RESEARCH PAPER

# Political Communication in the streaming oriented-platform, *Twitch*

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**ABSTRACT**
Until now, scholars of social media and politics have focused on text-oriented social media platforms, such as Facebook and Twitter, neglecting newer platforms focused on video and real-time chat. I investigate a video-oriented social media platform that has seen little attention from social scientists: *Twitch*. I study the patterns of political communication in the platform by focusing on the streaming chat of political "streamers", a term for live broadcasters of the platform. In this paper, I aim to answer three questions on Twitch politics: *1) Who are political Twitch streamers? 2) What contents are covered in the political streams? 3) How do the political streamers and their audiences interact with each other?* By using the supervised machine learning methods, I have identified 574 political streamers out of 59,272 total streamers, whose information is retrieved via the Twitch API. I have collected 33.6 million chat posts from political streamers' live broadcasting and found 646,073 unique Twitch users who have posted at least one chat post. Using the wide corpus of text data, I conduct text analyses to observe what contents are covered in the political streams and network analyses to capture the interactions among political streamers and viewers of their stream.

**KEYWORDS**
Twitch; Digital Politics; Social Media; Political Communication; American Politics; Computational Methods

## 1. Introduction

The popularity of Twitch streamer Hasanabi's live streaming of the 2020 US presidential election garnered attention from journalists and social scientists. The success of individual broadcasters like Hasanabi compared to traditional news media outlets like Fox News raises questions about why people choose to consume media from individuals on platforms like Twitch. Besides the popularity, novel political science research on Twitch is needed as the unique characteristics of Twitch, such as its real-time interaction, video and audio orientation, and streaming chat, create a distinct relationship between content creators and audiences that is different from traditional social media platforms. This difference could affect the patterns of political communication on the platform, as content creators on Twitch have more credibility and power due to their appearance and ability to interact with their audience in real-time (Marwick, 2015; Munger & Phillips, 2020; Senft, 2013). The active usage of the streaming chat function

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grants more credibility by enabling reciprocal interaction among content providers and audiences. As they could communicate with the one who produces political messages, the audience would regard the political streamers as more relatable and accountable compared to political figures on other social media platforms (Lewis, 2020). At the same time, Twitch streamers rely heavily on their audience for financial revenue and content creation, more so than other social media platforms. The lack of active reactions from viewers during a political stream on Twitch can make it less appealing (Sjöblom & Hamari, 2017).

Overall, the platform's real-time interactive nature, video and audio orientation, and streaming chat shape the environment of political communication by conditioning the credibility of political messages and granting audiences considerable agency over content production. The lack of political science research on Twitch is also alarming considering the increase of political activities on the platform. Despite Twitch being an entertainment-oriented platform, political activities are increasing, with streamers speaking up on political issues such as Black Lives Matter (Lopez, 2020; Ocal, 2020) and Capitol riots (Periwal, 2021). Streamers who devote most of their broadcasting time to political issues are also present on Twitch. To study the patterns of political communication in Twitch which has been understudied despite its theoretical and practical significance, I aim to answer three questions on Twitch politics in this paper by using various computational methods ranging from text analyses to network analyses.

(1) *Who are political Twitch streamers?* As Twitch is an extremely entertainment-oriented platform, the identification of political actors is essential to study Twitch politics. I found 574 political streamers using Twitch API and supervised machine learning techniques.
(2) *What contents are covered in the political streams?* After the identification of political streamers, what kinds of political content are covered in the streams should be studied as we do not know what kind of political content is present in the platform and how political streamers cover it. By collecting chat posts of political streamers and fitting topic models, I found political topics covered in the platform can be categorized into seven broad categories and a Twitch-specific pattern of political communication — the usage of context-specific "emotes".
(3) *How do the political streamers and their audiences interact with each other?* As a live streaming platform with a very easy-to-use streaming chat function, Twitch facilitates interaction among streamers and audiences. The patterns of political communication among Twitch users, including both streamers and audiences, cannot be properly understood without properly capturing communication networks. I create reference networks of audiences of political streams to observe how they interact with one another and found most of the networks have a structure of opinion leadership.

