

**Cost Effective Solar Powered Fan**  
(Technical Report)

**Assigning Blame for the Cambridge Analytica Controversy**  
(STS Research Paper)

An Undergraduate Thesis Portfolio

Presented to the Faculty of the  
School of Engineering and Applied Science  
University of Virginia, Charlottesville, Virginia

In Partial Fulfillment of the Requirements for the Degree  
Bachelor of Science in Electrical Engineering

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May 1, 2020

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### Socio-Technical Synthesis

The intersection of my technical and STS research lies in the impacts that technology can have on society; my technical research demonstrates how technology can be used to impact society in a beneficial way whereas my STS research focuses on how technology can be used for malicious operations. My technical research involves the creation of a cost efficient solar powered fan that can help those who are energy impoverished, which means they don't have access to affordable cooling/heating systems, and those who are struggling to pay their electric bills. For the STS research component, I argue that Cambridge Analytica and Facebook made conscious decisions that led to the misuse of millions of users' information so they are to blame for the exploitation of data to create psychologically manipulative ads rather than the users who took a survey that allowed Cambridge Analytica to collect information. Both research topics illuminate how technology can be used to impact people's lives.

My capstone group built a solar powered fan that is a low cost supplement to expensive traditional cooling methods. Many people in the United States are energy impoverished which means they don't have access to affordable cooling and heating. We tried to ameliorate their problem by creating a fan that utilizes solar energy to charge and run the fan so that users don't have to pay for energy-intensive air conditioning. To create the technical product we designed the circuit board, soldered the components onto the board, 3D printed the fan blade, and assembled the enclosure for the circuit board and the fan.

My STS research investigates who is to blame for the Cambridge Analytica scandal using the definition of blameworthiness that identifies that there are four criteria that need to be met in order to be culpable which include wrong-doing, causal contribution, foreseeability, and freedom of action. Cambridge Analytica and Facebook were to blame for the breach of privacy that allowed data to be collected in order to create psychologically manipulative targeted ads because they met all the conditions of blameworthiness, but users of Facebook were not culpable because they only met two of the four conditions. The point of researching this topic is to inform individuals of how Cambridge Analytica and Facebook took intentional steps that led to the misuse of data and to provide insight on data collection in order to formulate policy that can prevent history from repeating itself.

Working on the two projects allowed me to realize the importance of considering the user when designing a product. While working on the capstone project, my capstone team interviewed our client about the parameters of the design to make sure it aligned with their needs. Since I learned about the importance of the user in my capstone project, I also considered the interactions between the user and technology in my STS research. By considering the user in both my technical and STS research I realized that users are very vulnerable because they may not know exactly how the technology they are utilizing can harm them. I believe that it was beneficial to work on both research projects simultaneously because I was able to design a product while trying to understand the user and also observe how products already in use deal with user engagement issues.