

## **Thesis Project Portfolio**

### **Leafy - Link: Automated Hydroponic Irrigation System**

(Technical Report)

### **Examining the Volkswagen Emissions Scandal Through the Lens of Duty Ethics**

(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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## Sociotechnical Synthesis

My technical project and STS research are connected through a shared concern for responsible engineering—specifically, how technologies are designed to serve users ethically and effectively. Both projects focus on the role of decision-making in engineering practice, whether in the automated functions of a hydroponic system or in the corporate choices that led to Volkswagen’s emissions scandal. Although the two projects differ in application, the underlying theme of ethical responsibility and system design remains central throughout.

My technical work focuses on the development of *Leafy-Link*, an automated hydroponic irrigation system designed for growing microgreens with minimal user intervention. The system includes a range of sensors that monitor temperature, humidity, pH, water level, and total dissolved solids (TDS) to ensure optimal growing conditions. When sensor readings fall outside target ranges, the system automatically adjusts lighting, humidity, or nutrient delivery. A touchscreen interface allows users to select plant types or customize environmental parameters. Through this project, my team and I aimed to make hydroponic growing more accessible, especially for users without prior agricultural experience. The project showcases how smart automation and real-time feedback systems can reduce human error and labor while promoting sustainable indoor agriculture.

My STS research explores the Volkswagen emissions scandal using Kant’s framework of duty ethics. Specifically, I argue that Volkswagen’s installation of defeat devices in diesel vehicles violated core ethical duties such as honesty, transparency, and respect for stakeholders. By applying Kant’s categorical imperative, my research highlights how corporate decisions must be evaluated not only through legal or economic outcomes but also through moral principles that

hold regardless of consequences. My paper critiques Volkswagen's corporate culture and decision-making processes, emphasizing how the failure to uphold duty-based ethics contributed to widespread deception and long-term reputational damage. The goal of this research is to show how ethical theory can inform corporate accountability and guide future decision-making in engineering and management.

Working on both projects simultaneously gave me a deeper appreciation for the ethical dimensions of engineering design. Building *Leafy-Link* required careful consideration of how users would interact with and trust the system, particularly in how sensor data was presented and how maintenance notifications were delivered. My STS research, in turn, underscored the importance of embedding ethical responsibility into every stage of engineering—from design choices to long-term system impacts. Together, these projects helped me see how technical decisions are never neutral, and how ethical reflection is essential to the engineering profession. In future work, I plan to carry forward the insights from both projects to ensure that the systems I help create serve the public good responsibly and transparently.