Harnessing LLMs to Decode Polarizing Political Ads on Facebook: Content, Emotions, and Impact on User Engagement

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Abstract

Political ads on polarizing topics, such as gun control and abortion rights, play a critical role in influencing public opinion. In this study, we analyze political ads published on Facebook, focusing on their content types, political leanings, and stances. Leveraging various large language models (LLMs), we investigate how advertisers strategically incorporate emotions—such as fear, anger, and sadness—and thematic elements to engage audiences and maximize impressions. Our findings highlight the deliberate use of emotional and thematic strategies tailored to specific objectives, such as shaping attitudes or driving actions. By examining these patterns, we provide insights into how advertisers combine content, emotions, and themes to amplify their campaigns' reach and effectiveness. This study lays the groundwork for understanding the role of emotion-driven appeals in digital political advertising and their broader societal implications.

Keywords

Ads, Political Ads, Facebook, Social Media

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1 Introduction

Digital advertising is now ubiquitous across all media platforms, with the potential to influence public opinion, especially during elections. In the 2016 US Presidential cycle, 7 billion was spent on campaigning, increasing to 10.8 billion in the 2020 election.[1] Given the substantial financial investments and influence on public opinion, there is a pressing need for methodologies to accurately classify and analyze political ads at scale.

Our study investigates the use of large language models (LLMs) to classify political ads on a large scale, focusing on ads related to two highly polarizing topics: gun control and abortion rights. These topics frequently appear in US election cycles and are crucial in mobilizing voters and influencing public discourse.

We aim to answer the following research questions (RQs):

- **RQ1**: Can LLMs effectively classify the content, political leanings, and stances of polarizing ads?
- **RQ2**: How do advertisers incorporate emotions when generating these political ads?
- **RQ3**: What key themes do advertisers highlight in their ads?

Leveraging several popular LLMs, we classify over 36k Facebook ads by content type, political leaning, and stance, using data from the Meta Ad Library API. Our analysis highlights key topics and themes within the ads and assesses their impact on impressions. The results reveal that ads encouraging users to vote achieve the highest impression counts. Moreover, anger emerges as a dominant emotion for both abortion and gun control ads, notably in ads opposing abortion rights and supporting gun rights.

Lastly, we examine the emotional content of ads to identify which emotions advertisers prioritize based on content type, political leaning, and stance. Our analysis uncovers significant correlations between emotions and these factors. For instance, in *Gun Control* ads, we find a high prevalence of *Anger* in ads classified as "Petition" and aimed at Republican audiences. These insights inform the development of an ML model designed to predict the likely number of impressions an ad will generate, offering advertisers a tool to optimize strategies for enhanced engagement and effectiveness.

2 Related Work

Silva and Benevenuto [10] developed a classification schema for COVID-19-related ads, categorizing them into Political, Personal, News, Non-profit, Business, and Public Health. Building on their work, we manually annotated 2,382 political ads to classify their textual content, stance, and expressed political leaning, achieving F1 scores ranging from 0.27 to 0.99 for most tasks after fine-tuning. Previous studies have classified political leanings in ads using visual and textual information [11], but our work offers deeper insight into content, leaning, and stance. [9] highlighted the role of Facebook ads during COVID-19, focusing on narratives and rhetoric, which aligns with our analysis of rhetoric, emotion expression, and their variation across content type, political leaning, and stance. [5] mapped socioeconomic conditions using advertising data, while similar work analyzed ads related to German elections, climate change, and US Presidential campaigns [1, 2, 7]. In contrast, we classify political ads into categories that map their scope, including

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[1]https://www.cnbc.com/2020/10/01/election-2020-campaign-spending-set-to-hit-record-11-billion.html

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Monetization, Advocate/Vote, and Petition/Survey, contributing to future research on political ads characterization and impact.

3 Data

Our dataset was sourced from the Meta Ad Library API, focusing on advertisements published on Facebook during the 2022 US Midterm election cycle. Relevant political topics, such as abortion rights and gun control, were identified using targeted and topic-relevant keywords to collect ads related to these issues. The Meta Ad Library API provides comprehensive details about each advertisement, including its content, ad spending, run times (start and stop dates), and demographic reach, such as the distribution of impressions across age, gender, and location. Overall, we collected 23,147 ads for gun control and 13,108 ads for the abortion dataset. Both training and validation data were manually annotated for the classification tasks to address RQ1. The dataset used for content classification included 1,052 and 1,900 annotations for abortion- and gun-related ads, respectively. For leaning and stance classification tasks, 1,330 annotations were created for the abortion dataset and 1,900 for the gun dataset.

