Thesis Project Portfolio

Assistive Chessboard

(Technical Report)

The Improvement of Battery Technology: Using Geels' Multi-Level Perspective to Understand the Dark Story Behind the Screens

(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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Fall, 2022

Department of Electrical and Computer Engineering

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Sociotechnical Synthesis

Artificial Intelligence in the Development of Smart, Sustainable Devices

"I imagine a world in which AI is going to make us work more productively, live longer, and have cleaner energy."

-Fei-Fei Li, Professor of Computer Science at Stanford University

Artificial intelligence (AI) is a keystone for future technological devices, such as the smartphone or electric vehicle, and has been developed to achieve longer lasting devices and create a learning tool for people. For my capstone project, the assistive chessboard, my team and I used an AI to help beginner and experienced chess players hone their skills in the classic game of chess. My STS research topic, on the other hand, discusses the disastrous consequences of mining lithium for use in smart electronic devices, such as electric vehicles. My technical capstone project and my STS research project has a very important connection with each other, specifically with the use of AI. From voice assistants to autonomous vehicles, engineers have been using the creation of AI in many different fields of use. Through the use of AI, we have been able to produce less waste in our environments, as well as teach people new skills.

My technical project showcases an assistive chessboard. The approach to this project was to use a very powerful AI, Stockfish, which was specifically made to excel in chess. Utilizing the Stockfish engine, we decided that a great way to help the AI communicate with the player is by lighting up tiles on the chessboard. If Stockfish, for example, wants to recommend moving a pawn from E2 to E4, then it would subsequently light those tiles up. With this creative method of having the AI communicate with the player, we can start helping beginners and experienced chess players hone their skills in the classic game of chess.

Currently, there are many debates over the topic of electric vehicles being cleaner for the environment than gas powered cars. After speaking with my professors about the topic in the Spring of 2022, I decided, for my STS research topic to investigate the topic of lithium batteries and the impacts mining lithium has on the environment. I chose the topic of lithium batteries' impact on the environment for my STS research so that I can bring a wider view of awareness to people concerned about environmental impact, especially when purchasing an electrical vehicle. By making use of Geels' multi-level system with respect to the ecosystem revolving lithium batteries, I wrote about the impacts that mining lithium can have on countries, such as lack of water supply, water pollution, destruction of wildlife homes, and many more. Ideally, the result, would be an increased awareness of the products that consumers purchase that contain the battery technology.

There isn't an obvious relationship between the two topics presented at first. Recently, companies have started to act against the waste that the lithium batteries have been producing. To enable this, they created AI that would charge the battery slow enough to keep the lithium battery healthy enough for a long period of time. While I worked with an artificial intelligence to help me play better in chess, having a different use case for the same technology, broadened my viewpoint on how we can reduce the amount of waste using lithium batteries. While lithium is a stop-gap solution for a better battery technology, like graphene batteries, there still is a tremendous amount of work being poured into making sure the batteries would last as long as possible without a replacement. So, I agree with Fei-Fei Li in which there can be a world envisioned in which AI is going to make us work more productively, live longer, and most importantly have cleaner energy.