

# The Impact of TikTok’s Engagement Algorithm on Political Polarization

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Figure 1: Lionel Bonaventure/Agence France-Presse – Getty Images.

## ABSTRACT

Political polarization has increased dramatically in the United States throughout the last decade [1]. Similarly, social media applications have seen an increase in the percentage of their user base who turn to the platform as a regular source of news [4]. Naturally, as social media platforms grow, the algorithms that inform what suggested content users see evolve and become more efficient at detecting the type of content we are likely to interact with. In this paper, we aim to study how engagement algorithms may play a role in political polarization through the creation of echo chambers. Specifically, we will focus on the speed and percentage that TikTok curates one’s feed to contain political content based on user interest. We will analyze these differences for three user cases: a liberal user, a conservative user, and an independent user. We hope to measure

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how political affiliation impacts the rate at which echo chambers form and to classify which side of the political spectrum – if any – TikTok falls on. Our findings are consistent with user demographics data that TikTok is a “liberal app” and we observed a stronger echo chamber effect for a conservative user case.

## KEYWORDS

politics, social media, TikTok, engagement algorithm, polarization

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## 1 INTRODUCTION

The digital age is here to stay, and it’s no surprise that many news outlets, politicians, and journalists have begun to adapt by publishing their content on social media platforms; the largest being TikTok. Is the consumption of political content on social media a tool to help unite us and create community, or is it only a driving factor in the increasing gap between political parties?

In this paper, we will look at whether TikTok creates the perfect environment for echo chambers to form through their engagement

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algorithm that powers the “for you page” (FYP). We define an echo chamber in the context of a social media platform to be an environment where pre-existing beliefs are confirmed, amplified, and reinforced inside a closed system. Our goal is to highlight the tendency for engagement algorithms to create an individualized echo chamber by promoting myopic content. We hope to get a peek inside TikTok’s engagement algorithm and how it might curate the FYP for a “conservative” bot account, a “liberal” bot account, and an “independent” bot account differently.

We plan to accomplish this by analyzing the percentage of political content present in three bot accounts’ feeds after a certain level of engagement. Specifically, each bot will interact with posts tagged under a political topic (ex. immigration, vaccination, economics, etc) in the following ways:

- The conservative bot will only engage with Tiktoks that contain one or more hashtags from our “Conservative Tags List”
- The liberal bot will only engage with Tiktoks posts that contain one or more hashtags from our “Liberal Tags List”
- The independent bot will only engage with Tiktoks posts that contain one or more hashtags from our “Independent Tags List”

We expect to find radically different content on the feeds of each bot at the end of our experiment. Since the percentage of users who identify as regular news consumers on TikTok who are also democrats is 63% compared to only 32% republican [11], we expect that the liberal bot will form echo chambers faster than the conservative bot due to a higher level of content availability. However, studies on echo chamber formation on other forms of social media have shown that there exists an insular network dynamic between right-wing media which is more subject to propaganda feedback loops than left-wing media [8]. Therefore, it is possible that the conservative bot’s feed will be more subject to echo chambers by design.

## 2 RESEARCH QUESTIONS

By the end of our study, we hope to be able to gain insight into the following two research questions:

RQ1: Where does TikTok fall on the political spectrum?

RQ2: How does political affiliation impact the speed and intensity of echo chamber formation?

[RQ1] explores the general political leaning of content on TikTok. Our goal with this question is to determine whether or not TikTok has more left leaning or right leaning content. If the majority of political content on TikTok is liberal, then that indicates that TikTok is a left leaning platform simply because it has more liberal content than independent or conservative. Conversely, if TikTok has equal amounts of conservative and liberal political content, then the platform falls in the middle of the political spectrum. This classification is informed solely through the types of content on the platform and is subject to change as the creator demographics of TikTok changes.

Knowing the type of content that is more prevalent on TikTok is important because it will allow us to better engage with TikTok as a legitimate news source. As we will discuss further in the

Background and Literature review section, a growing portion of Americans are regularly utilizing social media platforms over traditional media to consume news. By being aware of the makeup of political content, users who turn to TikTok as a news source would be able to browse the platform with a critical lens - much like how readers of CNN, FOX, and other mainstream news sources would be generally aware of the media’s political leaning.

