1 A link to the URL to web application

The link to the URL to web application is as follows:
https://codepen.io/gblgphgv-the-styleful/pen/KKGYWZR (Note: You have to log in to ArcGIS online to see it. Although I have set the layers to public, it seems that it does not work.)

2 A description of our dataset and the external dataset

a. What information is available in our and in the external dataset?

We build and deploy the sensebox for ambient sensing and use Arduino IDE to program our sensebox:edu. We collected our data through senseBox around ETH Hönggerberg from 15:33 to 16:05 on May 12, 2023. We record date, time, latitude, longitude, temperature, pressure, PM10 and PM2.5 using our sensebox and they are saved in a csv file. The ambient data is recorded every 5 seconds. We walked around ETH Hönggerberg with sensebox and recorded 307 data points.

For the external dataset, we use ambient data from opensensemap website to extend our data, which can be used to validate our single measurements so the quality of the application we develop improves through the additional information about the situational conditions of the surrounding area. (URL: https://opensensemap.org/) It offers various ambient data, such as temperature, PM10, PM2.5, humidity and so on. So it can serve as additional dataset to our measurement.

b. Why do we choose the external dataset?

As a Volunteered Geographic Information (VGI) system, opensensemap offers environmental data from thousands of sensorboxes around the world. It covers a large area so it is quite easy to find the data around our research area (ETH Hönggerberg)

Opensensemap offers various ambient data, such as temperature, PM2.5, PM10, humidity and so on. So we can find the same ambient data from it.

The data downloaded from opensensemap with coordinates is easy to be displayed on the web application.

Also, it is easy, quick and free to acquire the data.

c. How does it correlate to the data we gathered and contribute to validating it?

The external dataset offers different types of ambient data that can be correlated with our data such as temperature, PM2.5 and PM10. From the senseboxes around our research area (ETH Hönggerberg), we can acquire the data that is obtained at the time when we measured so it can be used to show that our data is valid. Also, the data collected at other time could serve as additional data to complement our dataset.

From the map, It can be shown that pm10 value around the forest is lower than that around the buildings. It is consistent with our common sense. The data of the opensensemap at 14:25 is close to what we measured so it contributes to validating our measurement. The data of the opensensemap at 7:00 shows that pm10 value in the morning is higher than the afternoon. It helps extend our measurement.

3 A description of the web client

a. What information did I choose to display?

We collect temperature, pressure, PM10 and PM2.5 data using different sensors. I choose to display PM10 data. Another two group members choose to display temperature and PM2.5 data. Pressure almost remains unchanged so it is meaningless to display. Light changes a lot as long as we change the direction of the panel (such as when the sensor faces the ground) so we don’t consider to measure it.

b. Why did I choose that particular information (what is your “theme”)?

The theme of my web application is PM10 around ETH Hönggerberg.

First, it is quite easy to measure PM10 using the sensebox with the sensor. The sensor is sensitive to the change of the fine dust so it is meaningful to measure it.

Second, fine dust is highly correlated with air quality. So if I visualize it through web applicaiton, people can see it intuitively and it can give advice for people who want to improve air quality.

Last, PM10 value at different places can be shown so people can have a understanding with regard to air quality of different parts of the campus.

c. Why did I choose the specified geographical area?

We study on ETH Hönggerberg campus. So for one reason, it is easy for us to just go out and collect data around it. It is also meaningful to find some characteristics about our campus. We three group members just walked around the campus and explore it with sensebox at our hands.

Opensensemap has several senseboxes around the campus so we can find those data to validate our measurement.

d. A description of the code

My code is divided into three parts: html, css and js.

1) In html part, I define the structure of the web. I use bootstrap framework to show About, Legal notice and Privacy. And then, I use div node which contains checkboxes to handle which data is shown on map. After that, I add the map view from ArcGIS Maps. At last, I add button to handle measurement tool.
2) In css part, I define the style of different parts of the web page (view, layerToggle, measurement bar).
3) In js part, I define interactive parts between the user and application and feature layers to be shown. I define the renderer to show pm10 value and color of the points depends on the value of pm10. Then I define three point feature layers: one is the layer that displays data what we collected using sensebox, the other two layers show pm10 value from opensensemap. Three layers share the same renderer. Then, I add some widgets (basemap toggle that can be used to change basemap, legend to show the legend of the layers, home button to display home). At last, I define how to control the measurement tool to measure distance and area.