4 Methods

In this work, we are interested in understanding the content and political leanings of two of the most commonly discussed and polarizing political issues in the US: abortion rights and gun control. To this end, we first build a taxonomy to categorize the content of these political ads:

(1) *Vote/Advocate*: The ad aims to encourage people to vote for a specific person or party, or seeks to raise awareness;
(2) *Monetization*: The ad has a clear objective of soliciting money or donations;
(3) *Petition/Survey*: The ad encourages people to sign up or participate in a petition, or it is designed to collect public opinions through surveys;
(4) *Others*: The ad is off-topic or does not fit into any of the specified categories.

For leaning, we manually map advertisers to the two US political parties: *Republican* and *Democratic*. We also add the category: *Neutral* for any ads with no strong political leaning. For stance classification, we include the following categories: *neutral*, *support*, no support.

4.1 RQ1: Evaluation of LLMs for Classification Tasks on Polarizing Ads

As the classification of content in political ads is a novel task, we first establish some baselines using 7 state-of-the-art LLMs: *Llama3.1-8b-instruct*, *GPT-4o mini*, *GPT-4*, *GPT3.5*, *Llama2-7b*, *Mistral-7b-instruct*, and *Gemma*. To perform classifications, we generate five prompts: two zero-shot (with and without category definitions), two 1-shot (one example classification and one example classification per category), and one few-shot (three example classifications per category) prompts for each classification task. For example, our zero-shot prompt without defining the category to the model for *content* classification is: "I want to classify ads as one of the following: Survey/Petition, Advocate/Vote, Monetization, or Others. Answer

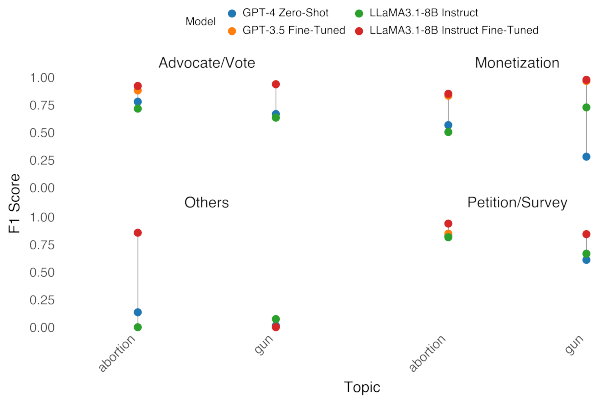


Figure 1: F1 Scores for Content Classification

in the format: Classification: <answer>". We evaluate the models using our annotated dataset and compare F1 scores for each category.

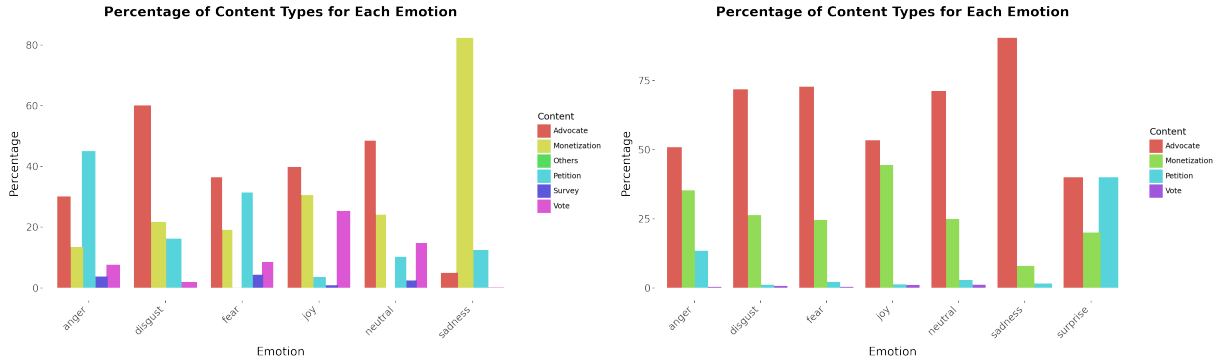
Although prompting has been shown to yield useful results for a wide range of tasks [12], fine-tuning LLMs has demonstrated superior classification performance for several specific tasks [13]. We fine-tune the models on Llama3.1 instruct 8b and GPT-3.5. GPT-4 and GPT-4o-mini were not utilized due to their built-in safeguards, which limit our fine-tuning through the OpenAI API. We use Q-Lora [4], a memory-efficient method to fine-tune Llama3.1-instruct-8b.

Figure 1 presents the performance of the models. The results indicate that the models excel in the Advocate/Vote and Monetization categories, achieving F1 scores exceeding 0.75. Among them, the fine-tuned LLaMA3.1-8B model consistently outperformed others across all categories.

