Master's Project Writeup | Air Quality Dashboard

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Background

In recent years, dramatic wildfires (mainly in the western United States) have wreaked havoc on both the land + generated massive smoke columns that have dramatically driven up air quality levels (AQI) in both surrounding areas as well as far away, carried by winds.
In this project, I utilized software to create a data visualization dashboard (primarily coded in python and Javascript). The function of this dashboard is to educate and inform viewers about the spread and variability of PM2.5 particulate matter; both domestically and abroad.

Objectives

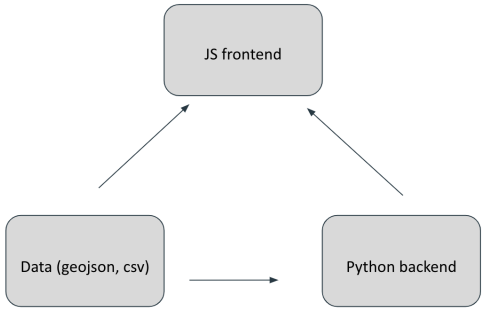
This dashboard includes the following components: a) an interactive map displaying AQI (air quality indices); b) a series of graphs/charts describing current air quality conditions; spotlighting the highest AQI in particular and differentiating between the disparate readings.

Data + Learning

For my data sources, I used the PurpleAir API as well as MapBox for information regarding sensor quality and geographic map. PurpleAir is a company that has created a massive network of low-cost sensors across the entire world, and has released this sensor data into the public domain. I leveraged this capability + utilized their API to pull data from these sensors.

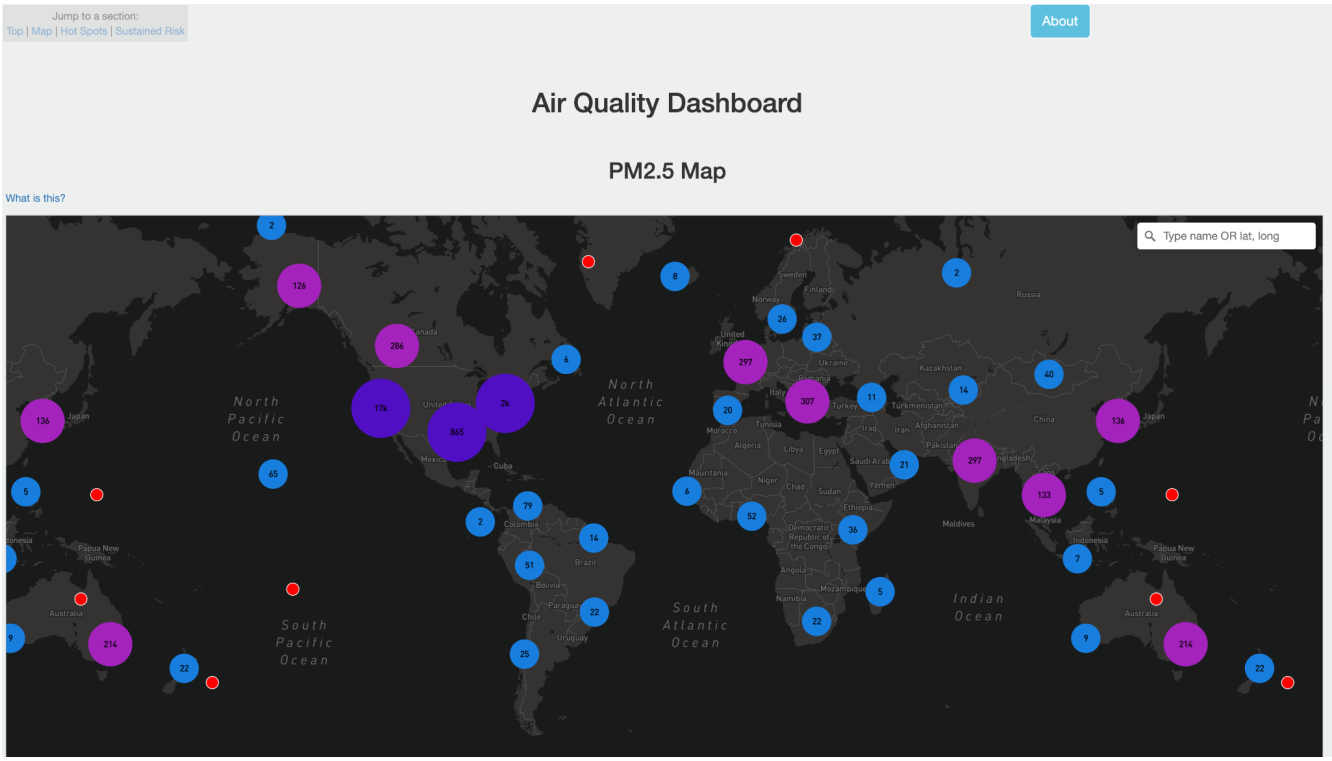
I learned from scratch how to properly utilize APIs, MapBox software, as well as learning d3 - a data visualization base library built in JavaScript. This was frankly an awesome project where I was able to go through the entire learning process while building these skills, as well as create something tangible and useful for others to learn from.

