Thesis Portfolio

Pedestrian Detection via Thermal Imaging
and
The Hummingbird Light Attack Aircraft
(Technical Papers)

The Intersection of Engineering and Safety Regulation: Transportation Case Studies
(STS Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

The Technical projects and STS Research paper are connected through design process. Both technical projects are in pursuit of a new design to meet two very different challenges. One is focused on developing a machine learning algorithm to detect pedestrians and cyclists. The other project is designing an aircraft to meet a design need set out by the American Institute of Aeronautics and Astronautics (AIAA). Both, however, involve the design process by which engineers create novel technologies. A key aspect of that process, is the consideration for safety. These technologies are designed to interact with humans in some way and thus the user(s) and their protection need to be kept in mind.

The Pedestrian Detection project created an algorithm in which thermal images can be fed in and the machine learning model will determine if any people are detected. This model is designed to use a thermal camera feed mounted on an autonomous vehicle. The car can then make more intelligent decisions, especially in situations where other sensors have reduced capabilities like at night.

The other technical project created a Light Attack Aircraft to meet the Request for Proposal (RFP) from the AIAA. The airplane has to be cheap, and effective in austere conditions and capable of loitering for several hours.

The STS Research paper uses Actor Network Theory to look at how the regulatory failures in the autonomous vehicle and jet-making industry have and will produce unfortunate accidents. It is well known that rules and laws are “written in blood” i.e., only accidents will create the motivation address safety concerns. Many of the laws that had to be considered for the technical projects were created that way. The research paper looks at these industries as they are

the basis from which the technical projects are derived from and therefore some of the tasks completed and the results from both projects are influenced by the topic of the research paper.

From all three projects, it has been made obvious the difficulty of developing a novel and large-scale design. Especially, to do it ethically. With a large project requires a large team and distributed responsibility. It is easy for safety to be lost between the steps. This is made even easier if the outside forces that normally constrain design and guarantee safety are relaxed and left open to interpretation. At the same time, these projects have also shown how to be an engineer that exercise ethical decision making.