detects harmful gases like Ammonium, Sulfur, Benzene, and Carbon Dioxide
- Included digital and analog output pins. When gas levels go over a threshold (set by potentiometer or code) limit the digital pin goes high.
- Analog pin measures in PPM
- Operates from 2.5V - 5V and consumes about 150 mA
- Requires some preheating before it can give accurate results (30 sec - 4 min)

# Potential Solutions

## Data Collection Arduino Sketch

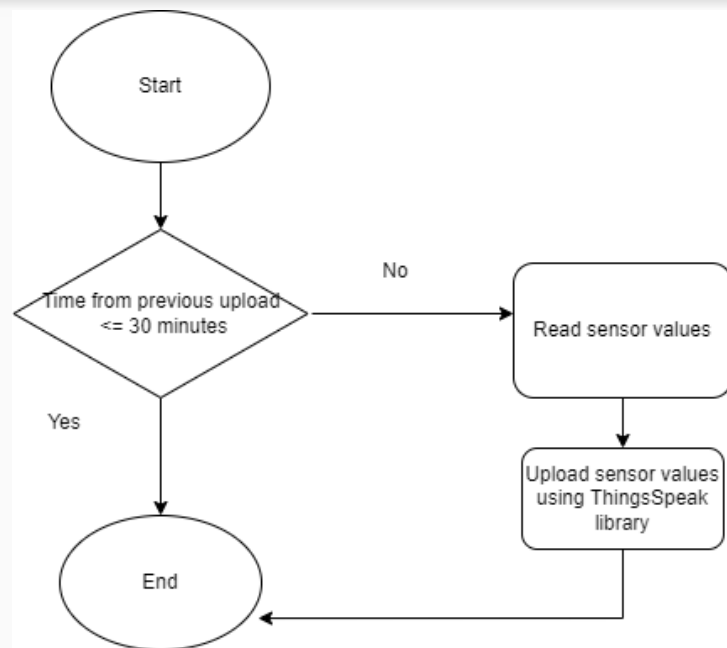
- Collect data from sensor values
- Upload to IOT platform.

## Visualize Metrics & Notification System

- Use MATLAB ThingsSpeak for visualization
- Set trigger for alerts based on sensor values
- Create webapp to display visualizations

## Extra: Regression Model

- Create Air Quality Index forecast ML model based on data
- Use Microsoft Azure to deploy/train/run model



Flowchart of Arduino Sketch

# List of Tasks

1. Breadboard the wire connections between the Arduino and sensors.
1. Write Arduino sketch to read sensor data and upload sensor values to ThingsSpeak IOT platform.
1. Setup ThingsSpeak platform for data visualization and notification system.
1. Create webapp with created charts/graphs of sensor value trends.

# List of Parts

Material/Equipment	Notes
Breadboard ✓	
+5V Power supply for breadboard ✓	
Jumper wires ✓	Not sure what quantity needed
Resistors ✓	Need to see what ohm level resistors required
Capacitors X	
Temperature and humidity sensor module X	(From spreadsheet of available sensors)
Air Quality Detection Sensor (i.e MQ135) X	Not on spreadsheet of available sensors

# Deliverables and Timeline

## Deliverables

1. Data visualization webapp

2. Metrics notification system

Stretch Goal:  
ML air quality prediction model

Date	Expected Completion Goals
10/24	Review proposal and required components Stretch goal: Start Arduino sketch for reading sensor values.
10/31	(A) If sensors arrive: Start breadboarding process. (B) If sensors do not arrive: Complete rough Arduino sketch.
11/7	Continue/Start breadboarding process. Stretch goal: Test/debug Arduino sketch.
11/14	Setup and test ThingSpeak and notification system; Create web application.
11/21 (No Lab)	Continue testing system/work on ML components.
11/28	Deliver final result.



# Conclusion



## **Goal:**

Develop a monitoring and notification system for environmental air quality + pollution metrics.

## **Applications:**

Use insights collected for data analysis/ developing future solutions and public policy

## **Extra Goal:**

Build a machine learning model to forecast air quality based on humidity/temperature/level of air pollution.

# References:

Temperature and Humidity sensor:

<https://create.arduino.cc/projecthub/sachendra003/arduino-humidity-sensor-288146>

Air Quality detection sensor:

<https://quartzcomponents.com/products/mq-135-air-quality-gas-sensor-module#:~:text=The%20MQ%2D135%20Gas%20sensor,the%20digital%20pin%20goes%20high.>