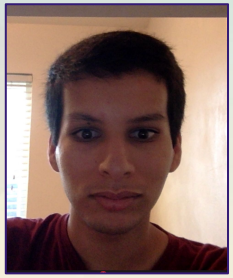
Sick Building Syndrome and Indoor Air Quality

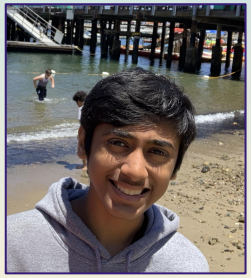
COVID-19 Increased Health & Safety Group 2

SICK
BUILDING
SYNDROME

Our Team



Saahil Sundaresan
California



Om Hirpara
Texas

Chris Huang
New York

Shafin Khan
Michigan

Ria Singhal
Ohio

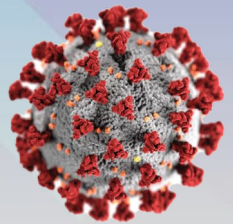
Zoila de Leon
Florida

Finn Maniscalco
California

Haydie Morales
Utah

Rohan Gudipaty
Texas

Background



- Sick Building Syndrome: acute health and comfort effects that appear to be linked to time spent in a building
  - Psychological factors
  - Ventilation
  - Chemical Factors
  - Biological contaminants

Our Approach to the Problem

- Trying to improve IAQ

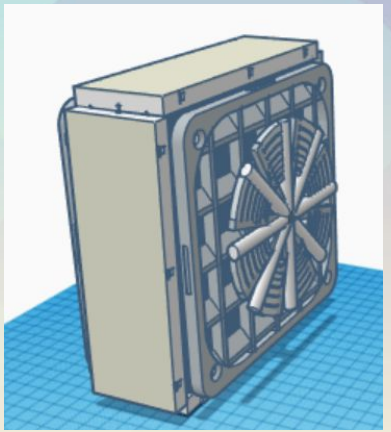
  → Focus on Designing a Filter Model
- Air Quality Monitor
- Machine learning algorithm for hazard prediction

Our solution: Filter model

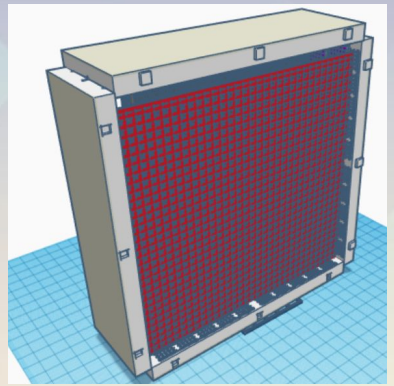
Components:

- HEPA Filter
  - Removes particles - dust, smoke, pollen, allergens, etc.
- Activated Carbon Filter
  - Removes VOCs, odors, and other gaseous molecules
- Far-UVC Sterilizer Lamp
  - Kills bacteria and viruses
  - Disintegrates remaining organic material

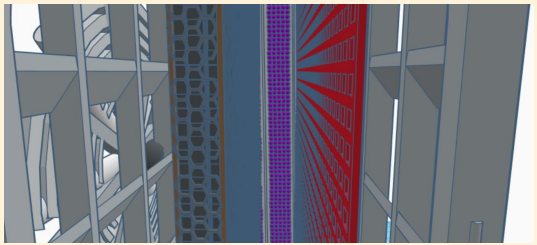
Back view

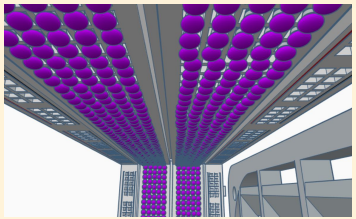


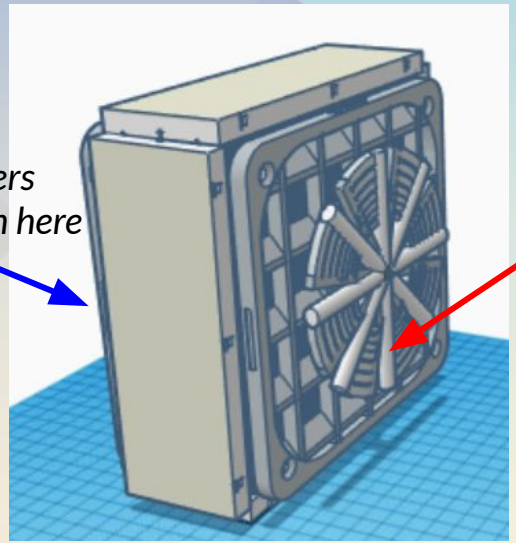
Front view(inside)



