



# AirU: Air Quality and How it Affects You

University of Utah

The Particulates

Chapman, T.; Knudson, G.; Ottenbacher, C.; Taylor, T.

## Goal

To create an interface for users to access pollution data gathered from a distributed network of low cost sensors.

## Introduction

Bad air quality effects residents in Salt Lake City. It can be hard to get an intuition of how bad the air quality actually is in a quantifiable way. Our team has aimed to change that by building upon a previous air pollution project. The previous project has already put out hundreds of sensors around Salt Lake which are currently collecting data. Our project builds on the previous project by developing a second generation of sensors that is cheaper and more robust, creating an interface for configuring those sensors, providing data in a visually and personally understandable way, and creating an API that researcher and developers can use to download large data sets or create their own applications.

## Scope

- Distributed network of low cost pollution sensors collect pollution data.
- Pollution data is pushed is pushed up to a database.
- Web application displays a map of sensors in an area and allows users to display current sensor readings and download sensor data.
- Mobile interface allows users to set up and configure a newly purchased sensor and view a live feed of sensor data.
- Personal Exposure Application allows users to track their path throughout their day and understand the levels of pollution they have been exposed to.

## Backend & Web Application

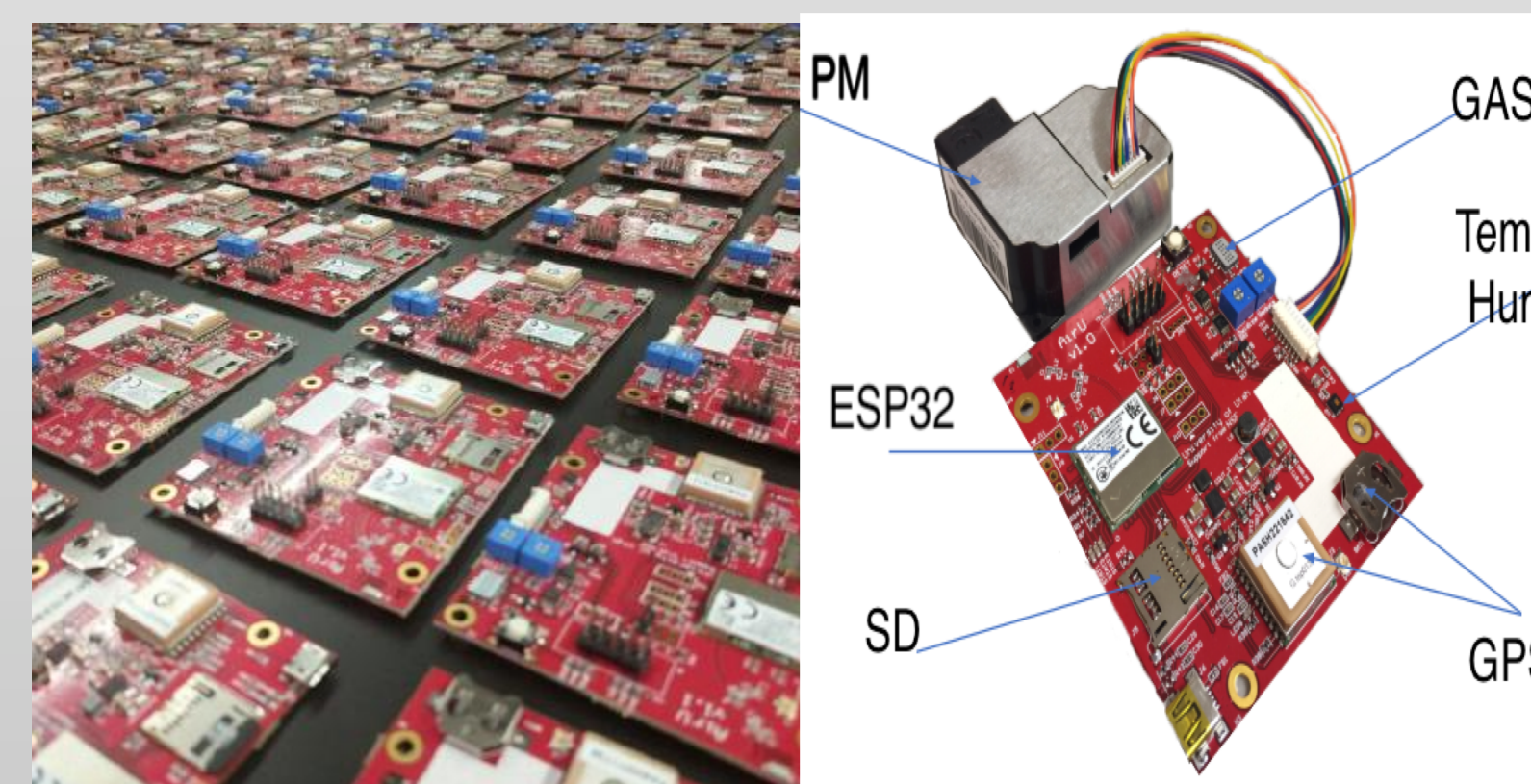
- Allows for interactive viewing of sensor data and pollution concentrations in certain areas which is displayed on a map.
- Allows for users to download sensor data into CSV format.
- Helps users manage their AirU sensors.
- Built with Flask and is hosted on the Google Cloud and requests sensor data from the InfluxDB database.
- MySQL database is deployed on the Google Cloud and stores data for the website.
- InfluxDB database is populated with sensor data via MQTT.

## Mobile Application

- Allows for personal pollution exposure tracking by monitoring a users location.
- Sends notifications when a user is in high pollution areas.
- Uses BLE to communicate directly with an AirU sensor, used for setting up new sensors.
- Communicates with the website backend to receive sensor data for easy viewing.
- Written in React Native.
- Runs on both iOS and Android.

## Sensor

AirU Sensor Components		
Components	MPN	Description
Particulate Matter	PM3003	Detects airborne particles between 0.3 ~ 10 microns. Communicates over UART at 9600 BAUD. UART packets are 24 bytes.
MEMS Gas	MICS4514	MEMS sensor is connected to a 12 bit 3.3V ADC built into the ESP32 microprocessor.
Humidity/ Temperature	HDC1080	Communicates over I2C and provides 14 bit data resolution.
GPS	L70-M39	Uses standard NMEA data format. Communicates over UART at a default 9600 BAUD.
SD Card Connector	ST-TF-003A	Temporarily stores data when disconnected from Wi-Fi. When Wi-Fi connection is reestablished data on SD card is sent to the server and erased.
Microprocessor	ESP32	32 bit dual core microprocessor with built in Wi-Fi and Bluetooth.



## System Architecture

