

Thesis Project Portfolio

Safe and Sustainable Fleet Management with Data Analytics and Reinforcement Training

(Technical Report)

How Social Media's Personalized Algorithms Contribute to Political Polarization

(STS Research Paper)

An Undergraduate Thesis

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Table of Contents

Sociotechnical Synthesis

Safe and Sustainable Fleet Management with Data Analytics and Reinforcement Training

How Social Media's Personalized Algorithms Contribute to Political Polarization

Thesis Prospectus

Sociotechnical Synthesis

Data has become an extremely powerful and essential tool as it helps inform, predict, and improve in almost any aspect of life. As data mining becomes a standard practice in many industries, it brings many benefits but also concerns surrounding its use and privacy. This portfolio aims to explore the impact of data-driven practices in different industries. The technical project highlights the positive use of data by the UVA Facilities Management Fleet to promote safe and sustainable driving. The STS research project explores how data-driven algorithms in social media have contributed to the rise of political polarization, showing how a different use of data can be harmful to the development of society.

The technical project was an extension of a project from last year which created an eco-driving training program for UVA's Facilities Management Fleet based on vehicle data analysis. My research team aimed to evaluate the effects of reinforcement training in both reactive and proactive approaches. The reinforcement training gave drivers feedback on their performance through scorecards. Rather than re-administering the same training, we created a conversation template for managers to discuss performance, eco-driving tips, and reflection on driving behavior with their shop. Reactive training was given if the shop performed statistically significantly worse in any metric than the previous week, and proactive training was given regardless of shop performance. The data showed that reactive training was effective in improving shop performance for the metric that triggered reactive training.

The STS project used research studies of political communication on TikTok, Facebook, and Twitter to assess how their algorithms affected social interactions both on and off the web, mainly during the recent presidential election. The social media industry has become so dependent on personalized algorithms which learn from user interactions and suggest content

that may interest them based on their past behavior. This puts users in an echo chamber, an endless cycle of consuming and interacting with pro-attitudinal content and users. These case studies show that because social media algorithms expose users to more like-minded content, it becomes more difficult to have open democratic discussions as well as gain a realistic perception of political opinion.

Working on projects that analyzed very different applications of data helped me think more critically about data privacy and the sensitivity that's needed in incorporating data analytics into human-centered processes. During the data collection process for my technical project, the data was anonymized so that individual drivers would not be identifiable in order to avoid making participants feel targeted. Although the project may have been more effective if individual driver performance was analyzed, my team and the management team wanted to make sure that data analytics would be a positive supplemental tool that avoids the discouragement of drivers and protects their privacy. Similarly, while researching the role of personalized algorithms in driving political polarization, I learned about the lack of policy and structure needed to regulate the integration of these algorithms and how it influences the information we consume on the internet.