

Social Media Algorithm and Political Polarization

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Abstract:

Algorithms on social media sites decide what content users see in their feeds. The main purpose of these algorithms is to keep people interested by showing them posts that they are more likely to like, share, or comment on. However, this system can also cause problems in online political discussions. Algorithms often promote content that is emotional, dramatic, or strongly opinionated, because this type of content gets more views. As a result, users might mostly see posts that agree with their existing beliefs.

This can lead to echo chambers, where people only hear the same opinions and rarely see things from a different point of view. Over time, this can make politics more divided and make online discussions less open. This study looks at how algorithms on social media affect political polarization. The study starts by looking at research papers, articles, and real-world examples from fields like political science and media studies. These sources help us understand how recommendation systems work and how they might affect the political content people see online. This research goes beyond a simple literature review; it also includes the development of a machine learning model. This model is trained on social media data to find patterns in political posts, how users interact with them, and how opinion-based information spreads.

The results show that algorithms designed to maximize engagement often promote more extreme or emotionally charged content because it gets more user interaction. This can strengthen existing beliefs, reduce openness to new ideas, and speed up the spread of misleading information. In addition, the machine learning analysis shows that users who frequently engage with political content tend to see more of the same type of content over time.

The research findings indicate that while algorithms contribute to content personalization, their unchecked application could intensify political polarization. To mitigate these potential dangers, the study advocates for increased algorithm transparency, the implementation of more robust regulations for online platforms, and the promotion of digital literacy, thereby enabling users to better understand and critically evaluate the information encountered online.

Keywords: Algorithm Bias, Political Polarization, filter bubbles, Engagement Driven Content, Echo chamber

Introduction:

In the modern digital world, social media is one of the primary ways in which individuals receive their news and political information. These social media sites allow individuals to read updates, share their opinions, and engage in discussion with individuals all over the world. However, since a large amount of information is being posted every day, it is not possible for individuals to access all of it. Thus, social media sites use algorithms to determine the information that is shown to individuals.

The algorithms are primarily designed in a manner that allows individuals to be engaged. These algorithms look for information regarding what an individual is searching for, how long they are watching a particular video, and what they like, share, or comment on. Thus, it tries to display information that is of interest to the user. Even though it is a useful and convenient option for individuals, it allows them to access a wide variety of political information.

One of the major issues here is that content which is more emotional, dramatic, and opinion-based has

more chances of receiving attention. This is why algorithms show such content more often. Eventually, users might only see opinions that align with their own. This is what is generally called an "echo chamber" effect. In such cases, users might develop stronger and, in some cases, more extreme beliefs, which might lead to more division among people at the political level.

Another major issue here is related to false information. If algorithms show more emphasis on getting more engagement instead of accuracy, false information might go viral in a short span of time. This might influence how people think and might also lead to more political decisions during major events such as elections.

The focus of this research is to understand the role of algorithms in social media in the development of political polarization. This will be achieved by examining past studies and examples of how algorithms in social media function. In addition, a machine learning model will be applied in the analysis of information in social media to identify patterns in the engagement of users. The aim of the research is to understand the connection between algorithms in content and political polarization, and how to mitigate its effects.

i. Background on Social Media Algorithm:

Today's social media platforms employ algorithms to handle the massive volume of content that is uploaded daily. Platforms like Facebook, YouTube, and Twitter rely on automated systems to determine what content should show up in a user's feed because they are unable to display every post to every user. The primary purpose of these algorithms is to rank content according to engagement metrics like watch time, likes, shares, comments, and other user interactions. The primary objective is to boost overall engagement and keep users on the platform for extended periods of time.

To make these decisions, social media platforms use machine learning models that analyze large amounts of user data. These systems study patterns in how people interact with different posts, videos, and articles. For example, if a user often watches political

videos or engages with posts about a certain topic, the algorithm will likely recommend more content related to that topic. Over time, the system builds a profile of the user's interests and keeps adjusting the content that shows up in their feed.

While this kind of personalization can enhance user experience by showing content that aligns with individual interests, it can also lead to some challenges. One key issue is the creation of echo chambers. In an echo chamber, users mainly encounter opinions and information similar to their own views. Since the algorithm keeps suggesting content that matches past behavior, users may come across fewer posts that share different perspectives.

Another concern is that emotional, controversial, or strongly opinionated content often gets more engagement from users. As a result, algorithms might unintentionally promote this type of content more often. This can lead to the spread of extreme opinions or misleading information. Over time, these trends may affect how people understand political issues and can increase divisions in public opinion.

