Thesis Project Portfolio

Artificial Intelligence: Using Machine Learning to Identify Dangerous Military Systems

(Technical Report)

Addressing the Ethical and Legal Implications of Machine Learning in Visual Art Creation

(STS Research Paper)

An Undergraduate Thesis

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

University of Virginia • Charlottesville, Virginia

In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

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Spring, 2024

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Table of Contents

Sociotechnical Synthesis

Failure to accurately assess the safety of a military system could lead to its misuse or malfunction and threaten the lives of its human users. System Safety Engineers (who are in charge with these assessments) currently struggle to complete such tasks due to the complex and dynamic behavior of modern technological military systems and their reliance on outdated system safety accident assessment models. To address this issue, I developed the Potential Hazard Identification via Artificial Intelligence (PHIAI) capability which prioritizes high levels of control from System Safety Engineers within the automated processes of Machine Learning (ML) technologies. The PHIAI capability is based around several ML models which train using hazard and military system data previously inputted by System Safety Engineers. The algorithm is then able to identify potential hazards in newly inputted military system data given by System Safety Engineers.

Due to its important responsibilities, the capability's misuse could harm the professions of System Safety Engineers or the human users it's supposed to protect. Therefore, understanding the human and social dimensions of this technology is essential to effectively addressing the ethical implications that arise from its use. Actor Network Theory (ANT) from Bruno Latour's work in *Where Are the Missing Masses? The Sociology of a Few Mundane Artifacts* was applied to analyze how ML technologies interact with society and vice-versa.

The human and social dimensions of ML were examined by analyzing the relationship between visual artists and ML. ANT reveals how both actors symmetrically shape each other and how artists must evolve their relationship with ML technologies to address its ethical concerns. These ideas are evident in my research where I apply ANT to discover how ML's negative interactions with the Visual Art Industry can be reshaped. For my research, I conducted four interviews in relation to the artistic, technological, or legal sides of this relationship. I interviewed one artist from Reddit and three professors from the University of Virginia. I then analyzed each interview using ANT to explore how the emergence of ethical and legal issues from ML technologies can be addressed through the framework's principles of symmetry and evolving relationships. Through these methods, I made observations and drew meaningful conclusion on how artists should address these ethical and legal implications from ML technologies to make them more productive in the creation of visual arts.

Altogether, my technical project and sociotechnical research on ML can be connected to reveal how society should use ML technologies and address the ethical/legal implications they impose. Users of the technology must exercise high levels of control and effort to minimize its ethical and legal concerns.