

## 1 Motivation

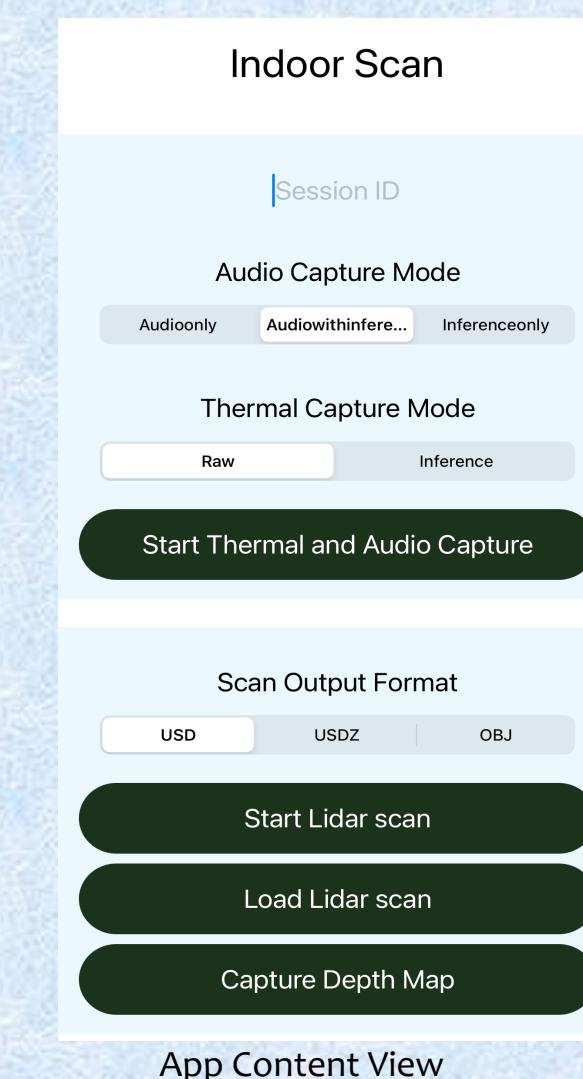
- Indoor air quality is crucial for the safety and comfort of people in various setting.
- Existing air quality monitoring systems are often expensive and do not account for risks associated with respiratory droplets and aerosols.
- A tool can provide information about resident time of respiratory aerosols would be useful.

## 2 Goals

- Develop application to monitor resident time of human respiratory aerosols in indoor environment utilizing mobile sensors and machine learning models, with the aim of improving the safety of people, especially in high-risk environment such as hospitals, healthcare facilities and classrooms.
- The app will capture syndromic signal such as cough and provide information to optimize safety in dynamic real world setting and use cost effective and accessible to the general public.

## 3 Data Collection App

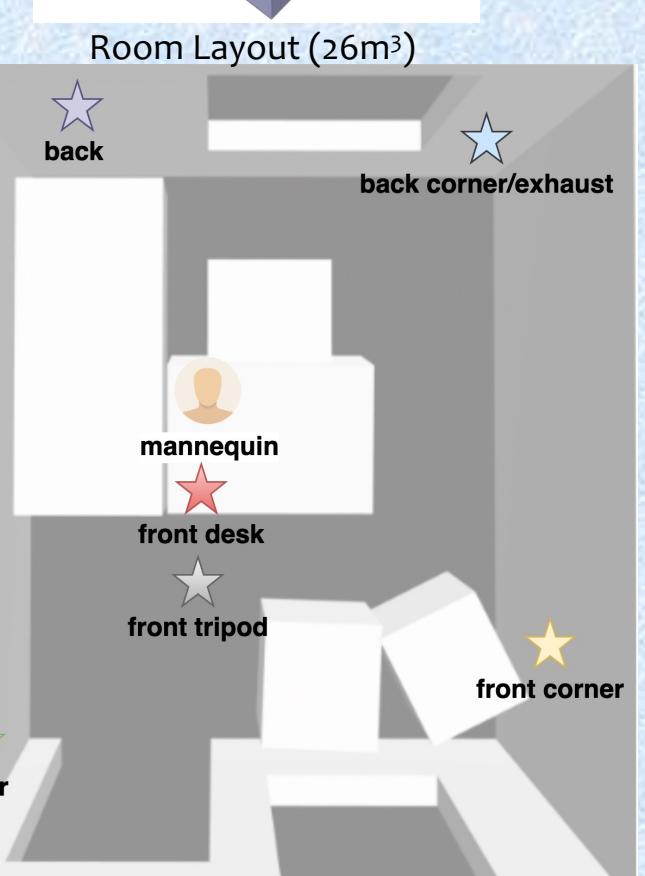
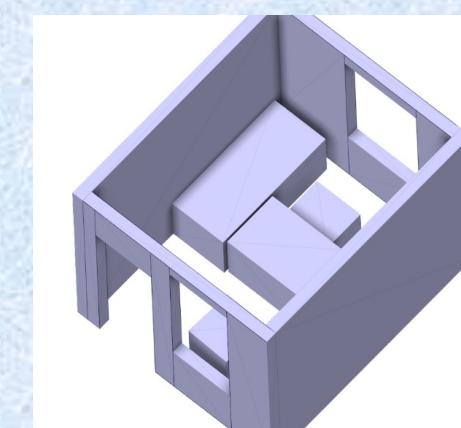
- Develop iOS application for collection of data and proof of concept deployment of models



