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STS 4600: Engineer Ethics: Professional Responsibility

Socio-Technical Synthesis: Flexible Sensors and the Power of Definition

My team and I developed a flexible sensor using a kirigami-inspired network design in my technical capstone project. At the same time, my STS research paper explored how societal power dynamics shape and even define emerging technologies through the Social Construction of Technology (SCOT) framework. While these two projects differed in methodology and immediate focus, they are intimately connected through their central theme: how a technology's function and impact are not purely technical but also social. Despite its innovative potential, both efforts examined how a flexible sensor might ultimately serve only a privileged few unless its development and distribution are guided by a broader, more inclusive vision of accessibility and equity.

Our technical project focused on designing and fabricating a flexible sensor by embedding a conductive kirigami network into a PDMS (polydimethylsiloxane) substrate. This sensor was engineered to maintain consistent resistance even when stretched, compressed, or flexed. It is ideal for applications in wearable electronics, biomedical monitoring, or health technologies like skin-mounted devices and fitness trackers. The symmetric kirigami pattern ensured mechanical stability and uniform performance across various stress conditions. This innovative design made the sensor lightweight and highly conformable to human skin and opened doors for potential integration in future consumer and medical devices.

On the other hand, my STS research used the SCOT framework to analyze how flexible different groups with varying degrees of influence might socially construct sensors. Specifically, I investigated how the wealthy and powerful often shape the definition and application of new technologies based on their perceptions of need, which can exclude or marginalize underprivileged communities. For example, a flexible sensor designed with high-end fitness tracking in mind may be inaccessible to communities that could benefit from low-cost health diagnostics. I argued that technology's very identity and purpose, like our sensor, are not fixed but negotiated within a landscape shaped by power, resources, and cultural values.

Working on both projects simultaneously allowed me to reflect more critically on my role as an engineer. Building the flexible sensor gave me a hands-on understanding of material behavior, sensor design, and the challenges of integrating mechanical and electrical properties. However, through my STS research, I became more aware of the broader implications of technological development. Creating a successful technology is not enough; we must also consider who it serves, excludes, and why. This dual perspective taught me that ethical engineering requires technical excellence and a commitment to social responsibility. Moving forward, I intend to apply these insights to future projects by actively questioning how technologies are defined, who defines them, and how we might build more equitable systems from the ground up.