[RQ2] looks at how user’s implied political affiliation through engagement behavior affects how political echo chambers form on TikTok. A 2021 study that looked at social media’s connection to political polarization showed that certain political affiliations had stronger tendencies to form echo chambers on Twitter based on conscious behaviors by the users such as following creators with similar ideologies. [6] Inspired by this study on Twitter, we want to explore whether the TikTok engagement algorithm could form echo chambers algorithmically based on subconscious behaviors on the users part (such as watching a video multiple times over).

## 3 BACKGROUND AND LITERATURE REVIEW

The literature below gives some background on previous research pertaining to the connection between social media platforms and their tendency to form echo chambers. Due to the recent popularity of TikTok and the lack of an official API for data collection, there are not many publications that specifically focus on this app. Because of this, we will use past studies focused on other social media platforms to support the connection between political echo chambers and political polarization. This section also contains high-level information on TikTok as a social media platform and a brief overview of TikTok’s engagement algorithm.

### 3.1 Tiktok: A Social Media Platform

Since its international launch in 2017, TikTok has seen explosive growth in its user base. [5] Information from a leaked pitch deck from 2018 obtained by Digiday shows just how much Tiktok has grown since then. (Figure 2). Data gathered by Sensor Tower shows that in Q1 of 2022, Tiktok was the most downloaded app worldwide with more than 3.5 billion downloads.[10] In Q4 of 2021, the company had 1.2 billion monthly active users and they are expected to reach 1.5 billion by the end of 2022, according to company data. [5] This is a sharp increase from the 3.7 million active users in 2018.[3]

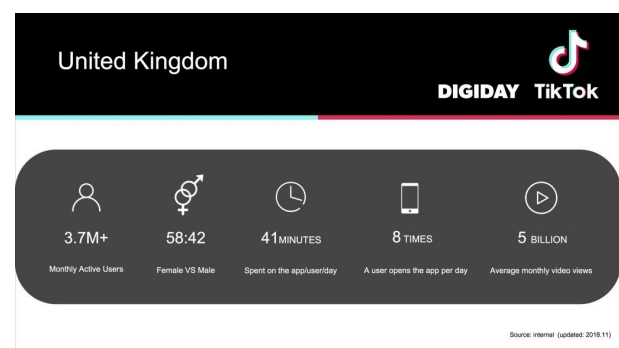
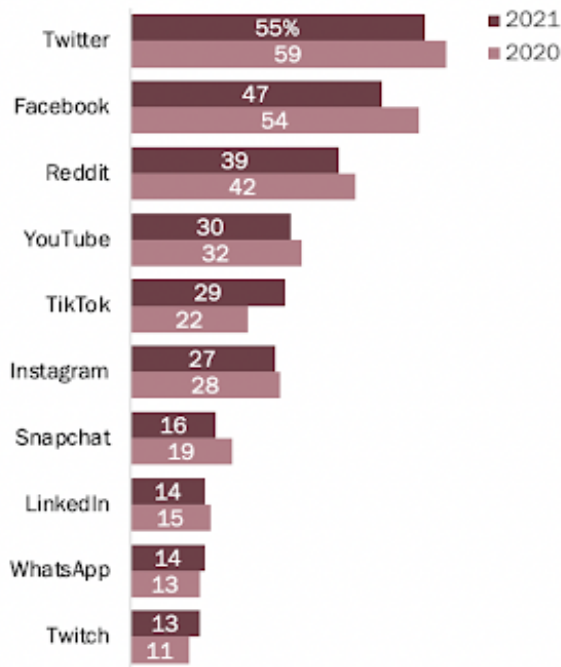


Figure 2: TikTok Internal Pitch Deck, 2018 [3]

What are the implications of this? While we have emphasized just how large TikTok has become in the past few years, the kind of content shared on the platform is instrumental in the influence it has. As a short video-sharing platform, TikTok’s content is both easily consumable and shareable. This makes it an ideal platform for news propagation. In fact, a 2021 survey by the Pew Research Center found that 29% of TikTok users regularly get their news from the platform - a 32% increase from the previous year (Figure 3).