This image shows my workflow. I pulled data both from PurpleAir and mapbox; the latter into a python file for data processing and the former directly into the Javascript portion of the webpage. The python backend was built using flask, enabling me to make direct calls to the data sources without having to manually call the data each different time.

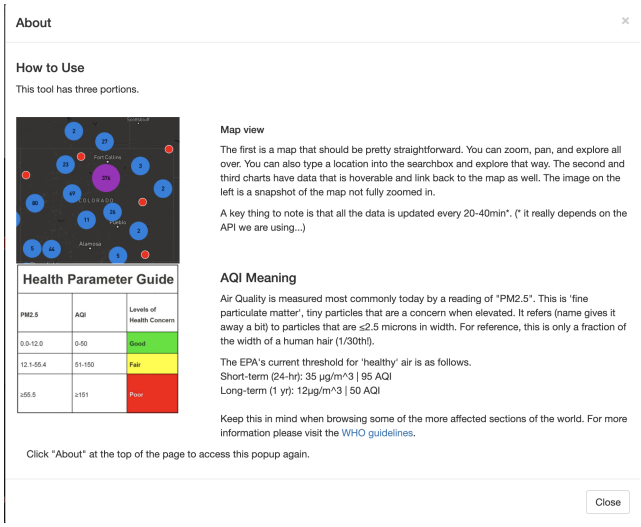


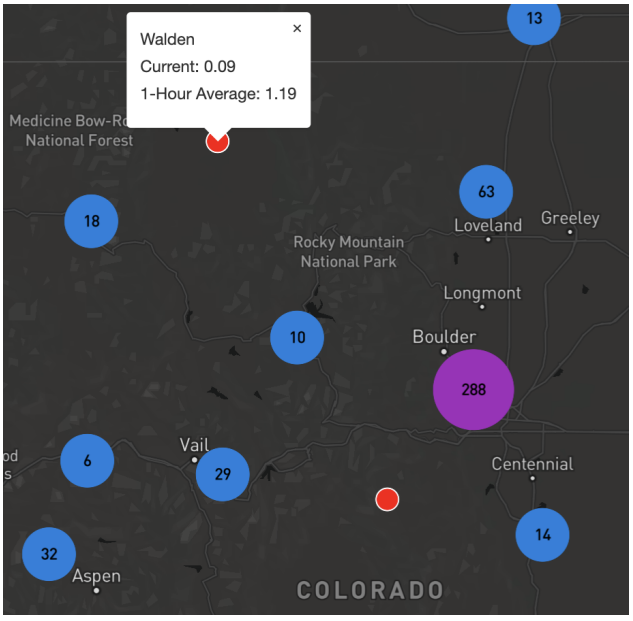
The following images are screenshots of the dashboard.

