

The data collection process entails simulating cough events and capturing the event data with mobile and particulate matter (PM) sensors.

Cough simulation:

Cough simulation is conducted using a fog machine and mechanical ventilator. The aerosol (fog) gets released into the room with high velocity air flow from the mechanical ventilator.

For each of the room conditions (e.g. placement of furniture, opening or closing of doors and windows, ac status), the aerosol release event is simulated five times, with three to five minutes intervals in between for capturing aerosol dispersion data in a steady environment.

The events are triggered manually with the press of the mechanical ventilator button. The fog machine is operated in continuous mode with a time interval set to 5 minutes. Because of the manual triggering requirement, a human experimenter must remain in the room during the trial.

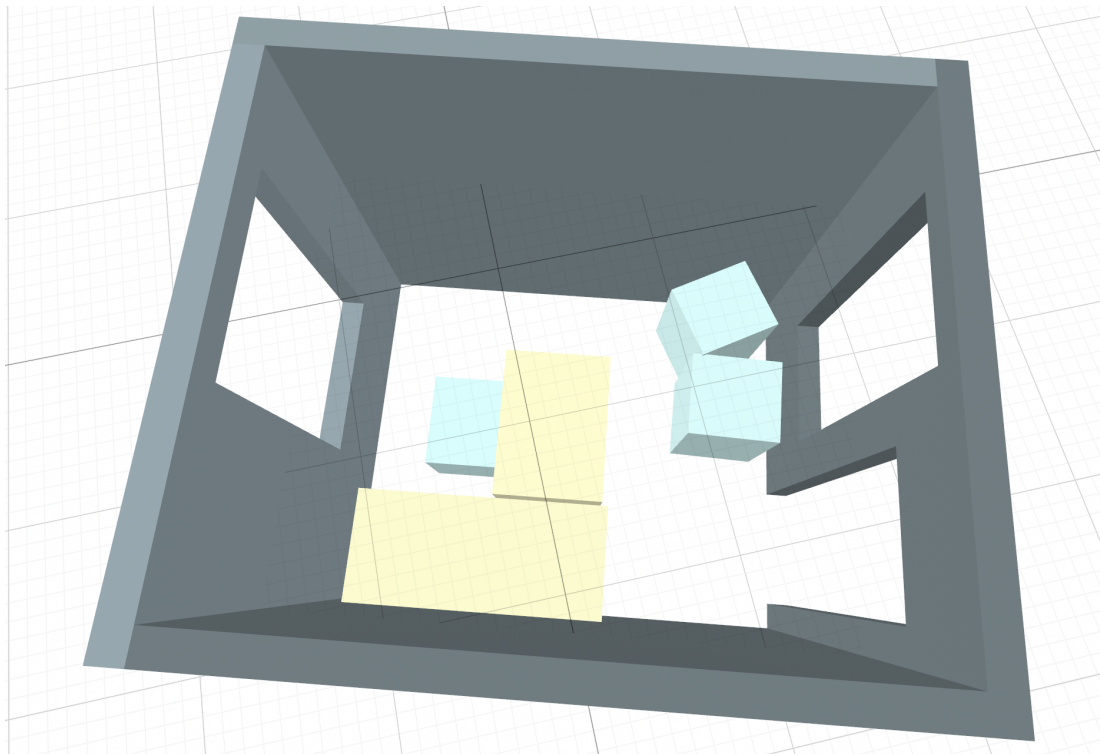
Sensors and data modalities:

The collected data include particulate matter concentration using a particulate matter sensor (SPS30, Sensirion AG). The PM sensors are connected to a USB hub which connects to a laptop during the experiments. We use the Sensirion control center application for communicating with the sensors and for saving the data to files. There are six sensors placed in different parts of the room, the placement of the sensors is discussed in more detail in the next section.

Additionally, we developed a mobile application for data collection which captures Audio (raw audio recording and/or classification using a model), thermal images (using a FLIR One Pro thermal camera, with option to detect humans in the images). Additionally, we are able to capture 3D layout of the room using Lidar sensor and phone camera and obtain depth information using the lidar sensor.

Room Layout and sensor placement:

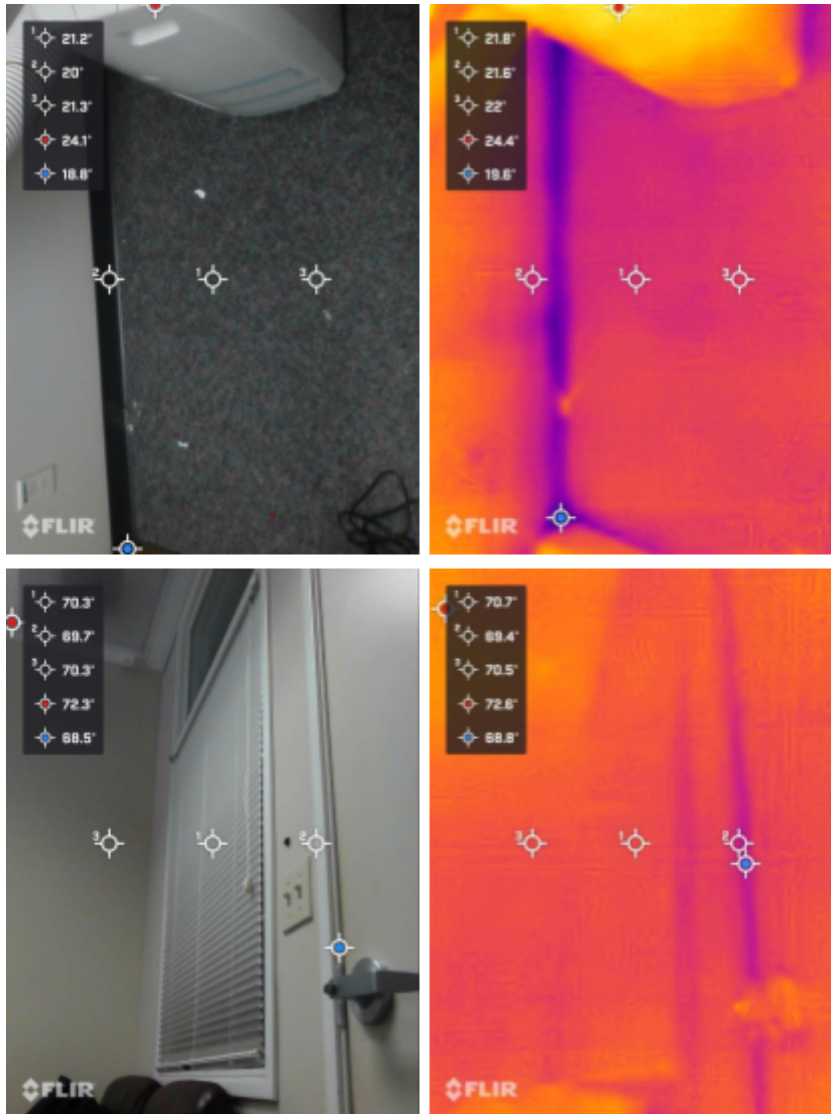
The room being used for data collection purposes is a small office room (approximate dimensions - 3.2 m, 2.6m, 3.2m). There is a desk and three chairs placed in the room. The fog machine and the mannequin are placed on the desk. Some images of the room are attached below.

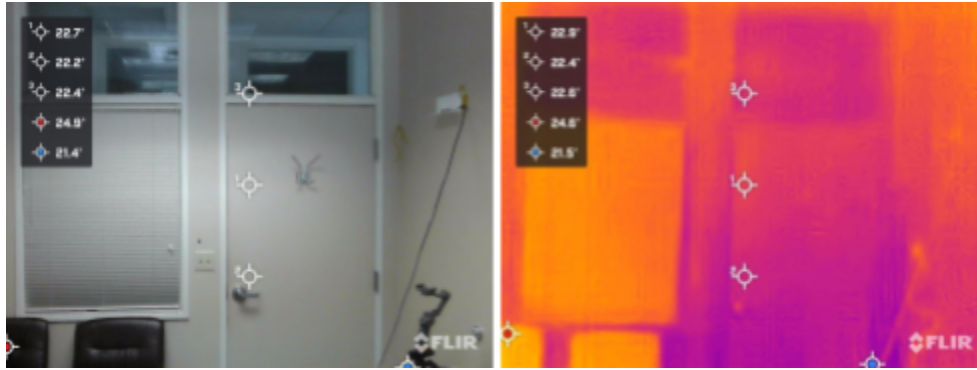


Surfaces and temperatures:

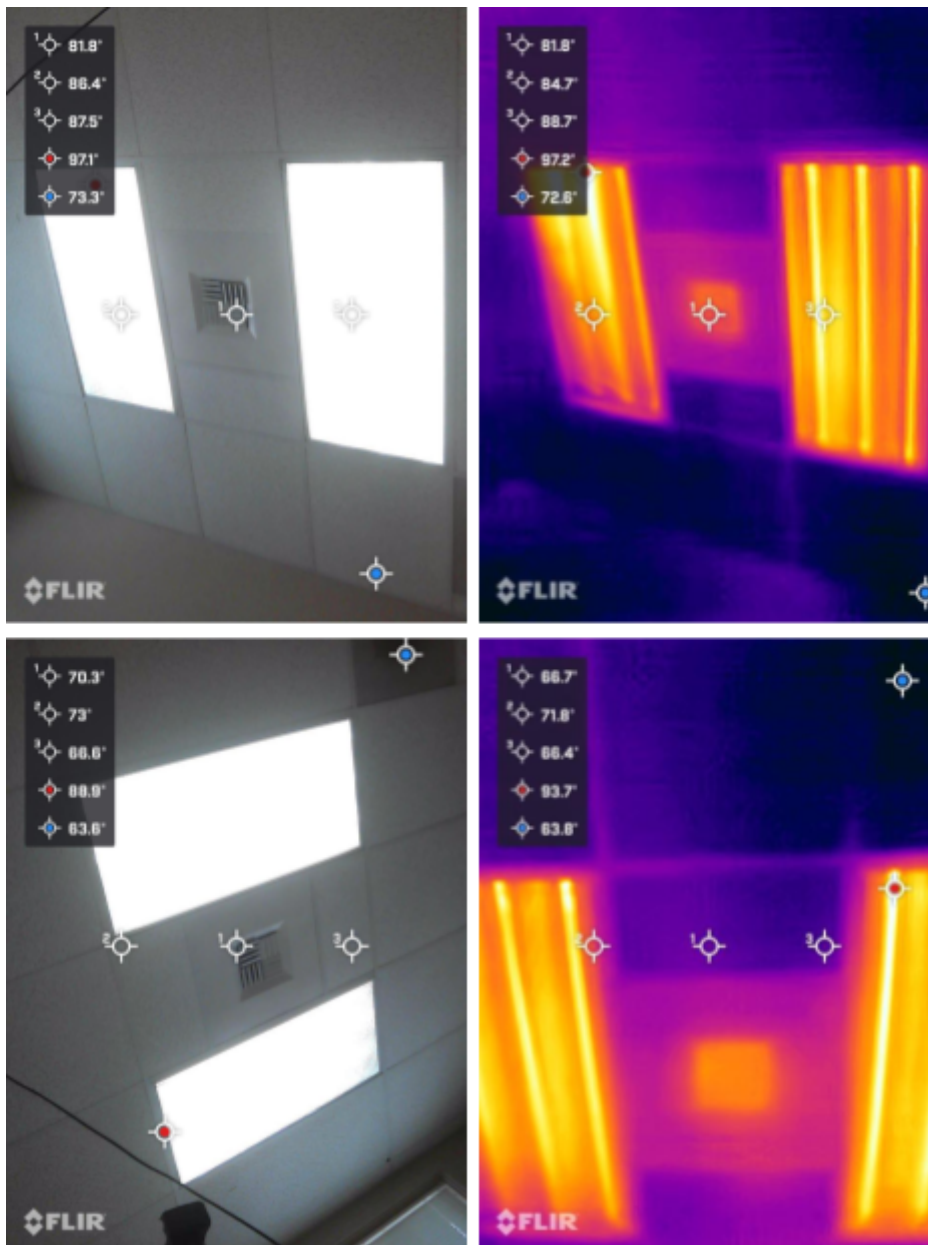
For setting up CFD simulations, we need to specify the types of surfaces and the temperature. With our developed data collection app, we can capture thermal images in the room using a thermal camera (FLIR One) which works with a smartphone. The following includes some thermal images of the surfaces using the camera for reference.

- Walls, windows, door and floor

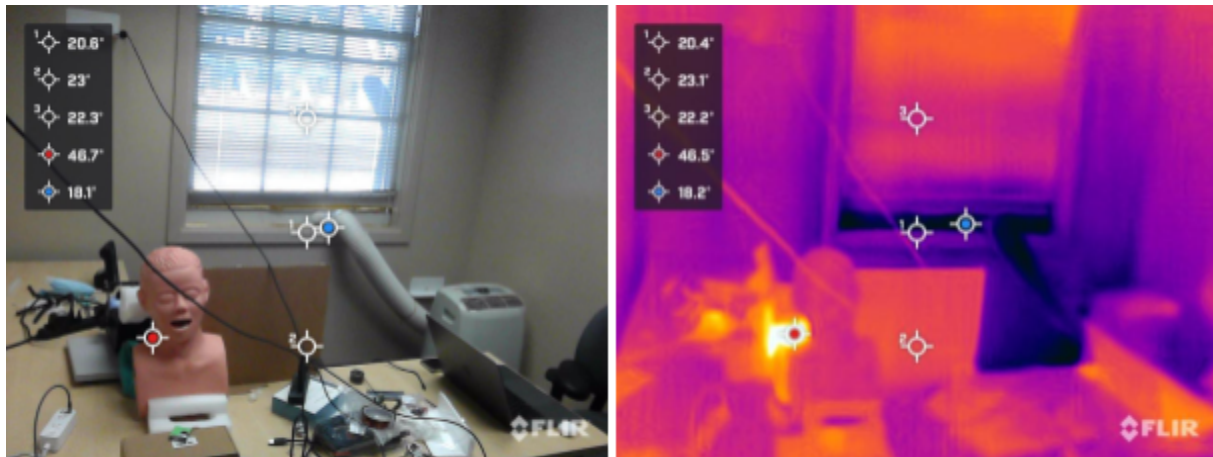




- Light fixtures



- Mannequin (the fog machine is heated and generates heat)



Sample Data:

The following plots include some example plots generated from the collected data. The fan speed refers to the fan speed in the AC unit (set to fan only mode, no cooling).