### Large portion of Twitter users regularly get news there

% of each social media site’s users who regularly get news there



Source: Survey of U.S. adults conducted July 26-Aug. 8, 2021. "News Consumption Across Social Media in 2021"

PEW RESEARCH CENTER

Figure 3: % of each social media platform’s users who regularly get news there [11]

### 3.2 Social Media and Echo Chambers’ Effect on Polarization

While the existence of echo chambers on social media has been contested in the past, recent research shows that social media platforms with a focus on social networks and news feeds encourage

echo chambers to form [2]. While TikTok does not have a “news feed” and instead has a “for you page” (FYP), almost a third of its massive user base regularly gets their news from the platform – as discussed in the previous section. These two findings lead us to believe that TikTok may also provide the perfect breeding ground for echo chambers despite not explicitly having a news feed.

Additionally, a 2021 study on social media polarization found strong evidence of political echo chambers on Twitter [6]. When analyzing cross-party engagement, Jiang found that far-right and far-left users had almost no retweets between parties. Across the political spectrum, users both creating and sharing political content interacted within echo chambers. The isolation of these networks reinforces one’s ideologies through confirmation bias which in turn only drives polarization – thus a vicious feedback loop is created.

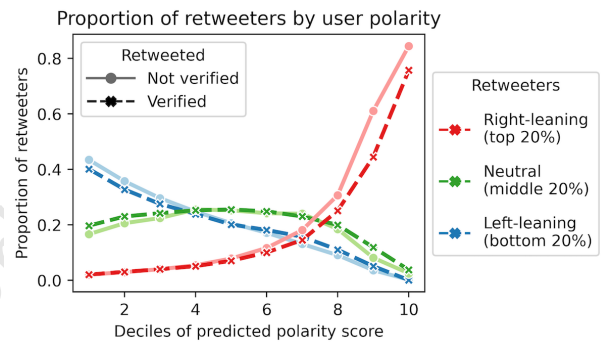


Figure 4: The distribution of left-leaning (bottom 20% of the polarity scores), center (middle 20%), and right-leaning (top 20%) retweeters (y-axis) for users across the polarity score deciles (x-axis). The retweeted users are either verified or not verified. [6]

### 3.3 TikTok’s Engagement Algorithm

In December 2021, the New York Times broke down the information within the leaked document, “TikTok Algo 101”, from TikTok’s engineering team in Beijing. According to the document, the company’s “ultimate goal” was to increase the amount of daily active users.

In pursuit of this, the app logs user browsing behavior in two key aspects: “retention” and “time spent”. These two main metrics, in addition to others such as “likes” and “comments”, are fed into a predictive machine learning algorithm to recommend relevant videos that users are more likely to interact with. The highly simplified equation below sums up the general calculations that rank suggested videos using these metrics. Videos recommended to users are videos with the highest scores according to the following equation:

$$P_{like}XV_{like} + P_{comment}XV_{comment} + P_{playtime}XV_{playtime} + P_{play}XV_{play} \tag{1}$$

Essentially, the more a user interacts with a post the higher it’s scored. The score is a sum of weighted constants (P and V)

multiplied by each level of engagement (liking, commenting, and playtime).

There is more than just qualitative data that motivates the algorithm. The document also mentions that “some authors might have some cultural references in their videos and users can only better understand those references by watching more of the author’s videos.” Thus, there is a higher weight associated with watching multiple videos from one creator, than watching the same number of videos from separate creators. Another consideration is videos designed to game the algorithm by encouraging users to like, comment, and share, otherwise known as “like bait”. The document details how TikTok makes an effort to identify and suppress these videos, but the New York Times article does not expand on them. The New York Times article also replicated a chart (Figure 5) present in this document that indicated that “creator monetization” was a company goal. This shows that the TikTok FYP algorithm may also suggest videos if they will be lucrative for creators.

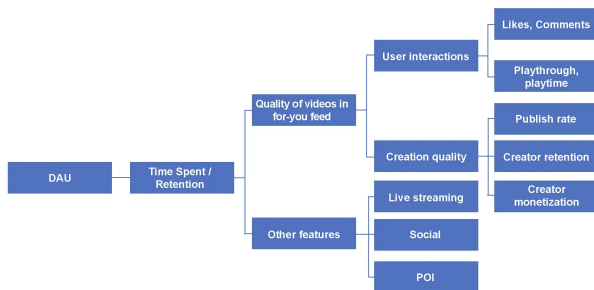


Figure 5: A chart illustrating the goals of TikTok’s algorithm was part of the report. (Note: This image was reproduced by The New York Times from original documents.) Credit: The New York Times [9]