For *stance* classification, the fine-tuned model significantly outperformed zero-shot models, particularly for the Neutral and Support categories, with F1 scores ranging from 0.75 to 0.99. In political leaning classification, the models demonstrated strong performance across most topics within the *Democrat* and *Republican* categories, achieving F1 scores nearing or surpassing 0.9. The fine-tuned GPT-3.5 and LLaMA3.1 models demonstrated the most consistent performance across all political leanings; therefore, we utilized these two models to classify the content, stance, and political leaning of the ads in our whole dataset. To address RQ2 and RQ3, we restricted our analysis to ads for which both models generated the same classification. This approach yielded a dataset of 13,108 abortion-related ads and 23,147 gun control-related ads for further analysis.

4.2 RQ2: Usage of Emotions in Polarizing Ads

Much research has explored the role of emotions in political ads, highlighting their strategic use to influence public opinion and engagement. For instance, [3] found that emotionally charged posts garner more interaction than neutral ones. Building on these findings, we study how advertisers use emotions in polarizing topics such as *Gun Control* and *Abortion*. Using a fine-tuned DistilRoBERTa model [8], we compute the dominant emotion in each ad. While most ads exhibit neutral emotions (*Gun control*: 77%, *Abortion*: 79%), others include emotions like *anger, fear, joy, sadness, disgust*, and



(a) *Gun Control* (b) *Abortion*

Figure 2: Distribution (%) of Content Types for Polarizing Political ads

surprise. Figure 2 illustrates emotional patterns across ad types, political leanings, and stances. For example, *Advocate* ads often use *fear*, *joy*, and *sadness*, with *sadness* prevalent in *Gun Control* donation appeals and *Abortion* advocacy ads. These findings reveal how advertisers tailor emotions to their objectives.

For *Gun Control*, ads targeting Republicans show a higher prevalence of emotional appeals, particularly *anger*, likely emphasizing threats or losses to rally support against gun control. In contrast, *Abortion* ads targeting Democrats use a broader range of emotions, with frequent *surprise* and *disgust*, provoking reactions to perceived injustices, aligning with liberal values. These strategies reflect ideological differences: *anger* in Republican ads taps into defensive emotions, while *surprise* and *disgust* in Democrat ads aim to provoke moral outrage.

We compute correlations between ad attributes and emotion usage, uncovering linguistic patterns. In the gun control dataset, *Petition* content shows a significant ($\alpha = 0.05$) positive correlation with Republican leanings and *anger* ($r = 0.31$), suggesting emphasis on perceived threats. Conversely, *Monetization* content is significantly negatively correlated ($r = -0.31$), indicating reduced appeals in this group. *Vote* content also shows a significant modest negative correlation with *Neutral* stances ($r = -0.24$), highlighting reduced neutral messaging in voting ads.

We train several probabilistic models, including Naive Bayes, Logistic Classifier, and MLP, to predict emotional usage based on ad attributes. We train our classification model with 80% of our annotated dataset and reserve 20% for testing. Among the tested models, the MLP classifier achieves an F1 score of 0.72 for *anger* in *Gun Control* ads and predicts that approximately 38% of the ads are *Survey* ads targeting Republicans with no support for gun control. . Similarly, *fear* in *Abortion* ads is classified with an F-1 score of 0.68 and MLP predicts that 30% of the ads are *Vote* ads targeting Republicans with no support for abortion. We extend this analysis by training several models (Naive Bayes, Logistic Regression, K-Nearest Neighbor, SVM, MLP) to predict the likelihood of emotion usage based on ad attributes. Using these models, we identify the most probable combinations of attributes associated with each emotion in the ads.

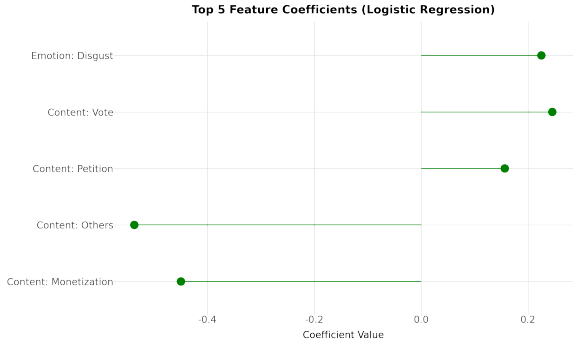


Figure 3: Top 5 Features by Coefficient Importance

Finally, we predict ad impressions using several regressors (e.g., linear, ridge, random forest), with a logistic regressor achieving an RMSE of 152.38 for *Gun Control* ads. As a reference, we compared it with a baseline classifier where the number of impressions is set to the median value of ad impressions in our training set, resulting in an RMSE of 281.38. Figure 3 highlights the top 5 features influencing impressions. Interestingly, ads featuring calls to vote generate the highest number of impressions, whereas those soliciting financial contributions tend to attract fewer impressions (from Figure 3: positive coefficients for *Vote* ads and negative coefficients for *Monetization* ads). The influence of emotions varies by political topic: for *Gun control* ads, the use of negative emotions such as *sadness* and *disgust* correlates with higher impression counts, suggesting that these emotions resonate strongly with viewers on this issue.