Side view (inside)







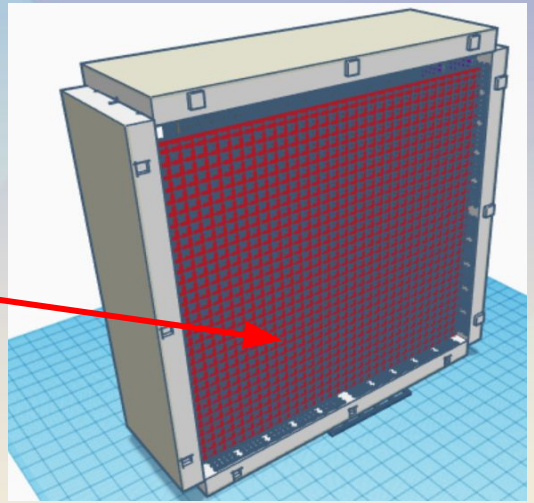
Back view

Air enters through here

Clockwise-spinning fan

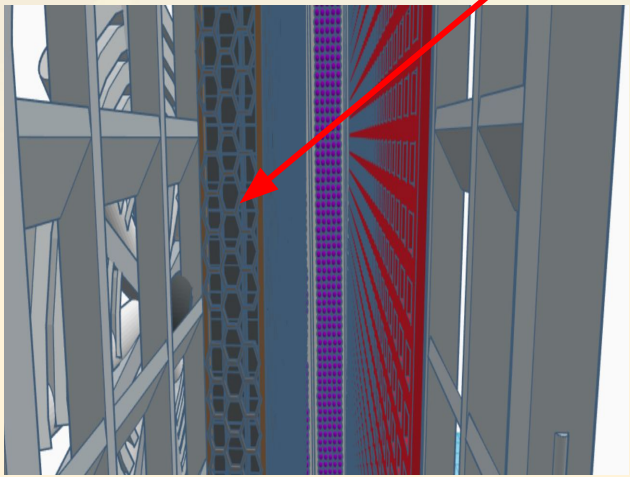
Front view

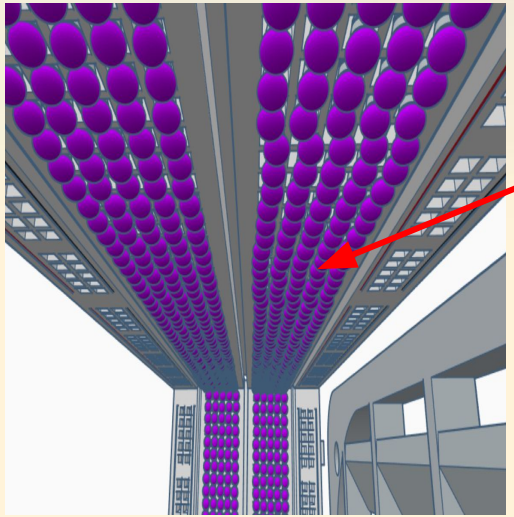
HEPA mesh-charged filter



Activated charcoal

Side view (inside)





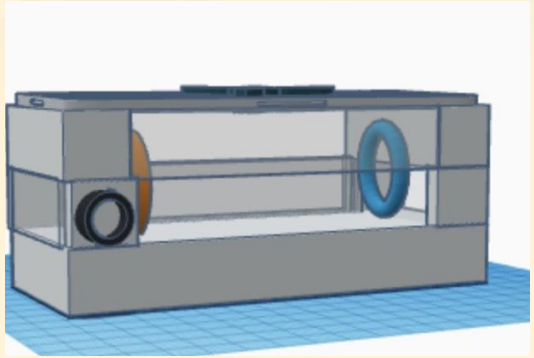
UVC overhead lights

Our solution: Monitor model

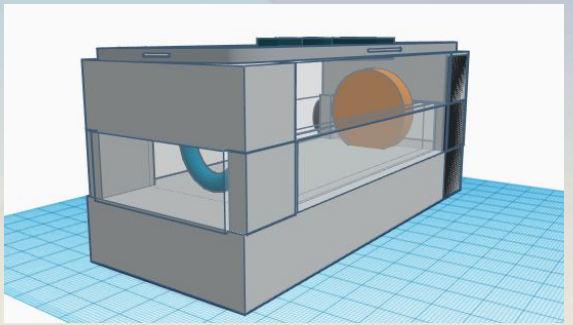
Features:

- Electroacoustic sensor
- Ability to display various concentrations of pollutants
- Detect all particles over 200 nm in length
- Multiple linked sensors throughout a building

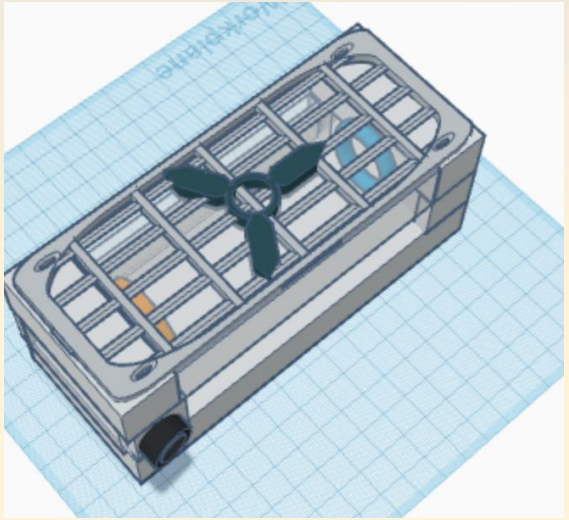
Side View



Front View

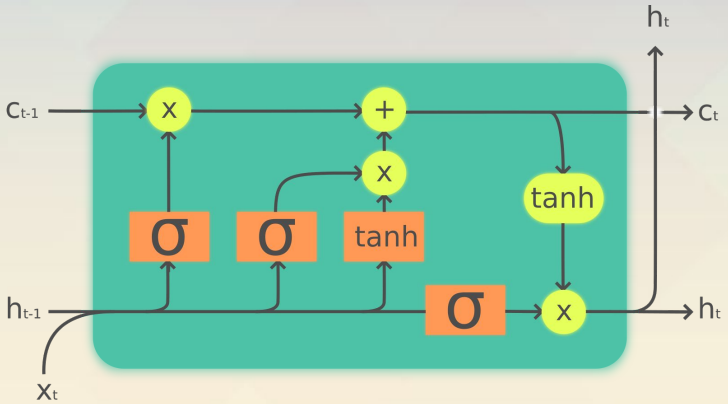


Top View

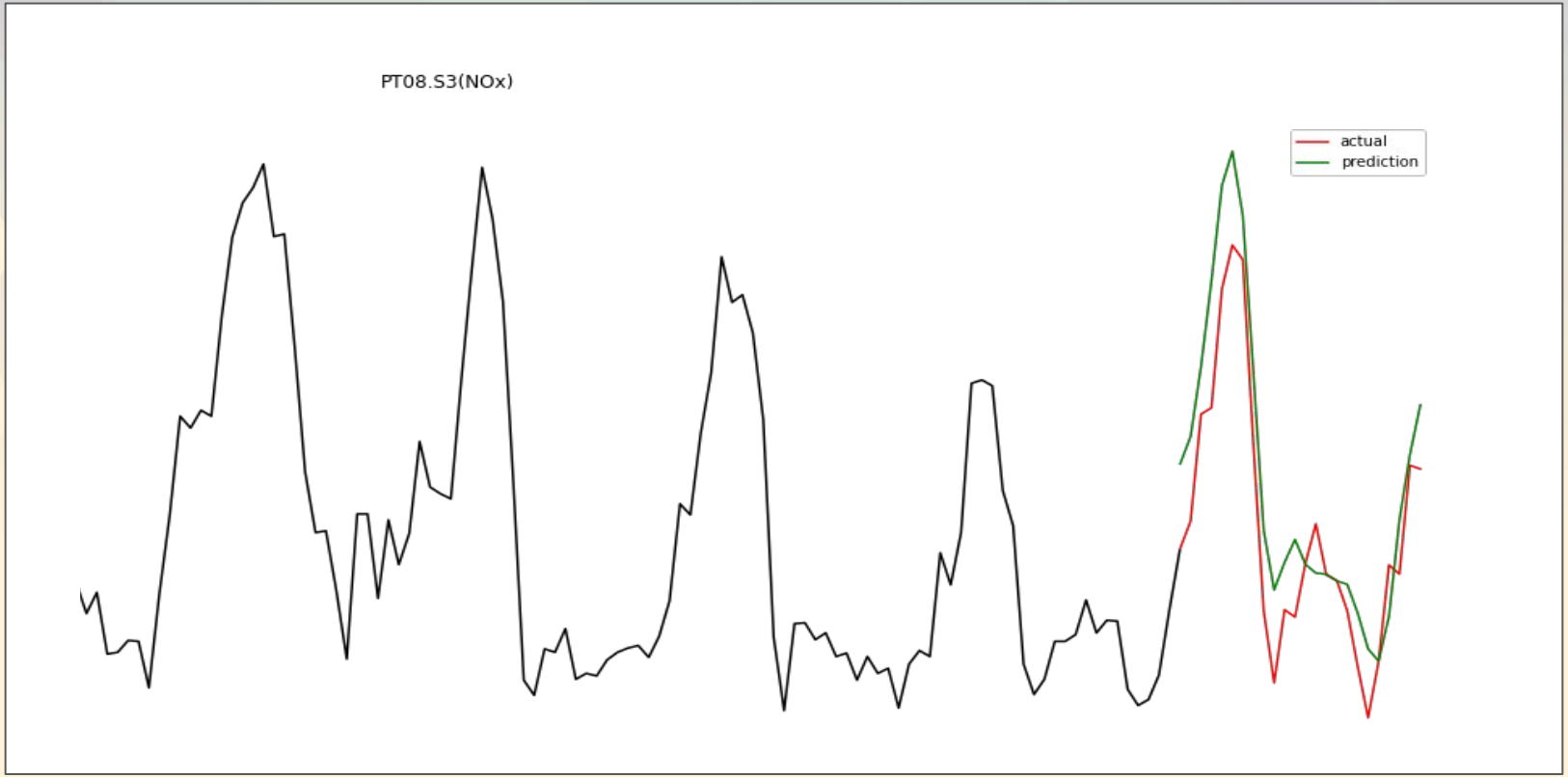


Hazard Prediction: Machine Learning Aspect

- Extension of monitoring system
- Architecture: Long-Short Term Memory Recurrent Neural Network
- Trained on a set of 9000+ air quality measurements
- Analyzes the last 7 days of data to predict air quality for the next 24 hours



Visualization of Model Predictions



Best features and challenges of SEES

Best Features:

- Getting to collaborate with fellow peers
- Mentored by a professional NASA researcher
- STEM Speaker Series

Challenges:

- Working with new individuals
- Online communication

How SEES Shaped our Future Plans

“This internship has demonstrated the required skills for my future goals in Computer Science.” -- Om

“Working on air filter design has opened up to me the possibility for a career in earth or materials science.” -- Saahil

“Collaborating with intelligent and ambitious peers has helped me understand the level of precision and detail necessary to succeed in any high-level field in the future.” -- Finn

Thank you for Attending!

- Director: Mr. Urban
- Chair of the Board: Mr. Chamitoff
- Associative Director: Mr. Vadali
- Board Members: Mr. Bowling, Mr. Gardner, Ms. Janes, Mr. Smith
- Senior Education and Outreach Coordinator: Ms. Baguio
- Senior Outreach Program Coordinator: Ms. Miller
- Mentor: Ms. Foxworth