The emphasis on watch time, likes, comments, and other engagement metrics indicates that the algorithm is designed to retain users for as long as possible and to entice them to return to the app often. This kind of behavior easily leads to falling down a rabbit hole, obsessive behavior, and entering an echo chamber. In fact, a Wall Street Journal report showed just that. [7]

“...TikTok relies heavily on how much time you spend watching each video to steer you toward more videos that will keep you scrolling, and that process can sometimes lead young viewers down dangerous rabbit holes, in particular toward content that promotes suicide or self-harm”

It’s reasonable to conclude that the same could apply to other topics that elicit strong emotions such as politics and dangerous conspiracies associated with it.

## 4 METHODOLOGY

In order to analyze if a user’s FYP becomes inundated with political content, we need to see how the percentage of political content on a user’s FYP evolves over time. To do this we want to collect time series data for three different types of users that reflect the political makeup of the United States. One that models a “liberal” type, one that models a “conservative” type, and one that models an “independent” type. These users will be differentiated by the type of TikToks they engage with. The criteria for whether or not these users engage with a TikTok depends on the hashtags used in the post caption. We separate political hashtags into “conservative”, “liberal” or “independent” categories to investigate whether political affiliation lends itself to the formation of echo chambers. We identified these 74 hashtags of each political category by manually checking which popular hashtags political TikTok creators use in their TikToks. (Figure 6)

Each of the three bots will engage with their prescribed hashtag group (found in Figure 6) by watching the flagged TikTok for 180 seconds. This is enough time for a standard length TikTok to play all the way through. They will ignore all other TikToks without the hashtags by immediately skipping the video. We were not able to automate a function to like or comment on videos, therefore we define engaging as simply watching the flagged post for an extended period of time (180 seconds). According to Equation 1, this should still contribute to a higher score for the watched post and in turn impact the recommended content.

The first of these bots will represent a “liberal” user. This bot will interact only with TikToks with the hashtags listed under Liberal Tags (Figure 6) and ignore all other TikToks. The second bot represents a “conservative” user, interacting only with TikToks where a Conservative Tag is present (Figure 6). The third and final bot represents an “independent” user. The independent bot will only engage with videos that include Independent Tags (Figure 6). This bot will interact with both posts from all political parties.

We will employ each bot until the account has engaged with 40 relevant political posts. This data will be stored in stages 1 through 4 where each stage contains all the videos on the bot’s FYP until 10 videos are engaged with. We will analyze the percent of political content in each stage by calculating:

$$\text{Percent of political content} = \frac{\text{engaged videos}}{\text{number of total videos}} \quad (2)$$

By comparing the percent change between stages we hope to answer the question of how political affiliation might increase the speed and intensity of echo chamber formation.

Personal browsing behavior from the researchers have suggested that liberal echo chambers will form faster based on an assumption that there is more liberal content on TikTok. To understand if this assumption is true, we plan to analyze the 40 political video captions from the independent bot’s FYP (text and hashtags) using a Naive Bayes classifier. Using the captions from the 40 liberal engaged posts and the 40 conservative engaged posts as training data, we will compare the number of different political posts identified by the classifier.

