Thesis Project Portfolio

A User Interface Informing Medical Staff on Continuous Indoor Environmental Quality to Support Patient Care and Airborne Disease Mitigation

(Technical Report)

Creating "Smarter" Cities through Human Involvement

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Table of Contents

Sociotechnical Synthesis

Smart technology has begun to emerge in all facets of our life. As we make decisions on community, business, and individual levels on how we incorporate this technology, it's important to ensure this technology helps us. The following research explored how smart technology can improve our communities when it is properly designed for the user.

The technical thesis aimed to utilize environmental air quality monitoring in hospitals to improve patient care and hospital efficiency. This became a relevant issue during the COVID pandemic, as our research process revealed the potential applications of air quality sensing in hospitals, if these metrics could be visualized in a way that wouldn't burden our users (nurses, doctors, etc.). Our final deliverable was a Django web interface to provide real-time healthcare insights based on current air quality metrics throughout a hospital department.

The STS research explores the problems with smart cities driven by corporate motivation and the importance of constituent cooperation in these cities. During my research, it became clear that technological progress does not necessarily signal progress for the people. The research allowed me to better understand how this smart technology should be implemented, which was both relevant to my technical thesis as well as my previous academic research into occupant sensing. I understood that the technology had the opportunity to provide data for the greater good, but I found it necessary to research how this information can be properly utilized for greater scale smart city projects.

These projects together provided me an in-depth understanding of human centered development in smart initiatives. Through my technical thesis, I engaged with users to create an interface that will continue to be utilized by my research team and the UVA hospital. My STS research provided some interesting questions about smart city development and how we can avoid misaligning the needs of the people. I think it's important to continue research into how we can better bring in the ideas of the "silent majority" in the smart city conversation.

Finally, it's important to understand I could not have completed this work without the assistance of my research advisors Alan and Arsalan, as well as my capstone team James, Will, and David for working through endless Zoom calls working on the interface.