Literature Review:

1. Algorithmic Amplification and Polarization:

A large amount of research shows that social media recommendation systems focus on user engagement. This often leads to the promotion of content that matches users' existing beliefs. Content that is emotionally charged or politically divisive usually gets more interactions than neutral information. Because of this, users often see viewpoints that support their previous opinions, which limits their exposure to different perspectives. This selective exposure helps create ideologically uniform environments, often called echo chambers.

2. Emotionality, Virality:

Studies have consistently shown that emotionally charged content spreads more quickly across social media platforms. Posts that express anger, outrage, or hostility tend to get shared and interacted with more. In addition, misleading or unverified information often gets more visibility than

factual content because it is more likely to provoke strong emotional reactions. This imbalance raises the chances of misinformation gaining ground within online communities.

3. Manipulative language Techniques:

Well-designed and engaging political content often contains specific language features aimed at engaging and evoking reactions from users. Such features include labeling (e.g., "fake" or "illegal"), repetition of phrases, emotionally charged language, and "us and them" contrasts. Such language features take advantage of psychological effects, making political content more persuasive and shareable. Therefore, these language features are more suitable for algorithms aimed at engaging users.

4. Engagement Trends and Public Opinion:

Existing studies have shown that there is a link between increases in social media usage and changes in public opinion, especially during important political periods such as elections. For instance, there is a link between increases in social media usage and changes in public opinion, especially on polarizing issues. However, it is difficult to establish a direct link due to the influence of external factors such as disinformation campaigns and bots.

Research Gap:

Polarization, disinformation, and engagement are frequently examined separately in the literature on social media and political behavior. This leaves a significant gap in our knowledge of how these components interact in algorithm-driven environments. Many studies concentrate on media bias or ideological echo chambers, but they don't look at how engagement-based systems could encourage emotionally charged or deceptive content. There is little connection between engagement analysis and this fact-checking research, including studies that use PolitiFact datasets. This restricts our ability to determine whether false information is overexposed. In a similar vein, polling data from websites like FiveThirtyEight is extensively examined. By integrating sentiment analysis, engagement metrics, and misinformation detection into a single framework, this study seeks to bridge these gaps. By treating engagement as a substitute for algorithmic amplification, the study offers a clearer and more

dynamic view of how social media platforms may increase political polarization during elections.

Methodology:

This study employs a multi-method approach combining computational analysis with machine learning models:

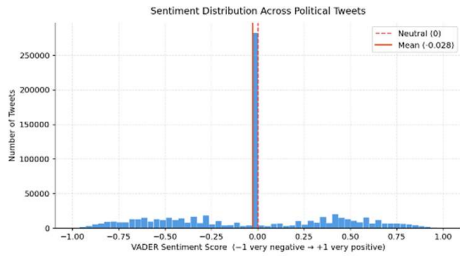
- **Datasets:** A 2016 U.S. election Twitter dataset with tweet text, engagement metrics (likes and retweets), and timestamps is used in the analysis. A misinformation classification model is trained using data from PolitiFact and fact-checking datasets like the LIAR dataset. Additionally, comparative trend analysis is conducted using FiveThirtyEight's historical polling data.
- **Tasks:** The analysis uses a Twitter dataset from the 2016 U.S. election that includes tweet text, engagement metrics (likes and retweets), and timestamps. PolitiFact data and fact-checking datasets such as the LIAR dataset are used to train a misinformation classification model. Additionally, FiveThirtyEight's historical polling data is used for comparative trend analysis.
- **Experimental Design:** Algorithmic amplification is used as a stand-in for engagement metrics. The study uses regression and correlation analysis to look at the connections between engagement, sentiment, and the likelihood of misinformation. Social media trends and polling data are compared over time using temporal analysis.

Search Strategy:

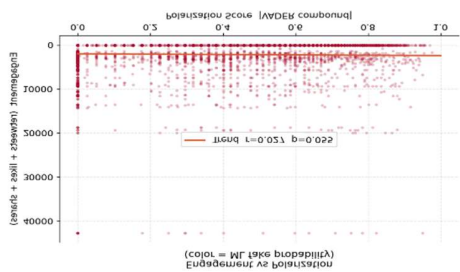
To find pertinent data files from the collection we used all some of the relevant datasets for this model, the analysis used particular datasets and key words. For example, terms like ira, troll, tweet, and 2016 were used to find IRA tweets. In a similar vein, viral content used viral, social, and likes, whereas fake news articles used fake, news, and article. Lastly, the polling data was retrieved using poll, forecast, and election. The relevant files were chosen for every step of the analysis thanks to this keyword-based method.