Independent Tags	Liberal Tags	Conservative Tags
#politics, #conservative, #liberal, #news, #democrat, #republican, #USA, #politicalparties, #police, #protest, #riot, #covid, #covid19, #vaccine, #abortion, #immigration, #uspolitics, #politicians, #economics, #supremecourt, #mask, #inflation, #politicstiktok, #tax, #americanpolitics, #democracy, #senate, #climatechange, #midterms, #scotus, #government, #president, #potus, #racism, #notmypresidnet, #congress, #stock, #election2020, #politician, #usapresident, #healthcare, #rally, #housingcrisis, #military, #america, #whitehouse, #crt, #mexico, #debate, #biden, #trump, #harris, #pence, #gender, #cancleculture, #redstate, #bluestate, #feminism, #race, #unemployment, #pronouns, #christian, #election, #pandemic, #politicalcommentary, #corruption, #nato, #china, #borders, #refugee, #inflation, #neutral, #centrist, #police, #protest	#acab, #defundthepolice, #blm, #policebrutality, #shooting, #1312, #endpolicebrutality, #blacklivesmatter, #abolishthepolice, #georgefloyd, #justice, #freepalestine, #blm, #defundthepolice, #lgbtq, #blacklivesmatter, #policebrutality, #equality, #georgefloyd, #stayhome, #misinformation, #antivaxxer, #getthejob, #getvaccinated, #getboosted, #maskup, #mask, #wearamask, #staysafe, #liberal, #voteblue, #democrat, #bluewave, #aoc, #bernie, #biden, #leftist, #anarchy, #socialism, #joebiden, #vote, #feminism, #eattherich, #ketanjibrownjackson, #liberaltiktok, #berniesanders, #hilaryclinton, #communism, #climatechange, #livingwage, #medicareforall, #cancelstudentdebt, #pelosi, #democratsoftiktok, #rbg, #lgbtqrighths, #alphabetmafia, #capitalism, #prochoice, #marxism, #taxtherich, #gender, #trumpism, #obama, #policereform, #genzforchange, #dentsaygay, #woke, #progressive, #leftwing, #systemicracism, #yallidarity, #classicism, #libtok, #feelthebern	#backtheblue, #bluelivesmatter, #humanizethebadge, #policeoftiktok, #thinblueline, #serveandprotect, #wedoitforyou, #policelivesmatter, #copsoftiktok, #alllivesmatter, #vaccine, #freedom, #antilockdownprotest, #freedomrally, #truckerprotest, #freedomconvoy2022, #endthemandates, #truckersoftiktok, #mandate, #masks, #mandate, #antivaxx, #stopthemandate, #medicalfreedom, #freedom, #stopthevaccine, #standupforyourrights, #myocarditis, #wilnotcomply, #pureblood, #maga, #republican, #conservative, #makeamericagreatagain, #letsgoabandon, #votered, #redwave, #trump, #snowflake, #factsoverfeelings, #trump2024, #trump2020, #foxnews, #patriot, #tedcruz, #conservativetiktok, #freespeech, #republicanhypehouse, #donaldtrump, #climatehoax, #conservativeheat, #libertarianism, #libertarian, #secondadment, #guns, #sleepyjoe, #gop, #trumprain, #prolife, #trumprally, #benshapiro, #saveourchildren, #proudamerican, #buildthewall, #conservativewoman, #republicangirlsdoitbest, #sheep, #todayisamerica, #wethepeople, #alm, #saveamerica, #2ndadment, #americafirst, #magaforever, #vaxx,

Figure 6: Three hashtag categories

## 5 RESULTS

### 5.1 Bot Engagement Data

For our liberal bot we saw a comparatively high initial concentration of flagged videos as it engaged with 0.83% of videos watched in stage 1. This increased to 1% by stage 2, or a 20% change between these stages. In other words, the liberal bot scrolled through 1000 videos and engaged with 10 videos in stage 2 while it had to scroll through around 1200 videos to engage with 10 videos in stage 1. However, this trend does not continue for stage 3 and stage 4. From stage 2 to stage 3, there was actually a 45% decrease in concentration. In other words, the liberal bot had to scroll through more videos in order to find 10 videos to engage with. The decline in concentration continues from stage 3 to stage 4 where there was a 14.5% decrease. This means that, again, the liberal bot had to scroll through even more videos in order to find 10 relevant videos with the proper hashtags to engage with.

The conservative bot showed a consistent, albeit small, increase in percentage from stage 1 to stage 4.

The independent bot saw a general increase in percent of engaged videos from stage 1 to stage 4. There was a small decrease of 2% from stage 2 to stage 3, however, from stage 3 to stage 4 this decrease was reversed and we see the highest ratio of engaged videos to watched videos of all stages.

Overall, there was a general increase in the ratio of engaged videos to watched videos from stage 1 to stage 4. Only the liberal bot deviated from this trend as the ratio in stage 4 was lower than the ratio in stage 1. The conservative bot saw the smallest percent changes, but also saw the most consistent percent increases from stage to stage.

Another relevant finding was the number of posts each bot swiped through in total. In order to complete all 4 stages, the conservative bot had to look through almost three times as much content as the liberal and independent user cases.

The heat map below shows the concentrations of each stage visually with the yellower colors indicating higher concentrations of engage-able videos for each bot.

