

Eco-Safe Driving in Fleet Management with Data Analytics and Personalized Education
(Technical Paper)

How Social Media's Personalized Algorithms Contribute to Political Polarization
(STS Paper)

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

This prospectus will consist of a technical research topic and a separate STS research topic. The technical research topic will build on a previous capstone project on eco-safe driver training in fleets and focus on using data analytics to measure the effectiveness of training over time and explore additional training methods. The STS research topic will explore how personalization in social networking media feeds contributes to the increase in political polarization in the United States.

The technical research project expands on one from last year that developed a safe and sustainable driver training program for the University of Virginia's Facilities Management Fleet by analyzing their vehicle data for areas of improvement using Geotab software. Automobile emissions are a major source of pollution, and the UVA Facilities Management Fleet (FMF) was eager to improve their sustainability efforts (EPA, 2021). Using Geotab data, the team identified signs of risky and unsustainable driving behavior and created the Mindful Driver training program to help UVA's fleet drivers adopt eco-friendly and safe, or eco-safe, driving techniques. The training was effective in improving driver performance and increasing vehicle efficiency. The technical research topic will create a new shop-based conversational training method to assess whether reinforcement prolongs the effects of preexisting training. It will also analyze pre- and post-training driver performance data to determine how long the effects of these trainings last. Lastly, the project will add incentives to the program to analyze what kinds of training methods are most effective.

The STS research topic will explore the role of personalized algorithms in social media in polarizing ideologies of users in the United States. Since the early 2000s, social media has increasingly overtaken the role of traditional media as a major source of news and information

(Levy, 2021). With this shift there is growing concern that curated content feeds are exposing users to posts that line up with their beliefs and ideologies (Levy, 2021). Simultaneously, political polarization has been reaching its heights with increasingly deepening disagreements and perception gaps between the two major U.S. political parties, especially with the 2020 Presidential Election (Dimock & Wike, 2020). Political polarization can be defined as the extent of differences in values, ideologies, and other opinions between members of political parties (“Explainer: Political polarization,” n.d.). This could be measured as the decrease in overlapping ideology between liberal and conservative positions (Pew Research Center, 2021).

Unsurprisingly, an additional factor in political polarization is contempt for the opposing party, however studies have shown that since 1994, the percentage of Democrats and Republicans with negative views of each other have doubled (Pew Research Center, 2021). Although social networking sites may not be the root cause of growing polarization, many experts and researchers agree they contribute to partisan animosity, hostility among parties, especially since they expose users to more divisive and upsetting political content (Barrett et al., 2021). Some believe that personalization in social media has made it difficult for Americans to have a common understanding and perception of the political climate (Yudkin et al., 2019). Others argue that humans naturally gravitate towards those who are similar to them and human psychology is an underlying cause of political polarization (Spohr, 2017). This paper will explore how the technology of personalization in social media contributes to and enables political polarization.

Technical Topic: Eco-Safe Driving

The United States ranks second in contributing to global greenhouse gas emissions, and in 2019, the largest portion of the US’s total greenhouse gas emissions came from the

transportation sector (Environmental Protection Agency [EPA], 2021). The transportation sector involves automobiles, trains, and aircrafts among other sources, yet 58% of these emissions came from light-duty vehicles (EPA, 2021). With climate change intensifying along with the number of vehicles on roads increasing, the issue of transportation sustainability is becoming more urgent. Luckily, eco-safe driving is a short-term solution that is both cost-effective and requires less resources than alternative technologies being developed to counter excessive vehicle emissions. Eco-driving is a driving style that aims to reduce fuel consumption and risky driver behavior through habits such as smooth acceleration and braking, driving at the speed limit, cruising, maintaining sufficient distance behind other vehicles, and minimizing unnecessary idling (Barkenbus, 2010).

Given the potential for significant improvements in sustainability as well as driver safety, last year's capstone team worked with UVA'S FMF team to create a pilot eco-safe driver training program. Data was collected through Geotab, tracking devices that are installed in vehicles that connect them to the internet. Weekly driver scorecards were created from the data using five performance metrics: hard acceleration, hard braking, hard cornering, speeding, and seat belt use (Gresham et al., 2021). The Mindful Driver training module was developed to help drivers improve their performance based on the indicators. After analysis on the data two weeks before and after the virtual training session, the results showed significant improvement in driver performance in the safety and sustainability metrics.

