Thesis Portfolio

Designing an Updated System for Time Lapse Microscopy to Study *Toxoplasma Gondii* Invasion in Intestinal Epithelial Cells
(Technical Report)

Depictions of Social Media Using the Social Construction of Technology Concept
(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

The infection of *Toxoplasma gondii* is so subtle that most people do not even realize that they are affected. The only way to find out if one is infected is through a medical diagnosis. While the infection is treatable with antibiotics, this does not make an individual immune to a future contraction of the parasite. In regards to its effect on behavior, the parasite has the ability to alter one's levels of dopamine. When comparing the parasitic infection to social media, one realizes the similarities between biological and technological concepts. Just as the parasite *Toxoplasma gondii* is capable of influencing one's behavior, social media can lead to user addiction and similarly interfere with one's way of life. People in society are determined to be user addicts based on their daily screen time, which reveals how much time one spends on various social media platforms. It can be difficult to distract oneself from social media, as technology is ingrained into modern society. Unfortunately, while *Toxoplasma gondii* infection can be treated with antibiotics, the same remedy cannot be applied to social media addiction. However, there are ways to control how an individual uses social media. This research will address the parasitic role of *Toxoplasma gondii* in the technical paper, as well as users' relationships with social media in the science, technology, and society (STS) paper.

The technical topic of this paper will cover *Toxoplasma gondii,* a parasite that has been found to cause an infection on various levels of severity. Research was conducted using time lapse microscopy in order to obtain a better understanding of the mechanobiology of the parasite. The parasite has the ability to manipulate one's behavior by altering chemicals in the human brain. Although this type of infection is not especially common, those who are immunocompromised or who are suffering from gut motility disorders, such as inflammatory

bowel disease or Crohn's Disease, have increased susceptibility of contracting the parasite. The objective of the technical project was to set up the background framework and to standardize some of the methods that will be used in this type of research. Ideally, the therapeutic treatment would help lower the invasion rate of *Toxoplasma gondii* for one with a previous underlying condition. Furthermore, the purpose of this Capstone project was to consider some of the fundamentals of biomedical engineering and to incorporate them into a predominantly biology-oriented field. By utilizing these concepts, the Capstone team was able to conduct the initial experiments for this research project, such as analyzing the rate of invasion of *Toxoplasma gondii* under peristalsis-like motion and unhealthy gut motility disorder-like states.

The science, technology, and society (STS) topic addresses how the depiction of social media influences human behavior. For instance, distinguished social media companies, such as Facebook and Twitter, have machine learning algorithms with the ability to generate user-specific advertisements. In other words, these companies are able to target a user with specific products that relate to their previous history on social media. These machine learning algorithms also have the ability to influence people's opinions in both favorable and unfavorable ways through generated advertisements, as seen in through the Cambridge Analytica scandal. Methods of analysis in this paper include applying the Social Construction of Technology concept, also known as SCOT, in order to understand why humans illustrate the usage of social media differently.

The infection of *Toxoplasma gondii* and the machine learning algorithms behind social media exemplify how external factors can manipulate an individual's behavior. Working on both of these projects has provided a broader understanding of how elements in society interact.

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Additionally, this research makes one aware of how certain factors (i.e. behavior, manners, and actions) in society often have a subconscious influence.