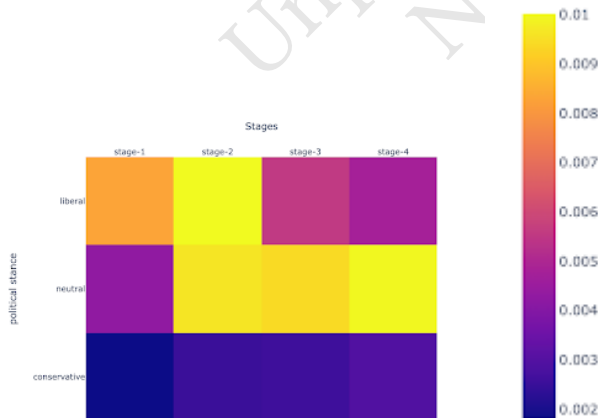


Figure 7: heatmap of percent of engaged TikToks in each stage

	Stage 1	Stage 2	Stage 3	Stage 4
Liberal	0.83%	1%	0.55%	0.48%
Independent	0.43%	0.96%	0.94%	1%
Conservative	0.18%	0.25%	0.26%	0.29%

Table 1: Numerical representation of Figure 7.

### 5.2 Classification of Independent Bot Data

Using the captions (text and hashtags) from the posts the liberal and conservative bots engaged with, we trained a Naive Bayes classifier to help us analyze if our independent bot was left-leaning, right-leaning, or truly centric.

Out of the 40 videos the independent bot engaged with, 22 were classified as liberal and 18 conservative. Even though there are more liberal users on TikTok (and therefore assumingly more liberal content), this close to equal ratio may be explained by the propensity for conservative media to create strong echo chambers [8].

Our Naive Bayes classifier was able to correctly identify liberal captions with a recall value of 0.88 and conservative captions with a recall value of 0.95 (Figure 8). The F-Score for our classifier was 0.91.

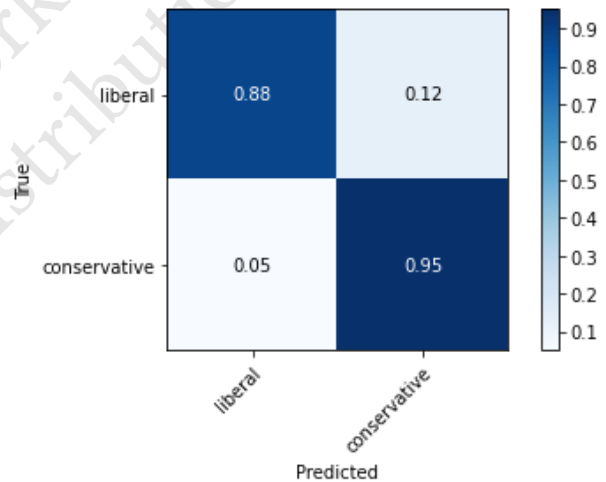


Figure 8: confusion matrix

## 6 CONCLUSION

Our results lead us to two main conclusions:

- (1) There is more liberal content on TikTok.
- (2) Conservative users on TikTok experience a stronger echo chamber effect than left-leaning or independent users.

Both of these findings support our initial hypotheses and are consistent with past research on social media.

Conclusion 1 is supported by the total number of swipes needed before engaging with 40 posts. Since the liberal bot engaged with almost 3 times less content than the conservative bot in order to find all 40 relevant posts, we can conclude that there is a larger quantity

of liberal posts on the platform and therefore can classify TikTok as a left-leaning app. This is further reinforced by data collected by the Pew Research Center wherein 63% of TikTok users who use the platform for news consumption identify as democrat [11].

Conclusion 2 is supported by both the consistent positive percent changes between stages and the close to equal ratio of liberal and conservative content present in the independent data.

Unlike the liberal or independent bot, the conservative bot showed a consistent decrease in the number of posts in each stage (figure 3). This implies a stronger echo chamber effect for the conservative user since the algorithm adjusted the suggested content to fit the user's interests at a rate that was not consistent for the other bots.

The equal ratio of left and right engagement present in the independent bot data further implies that there is a tendency by design of the engagement algorithm to form echo chambers for right-leaning users. Since we established that there is more liberal content on TikTok as per conclusion 1, one would expect a substantially higher percentage of liberal engagement from the independent user, but this was not the case. We're led to believe that the reason conservative content was fed to the independent user at a higher rate than expected is because the echo chamber effect is stronger for conservative users. Perhaps the algorithm is accounting for the fact conservative users engage with other right-wing media at a higher frequency than liberals [6].

