

Thesis Portfolio

Building Immunity to Online Deception: A New Approach Using Active Inoculation
(Technical Report)

Brain-Machine Interfaces: Treating and Decoding the Mind
(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Included in this portfolio are two distinct analyses exploring facets of the ever-deepening relationship between technology — digital tools with superhuman capabilities — and the collective of thinking, feeling entities responsible for innovating these tools — humanity. Though we have invented devices capable of storing and transferring complex information by sending electrical signals through silicon-based circuits, we have yet to fully understand the nuanced mechanisms by which our carbon-based neural circuitry facilitates our own thought and experience. Throughout this portfolio, we explore the increasingly blurred line between humans and computers, examining ways we can use these tools to control and mislead each other, while also discussing how we can use them to teach, heal, and learn about ourselves.

The Technical Report analyzes the viral proliferation of deceit and misinformation through digital media, our psychological susceptibility to it, and how we may begin to immunize ourselves from this threat. Predominant attempts to thwart such “fake news” are reactive, and focus on specific issues which have already taken root in the sphere of public discourse. These attempts, while largely made in good faith, have proven ineffective, and can even produce the opposite of the desired effect. My colleague and I propose a new system, based on the research-proven method of active inoculation, to familiarize users with the characteristics and tactics behind digital misinformation as a whole. Our proposed software tool, when integrated into popular social media platforms, is designed not for the purpose of damage control, but to teach people how to identify manipulative campaigns of divisive sensationalism before a detrimental impact can even be made.

The STS Research Paper explores an emerging field of innovation which aptly encapsulates the mysterious intersection of human thought and computational calculation —

brain-machine interfaces. Considering the electrical nature of the mechanism by which we perceive the world and express ourselves, it was only a matter of time before we began to consider how computers can interact with the brain, decoding and manipulating its signals for our potential benefit. Brain-machine interfaces (BMIs) are designed to do just that, by reading information from the brain and writing information into it, in the form of electrical impulses. These devices have already been used to give disabled and paralyzed individuals the ability to control computers, assistive devices, and robotic limbs simply by thinking. Furthermore, the capability of computers to directly interface with the brain provokes novel speculation about our collective future. Some faces of the field, like Elon Musk, postulate that, with continued development, BMIs could someday augment the mind with superhuman abilities, such as the telepathic communication of complex ideas and experiences directly between brains, obsolescing language. Even more profound is the notion that human consciousness may someday merge with artificial intelligence. The field has a long way to go before these achievements can become remotely feasible, but along the way, leaders and innovators must responsibly ensure the protection and security of our citizens' health, privacy, and agency.

This portfolio presents research and discussion underscoring the fragility of the human mind, and the roles technology can play in both its exploitation and benefit. Our brains' susceptibility to deception and affliction alike is a humbling reminder that we have yet to truly understand ourselves. In a way, this inner space is an even more uncharted frontier than outer space. However, with technological innovation and informed dialogue alike, we can keep exploring this frontier.