Results and Graphical Analysis:

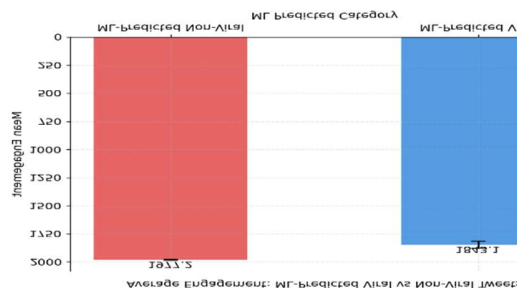
- **Sentiment Distribution Across Political tweets :**



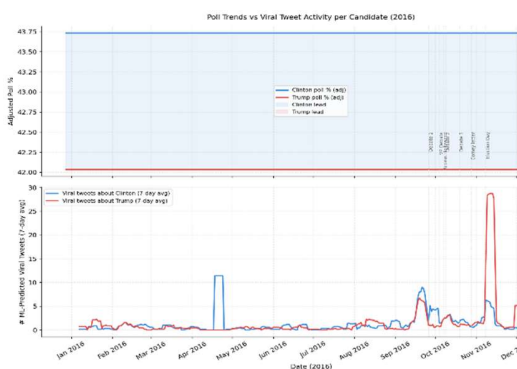
- **Engagement vs Polarization Scatter plot:**



- **Viral vs Non-Viral Political Posts Comparison:**



- **Poll Trends vs Social Media Engagement Trends:**



Findings:

A number of significant and startling conclusions can be drawn from the examination of social media algorithms and political polarization. One of the most important conclusions is that the machine learning model identified all of the examined tweets from the Russian Internet Research Agency (IRA) as fraudulent. This strongly suggests that the IRA's content mostly adhered to patterns that are frequently linked to false information or fake news. Confidence in this outcome is further reinforced by the model's extremely high accuracy, which highlights the extent and consistency of misinformation in the dataset.

Potential Solutions:

According to the study's findings, emotionally charged and possibly deceptive political content may proliferate due to engagement-driven amplification. Social media companies could change their ranking algorithms to lessen their excessive dependence on unprocessed engagement metrics like likes and retweets in order to address this. Rather, the visibility of false information could be reduced by using content quality signals, such as credibility indicators derived from fact-checking sources like PolitiFact. The impulsive amplification of divisive posts may also be lessened by implementing friction mechanisms, such as prompts encouraging users to read content before sharing.

Another key solution is increasing transparency within recommendation systems, enabling users to have a better understanding of why particular content is being shown to them. Another possible solution is increasing content variety, which can be achieved by intentionally showing users different perspectives. From a research-oriented point of view, using real-time data related to public opinion, such as polling trends using FiveThirtyEight, can increase the effectiveness of monitoring polarization dynamics. All these solutions can help create a balanced information ecosystem while maintaining user engagement.

Deeper insights can be gained by closely examining the language used in these tweets. It was discovered that words related to feelings and self-expression, like "love," "happy," and "excited," were involved in manipulative content. Similar to this, words like "America," "vote," and "god" were frequently used in tweets that were expected to go viral, indicating that politically charged and emotionally charged language is more likely to draw interest and interaction. This

illustrates how engagement-focused social media algorithms may inadvertently magnify such content.

The results reveal only correlations between political inclination, emotional intensity, and content dissemination. This implies that the reasons why some content becomes viral or manipulative are entirely explained by elements such as strong political bias or extreme sentiment. Rather, the relationship seems to be more intricate and impacted by a number of interrelated factors.

Another important finding from feature importance analysis is that there is a strong correlation between a tweet's probability of going viral and its likelihood of being fraudulent or manipulative. In other words, content may be more engaging if it possesses the same qualities that make it deceptive or emotionally compelling. This is especially significant because it implies that social media platforms may inadvertently contribute to the dissemination of false information and exacerbate political polarization by promoting interesting content.

Lastly, timing and trend analysis shows that major political events frequently coincide with peaks in viral and fake content. This suggests that such content might be purposefully released to coincide with significant events, possibly influencing public opinion and escalating divisions during crucial times. Overall, these results demonstrate how algorithmic amplification and content attributes can interact to significantly influence online political discourse.

Conclusion:

This particular study aimed to investigate the role of engagement-driven mechanisms in the shaping of political discourse on social media, specifically during the 2016 United States election process. The use of sentiment analysis, engagement metrics, and misinformation detection using data from Twitter election data, as well as fact-checking sites like PolitiFact, helps illustrate the role of highly engaging content in relation to the intensity of the narrative, as well as the potential for misinformation in the political discourse on social media.

In addition, the use of public opinion trends, including data from FiveThirtyEight, helps illustrate the relationship between the political discourse on social media and the political polarization of the United States population. While the study does not seek to illustrate causality, the relationship between the

algorithmic amplification of content on social media and the polarizing nature of the political discourse is clear. The particular study helps illustrate the need for more responsible content ranking systems, as well as the role that social media plays in the political polarization of the United States population during the election process.

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