Person &amp; Sound Detection

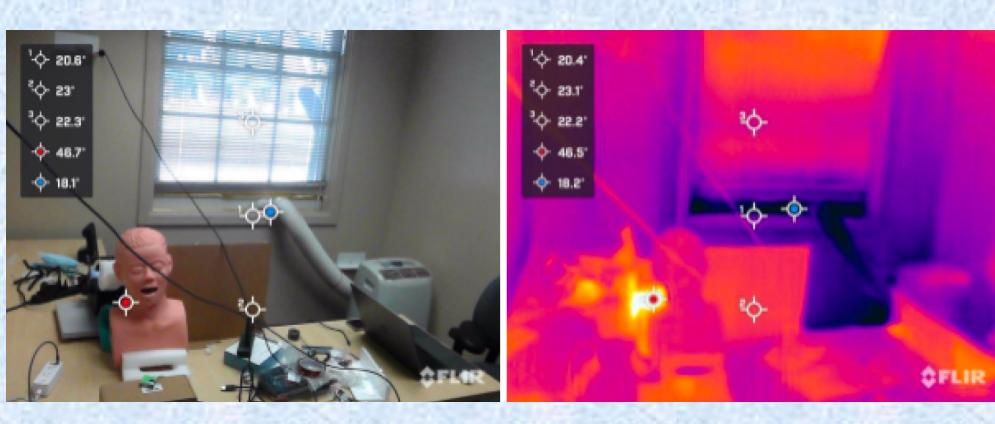
Room Scan Process

## 4 Data Collection Process



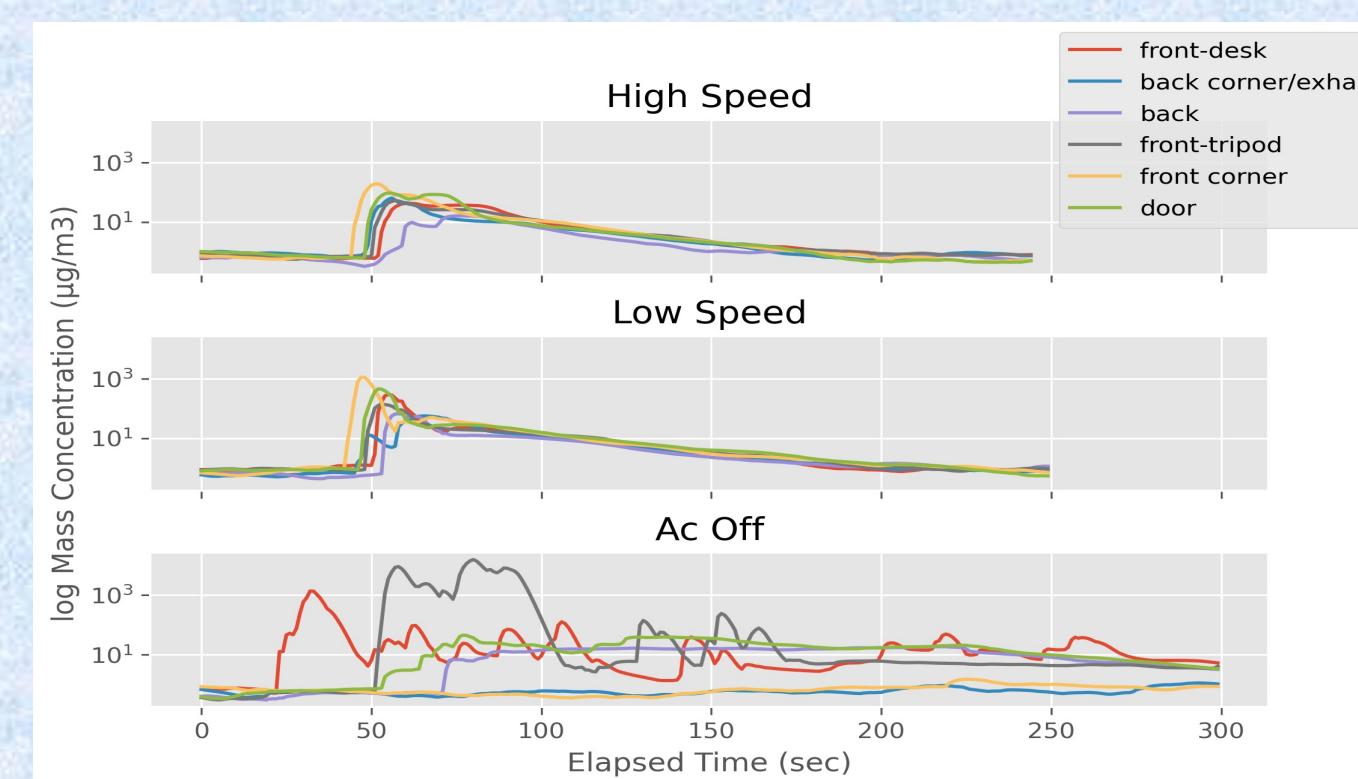
Sensors Placement

- Testbed setup in a small office room
- Simulated human coughs mechanically using a mannequin, mechanical ventilator, fog machine, and air compressor
- Six PM sensors were set up to measure actual particle concentration in the room