Screenshots



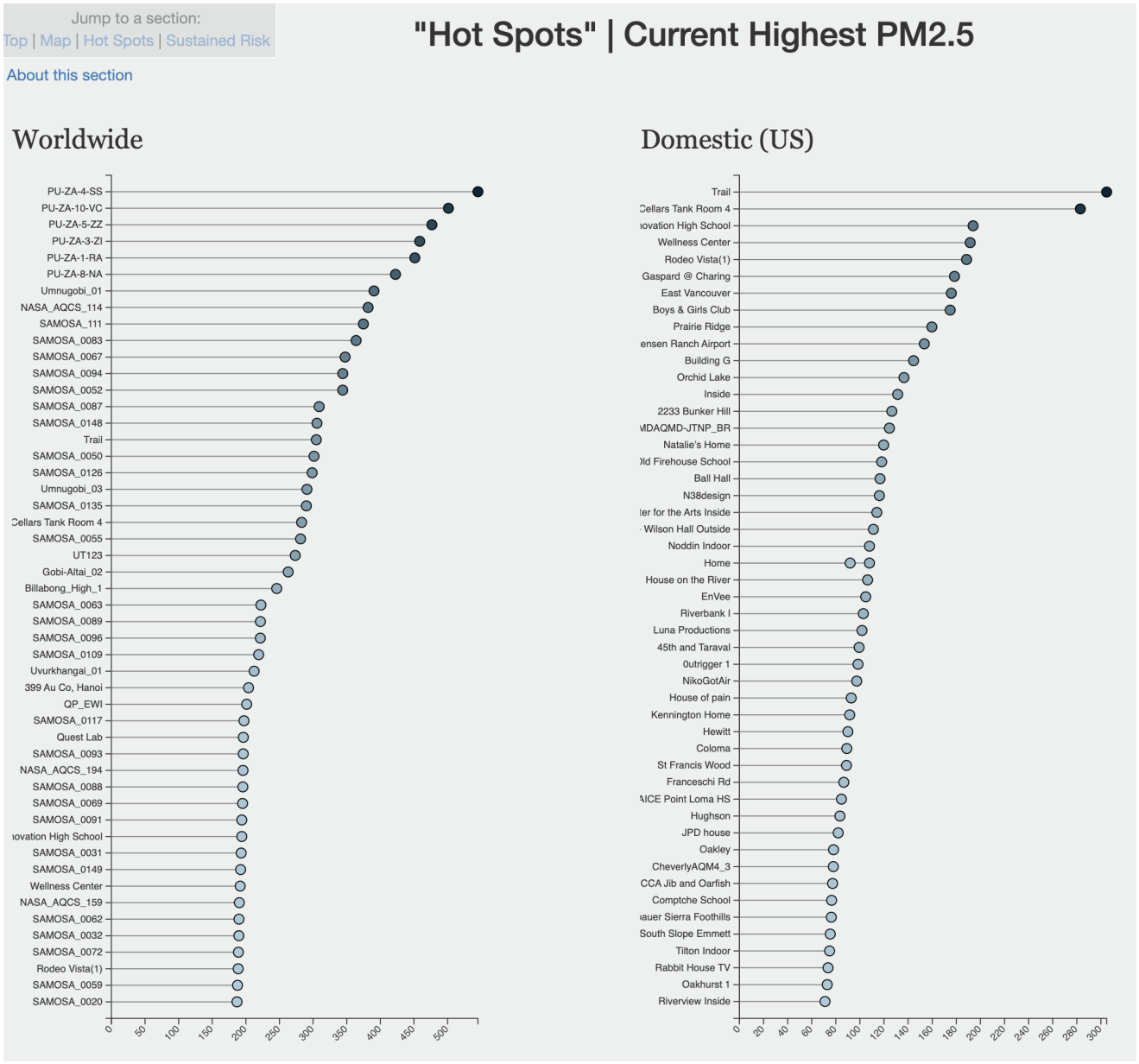
The above image displays the dashboard's loading page. Upon clicking the "About" button, users see the following popup —>. This is a quick introduction to the content that the page serves, showing how to use it and the capabilities on offer. On the map for example – users can click, drag, and pan; exploring as they would do with Google Maps, for example. It also explains Air Quality Indices (AQI), how that relates to PM2.5 particles, and more general information.

