1. Introduction

Widespread adoption of electric vehicles (EVs) can play a critical role in reducing greenhouse gas emissions and mitigating climate change, but their use is limited by public stigma.What makes some Americans hold biases against EVs, and how might we further study these opinions? While some papers use surveys to gather data, other research uses machine learning techniques to parse vast amounts of data from OSNs (online social network) such as Reddit or X (formerly known as Twitter) to analyze how public sentiment towards EVs have evolved over the past decade and differ between online communities. This paper proposes that future studies examining public opinions about EVs should further harness the enormous amount of data available from social media and OSNs.

2. Literature review

2.1 Survey directed studies

Most studies covering the issue of EV adoption approach the challenge of gathering data through surveys. In one study titled “The partisan politics of low-carbon transport: Why Democrats are more likely to adopt electric vehicles than Republicans in the United States” (Sintov et al, 2021), researchers recruited 545 participants from seven Central Ohio counties for a 20 minute online survey to study how political identity and symbolic perceptions influence EV adoption. To ensure the participants were financially able to be early adopters of EVs, they were required to have a bachelor’s degree or an annual household income of $100,000. The survey assessed participants' likelihood of adopting EVs by analyzing politically symbolic attributes like environmental or tech-savvy identities and concerns about concrete instrumental attributes such as fuel costs and maintenance. The findings were that political identity shapes attitudes related to EVs, with Democrats exhibiting more positive adoption intentions than Republicans, due to

differing perceptions of EV related issues such as environmentalism and technological innovation.

Similarly, “Analysis of a consumer survey on plug-in hybrid electric vehicles” (Krupa, et al 2014) recruited 1,000 U.S. residents in 2011 to examine biases against electric vehicles. The 105 question survey gathered data on participants' demographics, purchasing decisions, and attitude surrounding environmental issues. The survey responses were analyzed to explore correlations between these factors and attitudes toward EV adoption. This study concluded that while environmental benefits of EV adoption was rated lower than financial factors (fuel prices, mileage, safety), political identity also influenced willingness to consider EVs, along with an especially strong correlation between environmental concerns and preferences towards EVs.

2.2 OSN data directed studies

While the previous studies used surveys to collect data, “Public perception of electric vehicles on reddit over the past decade” (Ruan, et al 2020) instead collected large amounts of publicly available data from the popular OSN, Reddit. The dataset included posts and comments from between 2011 and 2020, which were keyword filtered using EV related terms to narrow down the dataset to just relevant conversations, totaling 3,162,938 entries. This dataset was further analyzed through sentiment analysis (machine learning technique used to identify the emotional tone of text) to determine the sentiment of users’ discussions, allowing researchers to compare opinions surrounding EVs between different years and different online communities within Reddit, centering on discussion of specific topics or beliefs, called Subreddits. This study revealed how community driven Subreddits, especially those dedicated towards right wing beliefs, hold negative sentiments towards EV’s, ignoring scientific evidence supporting their environmental benefits, a problem exacerbated by the forum ensuring users’ anonymity.

Similarly, “Public perception of electric vehicles on Reddit and Twitter: A cross-platform analysis” (Ruan, et al 2022) gathered data from OSNs, this time integrating datasets from two distinct OSNs. These platforms were X (formerly known as Twitter) and Reddit, which differ greatly in their structure and user engagement mechanisms. Much like the previously discussed paper, researchers gathered large amounts of curated data from the OSNs and used similar sentiment analysis methods to gauge users’ opinions on EVs and their adoption. The paper aims to explore how the difference in user behavior and platform design create different public perceptions of EVs. Contrary to the previous study, this one showed how the presence of politicians and media on X, played a significant role in shaping more optimistic EV narratives.

3. Research proposal

3.1 Data collection proposal

The primary source of data for my project will be data scraped from additional OSNs and media sharing platforms such as Instagram or Youtube. These platforms offer an endless stream of data that occurs in real time as political events take place, possibly shifting opinions surrounding EVs. To ensure the data is relevant to the study, keywords related to EVs, such as "electric vehicle," "hybrid car," and "Tesla," will be used to filter out irrelevant data. Additional metadata will be collected to compare posts, such as the communities where these discussions take place, the discussion the post is contributing to, and previous posts the commenter might have made surrounding EVs. Lastly, this data will be quantified through sentiment analysis, a process of applying numeric values to words and phrases to determine whether the overall sentiment of a conversation or post is positive or negative. Due to the sheer size and scope of the dataset, natural language processing (artificial intelligence that interprets human languages) and temporal analysis (studying data over time to identify trends and patterns) models will be

required to determine how sentiment is affected by different platforms, political affiliation, advancements in the EV sector, or significant political events.

3.1 Data collection

Survey based studies are limited by their small sample size and the constrained set of responses. In contrast, gathering data from online forums offers a much larger and more diverse sample of opinions. Platforms like Reddit and X attract users from all political affiliations, income brackets, and geographic locations, resulting in a dataset that is more encompassing and organic. Social media posts often reflect unfiltered, spontaneous thoughts, while surveys rely on participants' self-reported attitudes, which may be influenced by social desirability bias or restricted by questions asked. "Public perception of electric vehicles on reddit over the past decade" (Ruan, et al 2020) demonstrates the power of analyzing these enormous online datasets. By scraping and analyzing millions of comments and posts, this study tracked shifts in public sentiment over a decade and identified how different online communities expressed opinions surrounding EVs. Similarly "Public perception of electric vehicles on Reddit and Twitter: A cross-platform analysis" (Ruan, et al 2022) demonstrated how platform architecture and user behavior shape sentiment surrounding EVs.

3.2 Connections to existing studies

While surveys provide a small, static snapshot of opinions, these studies show the dynamic and evolving nature of public sentiment through the power of social media forums. This empirical research proposal extends these studies by incorporating additional online platforms and expanding that dataset from language data to voice, video, and even image data through the use of neural networks capable of processing multimedia datasets. Instagram, for example, combines visual content with text and audio, offering a unique opportunity to explore how

images and videos might affect sentiment differently than pure text. Additionally, this study will further explore how online political communities on all of these platforms engage with EV-related topics, offering insights into how political ideology is expressed in differently structured online spaces.

3.1 Potential future changes to studying EV sentiments

This proposal will shift the focus of EV sentiment research from survey-based data to the enormous and diverse real-time dataset of online social media platforms. By using new AI technologies such as sentiment analysis and natural language processing tools, we can gain a more complete understanding of the opinions surrounding EVs and how they are shaped by political identity. This study will additionally explore how these sentiments change based on the online groups discussions are held within and how platform structure and the presence of well known, influential figures on platforms affect user opinions of EVs. Additionally, by tracking changes in sentiment over time, this research can help identify the key political events or EV innovations that contributed to shifts in public opinion, helping policymakers and automakers overcome barriers to EV adoption.

4. Conclusion

While this approach may offer broader insights than traditional surveys, challenges such as data privacy concerns and stigmas surrounding AI web scraping must be addressed before using social media datasets in this manner. Additionally, due to the nature of social media, vocal minorities in discussion groups might create biases in the data. Despite these barriers, harnessing the vast, diverse, real-time data available from online forums will help us better understand public sentiment and biases surrounding EVs. By applying machine learning techniques such as

sentiment analysis, studies can provide a more comprehensive and dynamic picture of how political identity, platform structure, and significant events influence opinions on EV adoption.

Works Cited

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