To further promote safer and more eco-friendly driving behavior, the technical project will create a personalized training method that also provides feedback to the drivers on their performance. Other driver improvement training studies showed that providing feedback afterwards is more effective than providing no feedback, and its effectiveness increases with the

amount of detail (Castro et al., 2014). However, in order to prevent any targeting of participants, the project will generate bi-weekly scorecards based on vehicle level, rather than an individual driver level. Conversation outlines for performance metrics will be created to help shop managers motivate their shop using positive feedback based on categories they performed poorly in. Post-training data will be analyzed for longer than the previous capstone project in order to also determine how long until effectiveness falters after training. Additionally, there will be different treatment groups that receive different combinations of scorecards, conversations, and incentives to compare which methods work best. The project will hopefully provide useful insight for the structure and scheduling of future fleet driver training programs. Data will still be collected using Geotab with the same performance metrics from last year.

STS Topic: Social Media's Personalized Algorithms in Political Polarization

The increasing popularity of social media even has news outlets competing for a spot in a user's carefully curated content feed. 18% of U.S. adults said social media was their main source of political and election news, compared to the 25% that depend on news websites and apps (Mitchell et al., 2020). This increased dependence on social media for news places the frequency, type, and quality of their news consumption at the hands of the algorithms behind social media content feeds. However, personalized feeds work to share more content that a user will be interested in and this may place users in echo chambers or feedback loops of pro-attitudinal information, limiting exposure to bi-partisan communication (Spohr, 2017).

Despite the abundance of news sources, there has been an increase in the perception gap, the difference between the extent that Republicans and Democrats think they disagree with and what they actually disagree with (Yudkin et al., 2019). Surveys showed that there was a positive relationship between news consumption and the perception gap, meaning that those who

consume more news have a more disconnected perception of their opposing political party. Furthermore, Americans overestimated almost twice the proportion of the opposing party that held extreme views and often noted they contributed negative personality characteristics based on their political affiliation.

There are two main arguments concerning the increased modern day political polarization, one that places the cause in technology and one that attributes human behavior (Spohr, 2017). One side believes that personalized algorithms work as filter bubbles that filter out content to leave users in bubbles that match their ideology. Others believe the psychological biases of users cause them to cluster in echo chambers with like-minded people. Rather than allowing discussion, echo chambers continuously reaffirm individual beliefs which can lead to growing intolerance for those with opposing views, often incorrectly demonizing the other side to be more extreme than they actually are. Some examples of these psychological conditions include “selective exposure behavior, confirmation bias, and availability bias” (Spohr, 2017). User behavior is a factor, but social media personalization also makes selective news consumption so accessible and convenient. Social media platforms hold the key in being able to mitigate these effects, diversify news, and promote democracy in the exchange of information (Levy, 2021).

To analyze this phenomenon, the project will apply the STS theory of technological determinism that has been expanded by Allan Dafoe to embody the “approaches that emphasize (1) the autonomy of technological change and (2) the technological shaping of society” (Dafoe, 2015). Langdon Winner was a well known defender of technological determinism, which believes technology shapes society and drives social progress. Although technological determinism has been largely rejected and no longer taken seriously in STS after the 1980s,

Dafoe proposes to reclaim this theory by framing it as what degree, scope, and context are needed for certain technology to be more impactful in developing society. This theory seems fitting as the goal of this paper is to further understand social media personalization's role in political polarization in order to suggest possible actions in mitigating or transforming its effects. Case studies of different social media platforms will be analyzed to determine specific aspects of personalization that contribute to polarization, as well as underlying and unintentional consequences of personalized algorithms. The case studies to be considered include Facebook and Twitter's policy and algorithmic changes during the recent 2020 election, as well as the role of alternative social media networks like Parler as platforms for political discussion.

Conclusion

In conclusion, this senior portfolio will consist of a technical topic and separate social topic. The technical topic will be an expansion on the 2020-2021 capstone project on improving sustainability and safety in fleet management through data-driven training. It will assess the impact of feedback and new shop-level training on driver performance. A personal goal of this technical project is to strengthen data analytics skills as well as learn how positive feedback can impact human performance. The STS project will utilize an expanded theory of technological determinism to examine the role of personalized social media algorithms in political polarization, and potentially suggest guidelines on mitigating their effect. The phenomena of political polarization has been increasingly more visible in daily life as well as current events so a personal motivation for this research is to explore one factor that may cultivate these chaotic, divisive discussions.

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