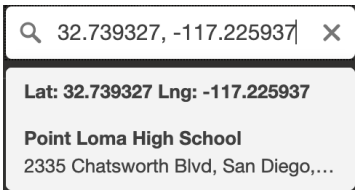




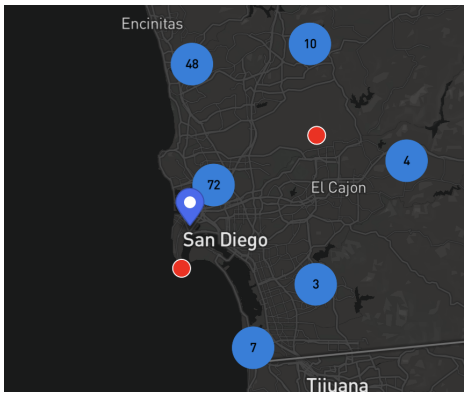
The image on the left is a zoomed-in shot of the interactive map. The user has navigated to Colorado, and clicked on a single point displaying AQI in Walden. We can see that Walden has a reading of .09 (very good), and that there are a ton of sensors - some 288 - very near to Boulder. Zooming in further would reveal those individual sensors.

The next section discusses “Hot Spots” - where the AQI is currently the highest. There are two charts - worldwide and the United States. We display them here.