These findings bring into question the role that social media plays in enforcing political polarization. Who is responsible for political polarization caused by echo chamber formation? Should engagement algorithms be adjusted to introduce purposeful interactions between otherwise isolated networks?

We can see that the TikTok's company goals of increasing user retention has led the engagement algorithm to perform in this way. We believe that restructuring company priorities to consider the moral responsibility of avoiding echo chambers will sufficiently address the concerns of the role that TikTok plays in the United State's political battlefield.

## 7 LIMITATIONS

We note several limitations of our study. For one, the hashtags that were used to flag videos for each bot were manually chosen. As is the case with manual selection, our personal biases were present when deciding whether something was an independent tag or whether a tag belonged to either the liberal or conservative categories. Although we tried to mitigate the effects of this, we cannot be aware of all political contexts a certain hashtag would be used in. For example, niche hashtags such as #1312 indicated a liberal video to us because we closely followed Black Lives Matter protests and know that "1312" is a somewhat underground representation of the popular hashtag #ACAB that protested police brutality. Because we cannot have a deep understanding of all political topics on TikTok, there are definitely other niche conservative or liberal hashtags that we are not privy to.

Another limitation regarding hashtags is the inability to identify if a video is liberal or conservative purely based on hashtags. We note that many hashtags have different meanings in different contexts. In our list of conservative hashtags, we added #snowflake because we were confident that by the time we collected data, there

would be no more content about actual snow in the United States. However, there is still a chance that a similar coincidence could occur with another hashtag such as #mask. In a political context, this hashtag would be used in a video discussing the pandemic and the government response. However, this hashtag could also be used by an artist creating a masquerade mask or even the 1985 movie titled "Mask".

In a similar thread, hashtags are often used for visibility. If a left leaning creator is discussing police brutality and they wanted conservative users to see the video, they may use conservative hashtags so that their video would show up on a conservative user's FYP. Although this hypothetical video would be a liberal video, the hashtags would indicate to our bot that its a conservative video.

The final note we have about the limitations of using hashtags is that there are a lot of other user interactions that would indicate to an algorithm a user's political stance. For example, if a user interacts with cottagecore content, a subculture focused on a simpler lifestyle that is often queer-coded or outright lgbtq+, then they are more likely to be a liberal user. The algorithm would pick this up and suggest liberal political videos in response to a user interacting with cottagecore videos. However, we are unable to know all these subliminal links between genres of videos which limits our bot to solely interact with strictly political videos.

Additionally, we only looked at 4 stages in total which means that we only engaged with 40 TikToks for each bot. A typical user would engage with many more before the personalization of the FYP becomes obvious. If we were able to run the experiment for longer, we would be able to get more robust data that would allow us to see if the trends we saw in our results continued.

Finally, due to limitations on TikTok's end we were only able to engage with TikToks by watching them for 3 minutes. A typical user would like, comment, share, and follow to indicate interest in the engagement algorithm.

## 8 FUTURE WORK

There are 3 primary improvements we would like to implement for future iterations of our experiment. As mentioned in our limitations section, we noticed that hashtags are not a perfect indicator of whether a video is political or not. The numerous contexts a single word could show up in makes it difficult to pinpoint the real content of the video without watching the video itself. We would like to develop a more accurate way to determine if a video was political and or relevant or not. This could be achieved simply by training a classifier with a data set of conservative and liberal social media posts.

Secondly, we would like to run our experiment for longer than 4 stages. By engaging for a longer period of time we would be able to more accurately simulate an average TikTok user and improve the accuracy of our findings. It would be interesting to see how simulated long term usage inform the engagement algorithm on what content each bot would be likely to engage with. Would the trends we see in our results persist through more stages, or would there be a change?

Finally, we would engage with relevant posts in more than one way. For this paper, we were only able to watch the TikToks for

an extended period of time due to limitations TikTok put in place against bot interactions. However with more time and resources, we would like to have our bot accounts engage in other manners such as liking and commenting on relevant videos. Further, if we had more than one classifier or an ability to assign a weighted relevance score to each TikTok we could like, comment, watch or preform a combination of the three in accordance with that score.

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