

## **Thesis Project Portfolio**

### **Developing an Adaptive Learning System for Personalized Computer Science Education at UVA**

(Technical Report)

### **How do different social groups influence the development and adoption of the Ford F-150 Lightning, and how does the vehicle address or fail to address the specific needs and problems of these groups?**

(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

**Oliver Mu**

Spring, 2024

Department of Computer Science

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## **Sociotechnical Synthesis**

This portfolio highlights two topics that underscore the relationship between technical progress and societal requirements. My technical research at the University of Virginia focuses on proposing an Adaptive Learning System (ALS) designed to revolutionize the educational experience in computer science by tailoring learning paths for individual students. This personalized approach has the potential to significantly enhance students' understanding and engagement, thereby paving the way for a more inclusive and effective educational system. Meanwhile, my STS research paper investigates the broader societal effects of electric vehicles (EVs), specifically the Ford F-150 Lightning. The research includes how the development and market adoption have been influenced by various social groups. These studies provide crucial insights into how technological solutions can address specific educational and societal concerns, setting the stage for future and inclusive progression.

In my technical report, "Developing an Adaptive Learning System for Personalized Computer Science Education at UVA," I proposed the Adaptive Learning System (ALS) for the University of Virginia's Computer Science department. The proposed ALS uses AI algorithms to personalize education by assessing students' learning patterns, preferences, and performance and adjusting the content and pace accordingly. This technique is anticipated to increase engagement while allowing a deeper understanding of complex computer science concepts by making them more accessible to more student populations.

The ALS's process design includes collecting and analyzing student data to dynamically personalize the learning experience. This approach ensures that the ALS caters to the diverse learning needs of our students. A pilot study in the Introduction of Programming class is planned to assess the system's effectiveness. The expected outcomes from this study include improved

student understanding, engagement, and achievement. The study also aims to expand to include more courses and even different departments within the University of Virginia community, further demonstrating the ALS's inclusivity.

My STS research paper, "How do different social groups influence the development and adoption of the Ford F-150 Lightning, and how does the vehicle address or fail to address the specific needs and problems of these groups?" examined the societal influence of F-150 Lightning. The study analyzed the complex interplay between technology and various social groups, highlighting how they have influenced and been influenced by the development and acceptance of EVs. The findings of this research have significant implications for the future of transportation and environmental sustainability, as they shed light on the factors shaping the electric vehicle landscape. From the interactions of numerous stakeholders, such as consumers, environmentalists, industry workers, and legislators, I investigated the roles of technological innovation, government policies, market dynamics, and social views in changing the electric vehicle landscape.

In conclusion, the technical and STS research studies showed the complex link between technological innovation and societal demands. The ALS study demonstrated the promise of individualized education through technology to meet various learning needs, whereas the STS research on F-150 Lightning emphasized the complex socio-technical connection that affects the adoption and development of new technology. Collectively, these research projects indicate an in-depth engagement with the challenges and possibilities resulting from technological breakthroughs, offering insights into how they can be used to fulfill society's needs and promote sustainable development.