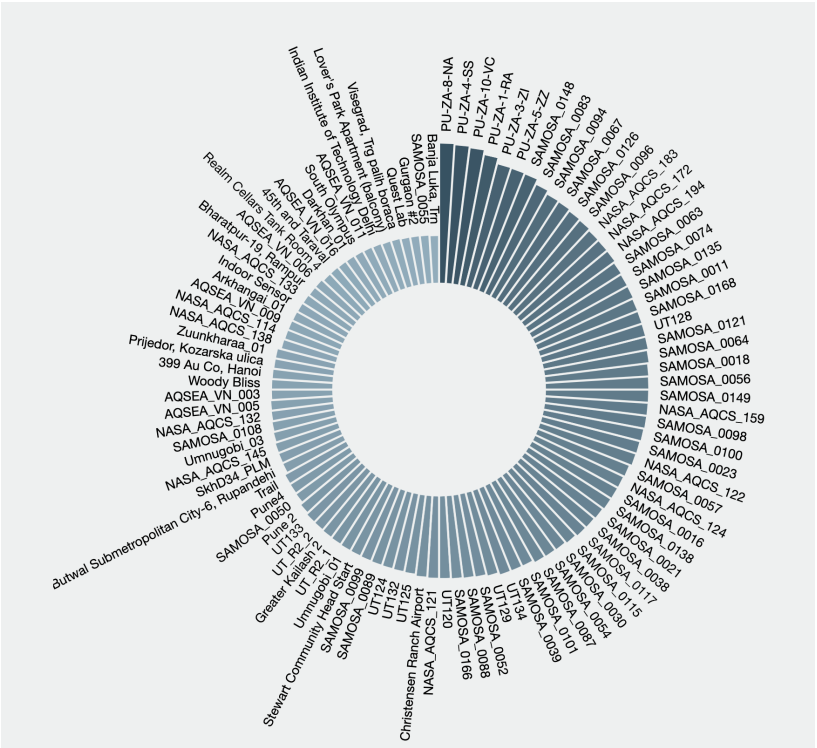




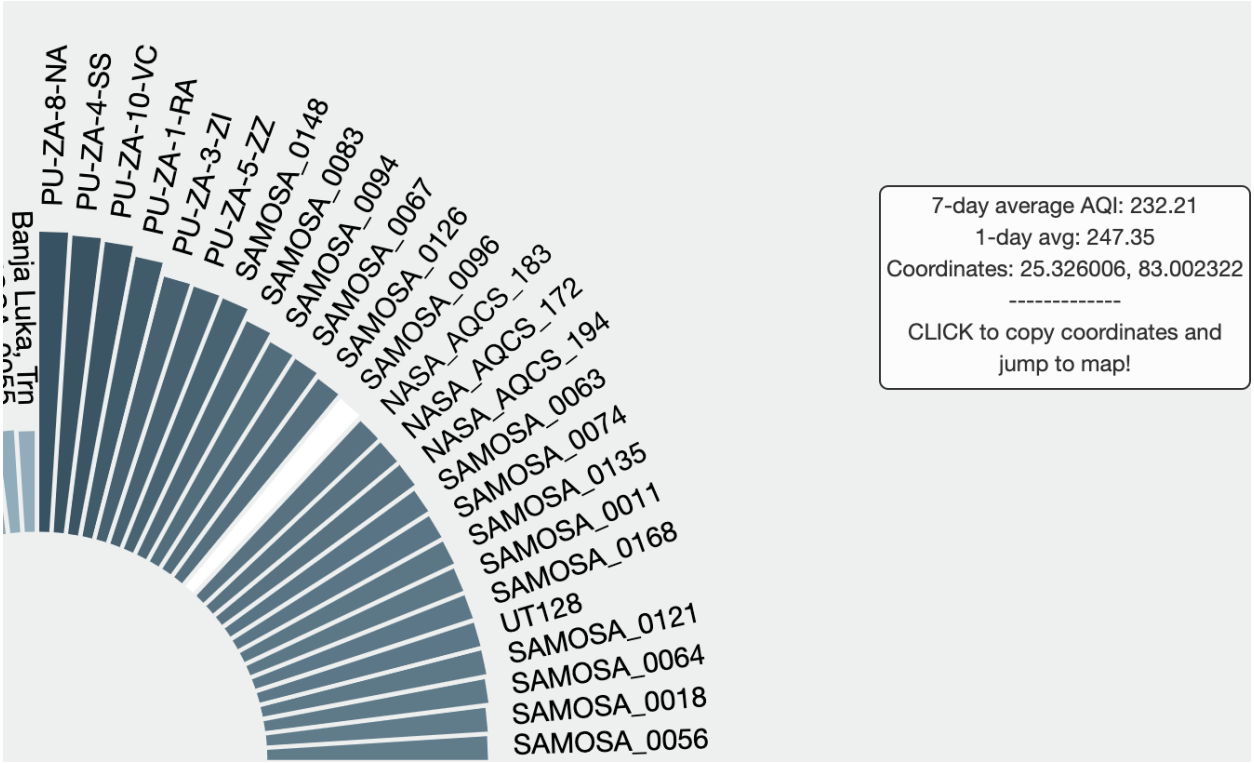
We note that hovering over the dot denoting “AICE Point Loma HS” displays the box on the right - AQI for different times, as well as the coordinates. Clicking on the dot redirects the user back to the map, where they are able to paste in the coordinates of the dot they hovered over. Pressing enter, or selecting the location, seamlessly takes the user to the desired location on the map.



The final chart follows here. This chart displays the highest average AQI over the past week (7 days).



We note that hovering on a slice a) highlights it and b) brings up a popup with the highest weekly AQI, the ability to compare it to the daily AQI, and the coordinates. Again, clicking on the slice will bring the user to the map, where they can again paste and search to find the coordinates of the sensor.



Website Link + Thanks

This dashboard is hosted through GitHub pages here. Feel free to reach out to me with any questions.

A huge thank you to Professors Baruah + Ho for evaluating, and especially to Jeffrey Rosenbluth for both assisting throughout the project as well as sitting on the committee.