Sources

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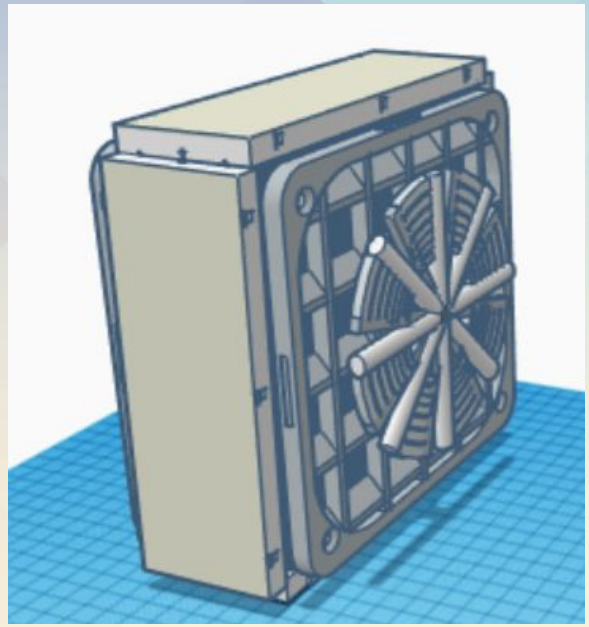
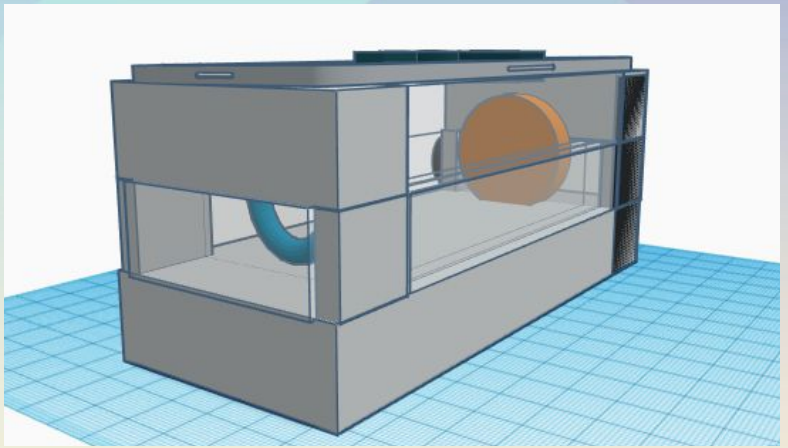
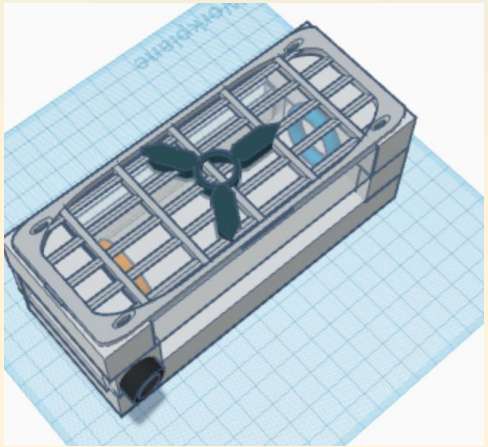
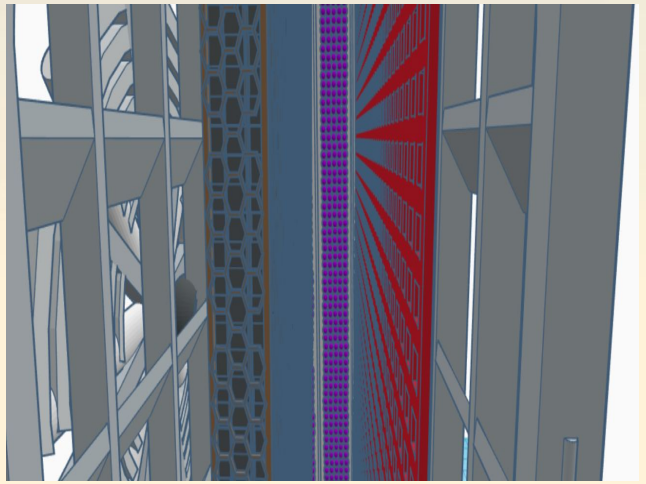
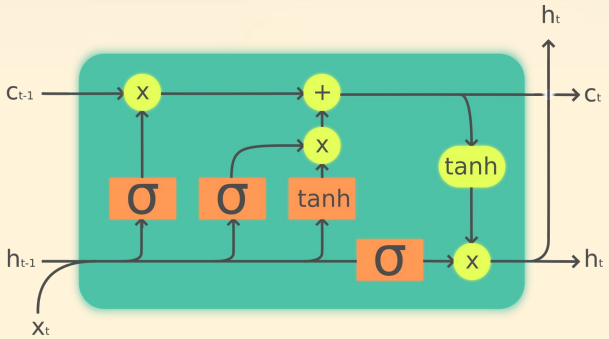
Questions?







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