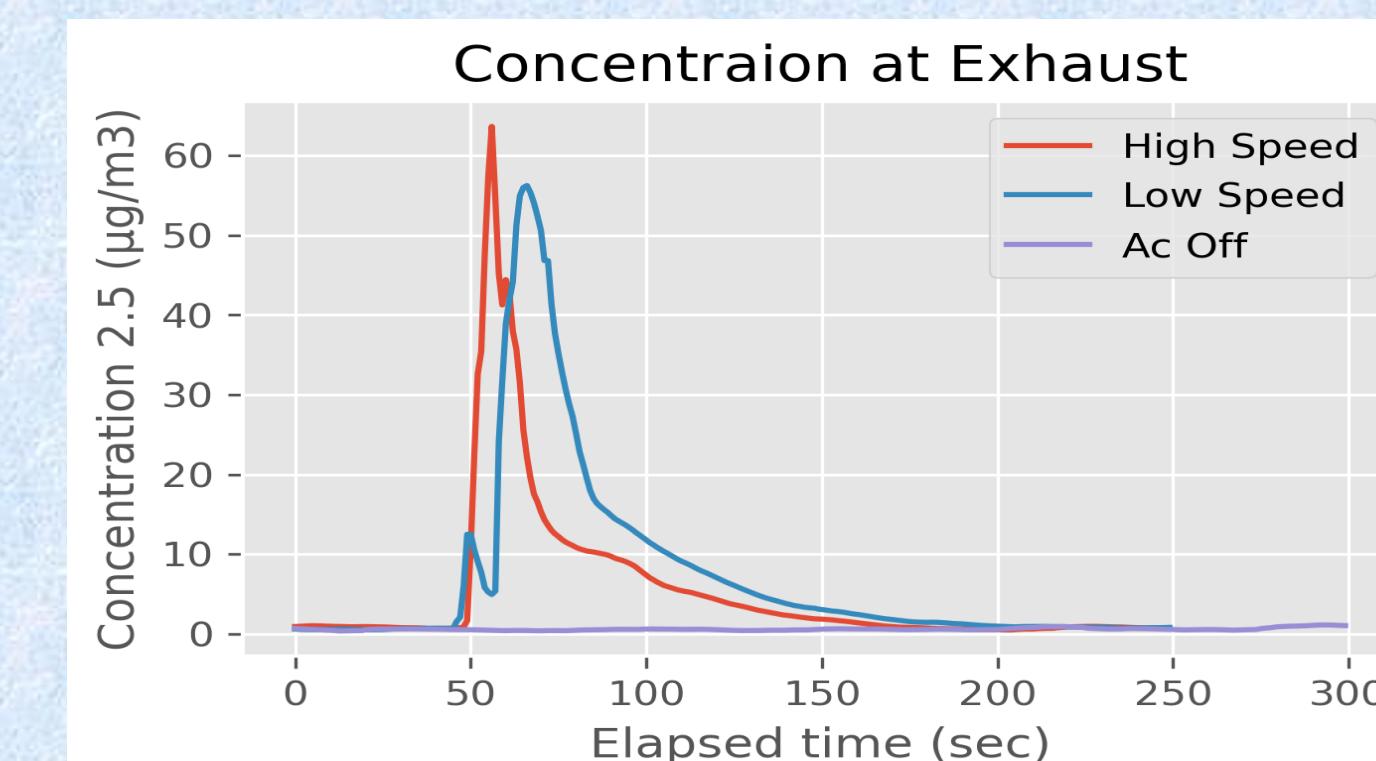


Data Collection Environment with Cough Simulation Mannequin

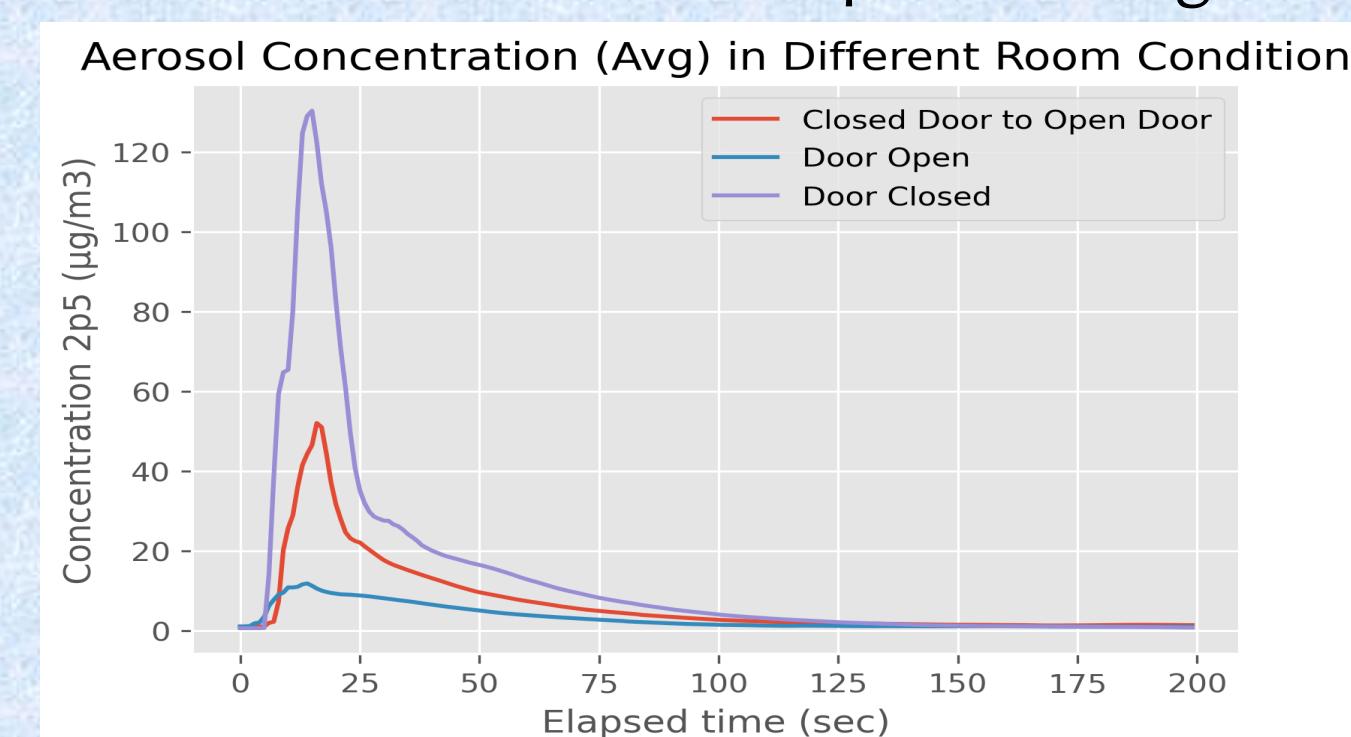
## 5 Data Visualization



- Impact of Fan Speed and Sensor Location on Aerosol Concentrations