In the next section, I would introduce Twitch since the platform itself can be unfamiliar to some readers. Then, I describe why should we study Twitch through the lens of political science. Next, I introduce why political actors choose Twitch as their means to deliver political messages with an emphasis on streaming chat. After that, I introduce three questions to understand Twitch politics and suggest the answers to those questions step by step.

## 2. What is Twitch?

Twitch is a ten-year-old platform with 140 million unique worldwide monthly visitors and 41.5 million unique US monthly visitors in 2021 (Dean, 2021). The popularity of the platform looks more impressive when we compare it with traditional media: its monthly viewership figures in 2018 are comparable to those of some traditional cable TV networks in the US (Gilbert, 2018). Figure 1 shows the screenshots of Twitch

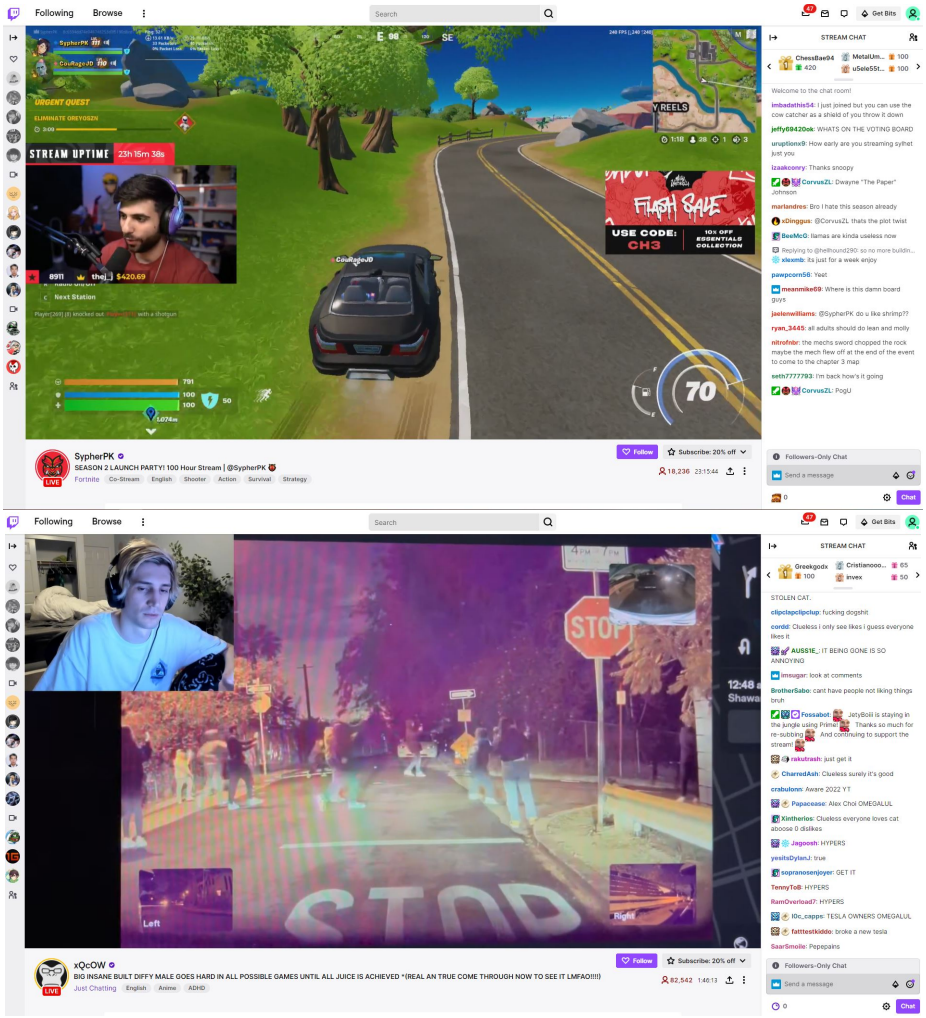


**Figure 1.** Screenshots of Twitch stream (Captured on 22/03/20)

streams. The upper image shows a screenshot of the typical gaming streaming of a Twitch streamer. He uses a microphone and webcam to show their appearance and voice while streaming their gaming screen, with a chat on the side for viewers to post messages. They sometimes watch videos or read texts with their audience and discuss the material together, as the lower image shows.