4.3 RQ3: Prominent Themes in Polarizing Ads

The topic extraction process began with preprocessing, including the removal of non-alphabetical characters, filtering documents with fewer than six words, and lemmatization to standardize word forms. Ads were then clustered into topics using BERTopic [6]. To enhance the insights, LLaMA 3.2's summarization capabilities generated concise summaries for each topic based on the clustered

#	Abortion Ads	Gun Control Ads
1	Pro-life, Christian values, Men's role	Second Amendment, Constitutional carry
2	Education, Healthcare, Awareness, Pregnancy options	NRA endorsements, State laws (e.g., Texas, Tennessee)
3	Pro-choice, Taxpayer-funded programs, Women's rights, Reproductive freedom	Voting for gun reform, Safer communities, Politicians' role
4	Government policies, Abortion law criticism, Overturning regulations	Patriotism, UN registry, Biden's gun control, Foreign influence
5	Economic impact, Support for women, Debate, Personal stories	School safety, Parental rights, Teacher education

Table 1: Topics for Abortion and Gun Control Ads

documents. This approach effectively identified key narratives, offering a comprehensive view of the discourse on gun control and abortion rights.

The results of the topic model classification for the abortion rights and gun control datasets are presented in Table 1. For ads related to abortion, the identified topics revolve around the pro-life movement, the pro-choice movement, healthcare access, and the emphasis on religious values. In the gun control advertisement collection, prominent topics include the Second Amendment, gun violence prevention, and legislation concerning citizens' rights to obtain firearms. In the gun control dataset, we analyzed the relationship between emotion classification and topic assignment. The Chi-Square test for independence revealed a statistically significant association between emotion and topic (p-value < 0.001). However, the strength of this association, measured using Cramér's V statistic, was 0.04, suggesting a negligible relationship. Neutral tones dominate across topics, the most prevalent would be Topic 1, which is centered on American citizens' right to bear arms and the second amendment; thus, suggesting a factual framing to maintain credibility. The occurrences of *Anger* in Topics 1 and 2 demonstrate the substantial role within ads addressing the Second Amendment, gun rights, or legislative changes. We further applied the Chi-Square test to examine the association between topic labels and the ads' content, stance, and political leaning. Among these, the strongest associations were observed between topic labels and the ads' political leaning. The p-values for the associations between topic labels and content, stance, and political leaning were $p < 0.001$, $p = 0.014$, and $p < 0.001$, respectively. At a significance level of $\alpha = 0.05$, the associations with content and political leaning were statistically significant, while the association with stance ($p = 0.014$) was marginally significant.

To assess the significance of the relationship between topic and emotion in the abortion dataset, the Chi-Square test and the Cramér's V tests were employed. The analysis yielded a p-value < 0.001, indicating a statistically significant association between the topic and emotion labels. However, Cramér's V statistic of 0.07 suggests the strength of this association is negligible. Across all topics *neutral* emotion dominates across all topics, reflecting the prevalence of neutral or fact-driven narratives in abortion related ads in Topic 1. *Anger* also appears frequently in Topic 1, suggesting that ads centered on pro-life ideologies are designed to evoke strong emotion responses, particularly regarding controversial aspects of abortion debates.

The relationship between the topic and the ads' content, stance and political leaning was analyzed with the Chi-Square test and Cramér's V. The results revealed a p-value < 0.001 for the association between topic and content, as well as topic and political leaning, indicating statistically significant relationships. However, the association between topic and stance ($p = 0.175$) was not significant at $\alpha = 0.05$. The corresponding Cramér's V statistics suggest that all relationships exhibit negligible strength.

5 Conclusion

In this work, we provide an initial exploration of political ads on Facebook's platforms, focusing on polarizing topics such as gun control and abortion rights. By analyzing ad content, political leanings, and stances using LLMs, we reveal how advertisers strategically employ emotions and thematic elements to engage audiences and maximize impressions. In the future, we are interested in incorporating a broader range of topics and platforms to examine whether these strategies vary across different media environments. Additionally, we plan to incorporate user-level data, such as demographic data, to better understand how different users respond to various emotional and thematic strategies, which can offer a more nuanced understanding of targeted advertising practices.

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