

**Thesis Project Portfolio**

**Legna Software: Disrupting Forestry Ticketing with Machine Learning**

(Technical Report)

**Democratizing the Internet: A Care Ethics Analysis in Establishing the World Wide Web**

(STS Research Paper)

An Undergraduate Thesis

Presented to the Faculty of the School of Engineering and Applied Science

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Bachelor of Science, School of Engineering

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## **Sociotechnical Synthesis**

My technical research and STS research form a connection through analyzing disruptive technology, specifically software, and its societal impact. New software continues to alter our societal functions through anticipated uses and even unintended consequences. My technical research diverges from my STS research in that it applies technology into a system where it didn't exist before, whereas my STS research analyzes the intentions and consequences of new technology on society. Furthermore, across both research, the central technology varies—my technical research focuses on an application that leverages machine learning to capture particular forestry transactions, while my STS research covers the World Wide Web's accessibility technology. While the form of research differs across the technical and STS research, together, they use their respective analyzed technologies to provide detailed insight into the development of new software and its systemic effects.

My technical research works toward developing a software solution that solves a key problem for Legna Software, a startup creating a software-as-a-service model to track logistical information for forestry companies. The software solution the technical research follows is an application that records mill-to-mill transactional information digitally. Before this application, these transactions were solely accounted for by physical receipts, but with this solution, they are seamlessly integrated directly into Legna Software's platform. To make this transition, the application leverages innovative technology, mainly machine learning models applied to optical character recognition (OCR). Using this technology through Microsoft Azure's Form Recognition as well as Azure DevOps, Azure Data Storage, and C#, a serverless function application was developed that directly solved Legna Software's challenges with tracking mill-

to-mill transactions. As a result, this technology previously foreign to the forestry industry altered the current state of mill-to-mill accounting, reducing wasted materials, time, and money.

My STS research argues for Tim Berners-Lee's ethical decision-making in establishing the World Wide Web, expanding on pre-existing analysis of care ethics in software and Tim Berners-Lee. The World Wide Web is his proposed system for organizing and accessing information over the Internet. My STS research leverages care ethics, a framework that analyzes morality through actions that follow one's duty of care. The care ethics framework implements a four-stage care process that constitutes ethical decision-making in relationships. Berners-Lee has an asymmetrical relationship with his users as an inventor and ultimately acts ethically toward them by instituting three stages of care, attentiveness, responsibility, and competence when establishing the World Wide Web. My STS research supports this argument by proving Berners-Lee's attentiveness through his consideration of the World Wide Web's users' needs, responsibility through his engagement with representing stakeholders of the World Wide Web, and lastly, competence through his implementation of good and successful accessibility features.

Working on both research projects simultaneously developed a new understanding of technology's, specifically software's, disruption of society. The STS research inspired a greater level of care for my technical research as it sparked newfound recognition of the impact on systems from introduced software. Furthermore, it influenced development that extended beyond engineering by inspiring ethical considerations of intended and unintended technology uses. My technical research shaped my STS research by recognizing all relationships possess a duty of care, thus contextualizing my duty of care and its importance in developer-to-user relationships. Together, these research projects' influences formulated a new understanding of software engineering that would not have been possible without conducting the research in tandem.