How to Maximize Trust in Autonomous Driving
(Technical Report)

Using Actor-Network Theory to Assess the 2018 Fatality of Elaine Herzberg
(STS Research Paper)

An Undergraduate Thesis Portfolio

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<div style="text-align:center">Socio-technical Synthesis: Autonomous Driving Systems and Public Trust</div>

My prospectus and STS research paper each deal with different facets of Autonomous Driving System technology (ADS; technology which pertains to self-driving vehicles.) Though they do so differently, my technical and nontechnical research pieces both aim to emphasize the importance of public trust in the absorption of self-driving vehicles into the market. The prospectus' primary intent is to propose a method to measure an experimental subject's trust in real-time while performing ADS research, specifically in the context of a driving simulator. On the other hand, my STS paper explores the 2018 fatality of Elaine Herzberg, who was struck by an Uber self-driving car (i.e. how this incident affected public trust, why it's important to understand).

The idea set forth in my technical work comes from the research I performed from Spring of 2018 to Fall of 2019. Alongside a group of both undergraduate and Ph.D. students, I helped design and conduct experiments intended to measure human-subject trust of an autonomous driving simulator. Our initial challenge was to devise a real-time trust metric which was intuitive for the subject, transmittable in real time (along with a load of sensory data), and integrated with the lab's autonomous driving simulator. In our solution, we implemented a stepwise "trust function." The subject could use previously-vestigial buttons on the simulator's steering wheel to increment or decrement between integer values of 1 (i.e. "I don't trust the algorithm to handle this scenario") to 7 ("I fully trust the simulator.") My prospectus delves further into this solution, as well as the analytical value such trust data provides in conjunction with sensory data.

My STS paper assesses the circumstance surrounding the 2018 Uber crash which caused the death of Elaine Herzberg. I use Actor-Network Theory as a framework, which allows me to view the incident as a "Network" which failed. In the paper, I claim that scholarly literature on such incidents overlooks the criticality of public perception in the fate of a network like the one inherent in the Uber crash. To make my argument, I begin by stating the above claim. I follow with a review of literature on the subject to showcase what I believe is lacking in the scholarly discourse. Then, I explain the integral ideas of Actor-Network Theory before laying out my own view of the "Uber-ADS Network," as I dubbed it. The Uber-ADS Network is composed of 3 Actors which I viewed as most critical to the incident: Uber, Self-Driving Vehicles, and the Public. After I rigorously define these actors, I analyze the complex connections between them (Uber vs. Public, Public vs. Vehicles, Vehicles vs. Uber). Specifically, I argue that the two aforementioned connections containing the Public were the most important in the ostensible failure of the Uber-ADS Network.

I feel very fortunate to have done research regarding Autonomous Driving Systems; it's certainly one of the major hotbeds for current socio-technical research, and I feel it lent itself very well to both my technical and STS research. I enjoyed being able to explore different sides of the same issue. Writing my prospectus *first* was very useful, as it spurned a number of ideas that ended up being central to my STS paper. The prospectus prompted me to consider an issue's implications both technically *and* socially; this sort of consideration was invaluable in the pure-research paper that followed. More broadly, I find that writing these two papers has given me the tools to consider *any* socio-technical system confidently and systematically---as an engineer, this is perhaps the most important lesson I'll learn.