Thesis Portfolio

The Effect of Hornerin Knockdown on Tumor Vasculature in Melanoma
(Technical Report)

A Sociotechnical Imaginary for Neuralink
(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

The STS research paper and the technical project both emphasize that technology can be used to optimize medical research and medical treatment. The STS research paper delves into a sociotechnical imaginary analyzing Neuralink, a company developing an innovative medical device, and the technical project delivers an optimized vessel analysis software to use in researching the development of a novel immunotherapeutic cancer drug.

Technology is consistently used to augment current practices in the healthcare sector to provide holistic, efficient, and improved patient outcomes. As technology continues to advance, the capacity for novel approaches and treatments to medical conditions advances as well. The accelerating range of possibilities for innovation should be taken advantage of to procure the best possible results for medical patients, especially for diseases that have yet to obtain a cure despite decades of research and application of standard methods. Neuralink is an example of a technological innovation designed to improve healthcare through means that are incomparable to current technologies.

Neuralink is developing a chip called the “Link” to be implanted in the brain. The Link interprets brain signals and possesses the ability to communicate with external technological devices solely using one’s thoughts. Essentially, this development forms a “cloud” between a human brain and technology that aims to improve the lives of medical patients. The sociotechnical imaginary framework is used to envision the positive and negative effects of the Link in a potential future and assess the shared beliefs between the Neuralink social collective that motivated them to develop their technology as it is designed.

One component of the sociotechnical imaginary is the shared belief from the Neuralink social collective that technology can improve medical patient outcomes. Similarly, the technical capstone project aims to use technology to improve the treatment outcomes of a novel cancer therapeutic. Previous studies have identified the protein hornerin, which is located on cells that line blood vessels, as part of a compensatory pathway in angiogenesis, or blood vessel growth. In studies concerning pancreatic cancer, hornerin knockdown resulted in normalization of the blood vessels and reduced tumor burden. The technical project entailed optimizing the Rapid Analysis Vessel Element (RAVE) software and analyzing vessel characteristics of melanoma tumor vessels treated with a hornerin knockdown agent. The current RAVE software is time-consuming and uses inefficient measures for blood vessel analysis. By delivering an optimized RAVE software with batch processing and a single, exportable file containing the vessel parameter data, the technical project offers a more effective method for screening new cancer therapeutics that directly target tumor vasculature and could be extrapolated as a tool for vascular network analysis in a wide range of cancers.

The technical project illuminated the need for constant revision and improvement on current technologies to improve the outcomes of medical research. Similarly, the STS analysis of Neuralink showed the advantages, while considering drawbacks, of innovation in medical technologies to improve medical care. Both projects emphasized the advantages of the reciprocal relationship and cohesive nature of technology and medical care. Technology and medicine will continue to converge and influence one another to work towards a better future for human beings.