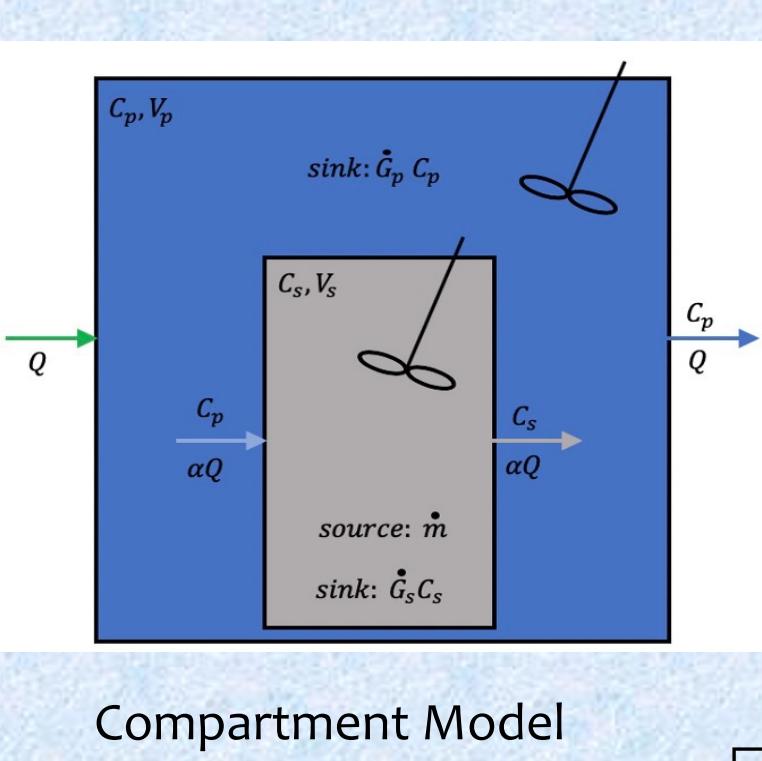


- Aerosols disperse more rapidly at high fan speed settings

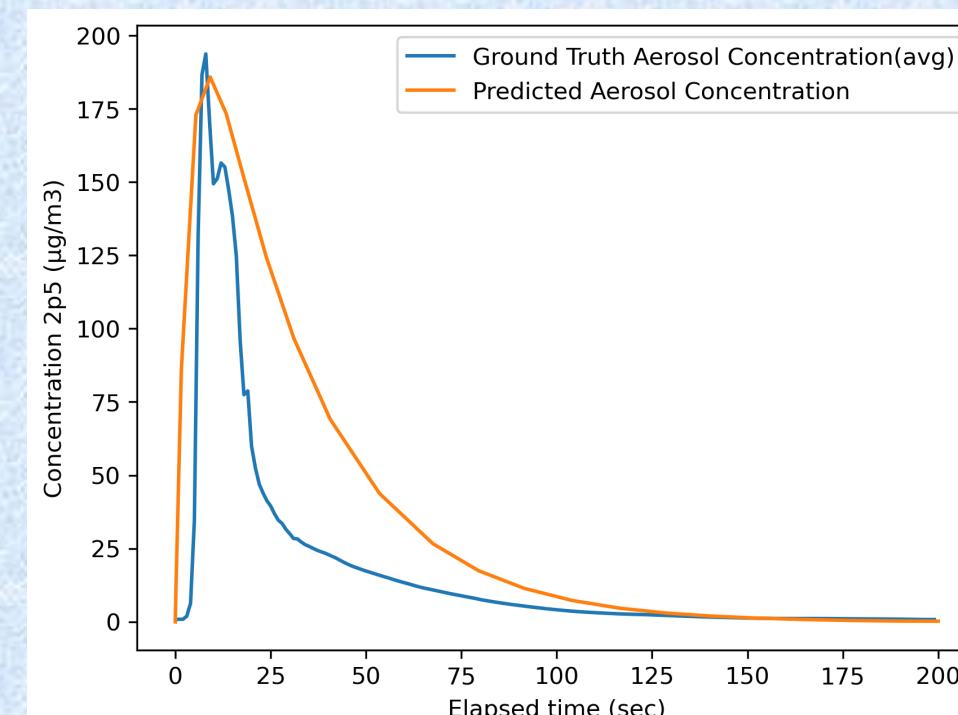


- Effect of Open Doors on Aerosol Concentration Dispersion

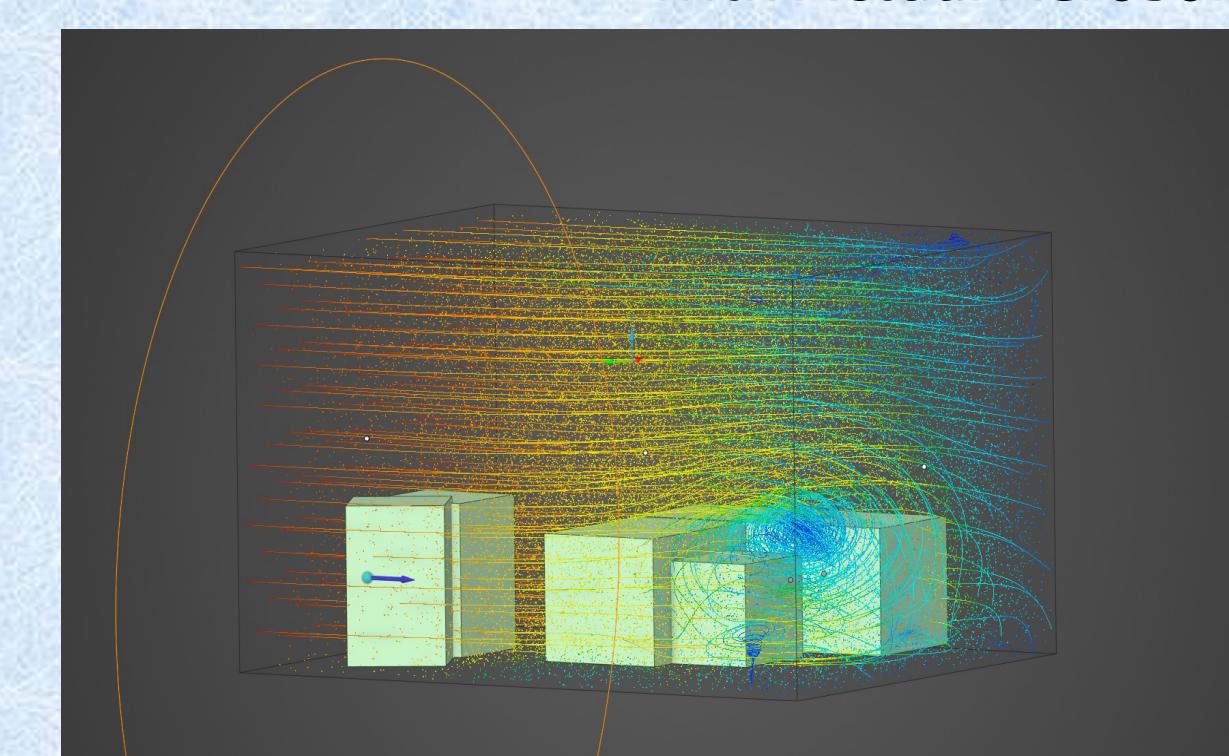
## 6 Model & Simulation



Compartment Model



- Comparison of Forecasting Model with Actual Aerosol Concentration



- Computational Fluid Dynamics Simulation for Modeling and Data Validation

## 7 Discussion

- Develop models using measured sensor data and simulation data to develop robust models to predict aerosol resident time
- Perform experiments on human subjects to improve the model's accuracy in incorporating sound labels and subject movement.