Several scholars from multiple disciplines have investigated Twitch from different angles ranging from relatively more macro-level approaches to studying Twitch as a platform that is affected by numerous exterior conditions (Ask, Spilker, & Hansen, 2019; Johnson, Carrigan, & Brock, 2019) to studies that focus on technology-oriented traits (Churchill & Xu, 2016; Claypool, Farrington, & Muesch, 2015) or Twitch af-

fordances (Flores-Saviaga et al., 2019; Jackson, 2020; Sjöblom, Törhönen, Hamari, & Macey, 2019), such as streaming chats (Ford et al., 2017; Hamilton, Garretson, & Kerne, 2014) and monetization (Johnson & Woodcock, 2019). Macro-level studies on Twitch as a platform economy point out that the flourishing of the platform has been possible because of both demand and supply for streaming (Ask et al., 2019; Johnson et al., 2019).

Other scholars examine the platform more in detail. Some focus on the Twitch technologies themselves (Claypool et al., 2015) and its influence on user network (Churchill & Xu, 2016), while others address the importance of social affordances of Twitch (Jackson, 2020; Sjöblom et al., 2019) arguing the social structure surrounding those technologies also matters. Out of various Twitch affordances, the streaming chat function has received the most scholarly attention (Flores-Saviaga et al., 2019; Ford et al., 2017; Hamilton et al., 2014). Streaming chat is essential for audience engagement in live streaming and allows viewers to communicate with the streamer and other participants in the same stream, creating a community that can act as a virtual third place for Twitch users. Affordances related to monetization have been seriously considered by scholars as well (Johnson & Woodcock, 2019; Sjöblom et al., 2019) as they are the basic building block that buttresses the Twitch platform economy by providing monetary incentives to pursue streaming as a professional career (Ask et al., 2019; Johnson et al., 2019). Apparently, although the existing literature has studied the platform thoroughly through various approaches, it lacks an examination of the platform focusing on political actors and their behaviors despite the political significance as I have described in the previous section.

## 3. Why Twitch?

Why should political scientists and social scientists care about Twitch, which is popular for its entertainment orientation? In this section, I will introduce a few episodes that clearly show WHY should we study Twitch politics. The first and most famous episode that shows the importance of Twitch politics is a series of streams by Alexandria Ocasio-Cortez, as known as AOC. Alexandria Ocasio-Cortez's series of gaming streams on Twitch in October 2020, which aimed to get out the vote for the incoming presidential election, was a huge success, with peak viewership of over 400,000 viewers (Rivera, 2020). A later gaming stream with Canadian MP Jagmeet Singh and other Twitch streamers raised $200,000 for charity (Dzhanova, 2020; Holt, 2020). Meanwhile, in her latest stream on Twitch, Alexandria Ocasio-Cortez discussed a political issue - the GameStop stock and Robinhood app issue - with guests including Alexis Goldstein, Alexis Ohanian, and TheStockGuy. They expressed their opinions on the issue and the financial system in general, with AOC advocating for systematic financial reform in the US. The stream was successful, with around 200,000 peak viewers. The case of AOC shows we should investigate how politicians use the medium as it shows similarities and differences at the same time compared to other social media. While she utilized the platform for mobilization and fundraising, much like politicians do on other social media, she also made a significant effort to be seen as a regular Twitch streamer by dedicating substantial time to gaming with well-known Twitch streamers. To understand this peculiar pattern, we should investigate Twitch scientifically to find out how the platform works and how those social affordances affect politicians' strategic choices when they are using the platform.

Other than politicians, there are other political actors in Twitch: Twitch streamers

who stream political content. The best example of a renowned political streamer would be "HasanAbi". His US 2020 presidential election marathon stream on November 3rd, 2020 for 16 hours had 225,000 viewers at its peak (Lorenz, 2020). Viewership of his election day Twitch stream was even comparable to the major media outlets when we use "Total Hours Watched" as a criterion to compare what media outlets people have chosen on election day: the stream's portion (4.9%) is almost similar to that of Fox News (6.5%) (Cale, 2020). The huge success of the election day stream by HasanAbi invited the attention of various news media outlets on the potential of Twitch as a political conduit, along with the huge success of AOC's few streams. As he clearly states in the interview with New York Times, his intention of the Twitch stream has been mainly political - he wanted some platform to congregate people every day and deliver his political opinion (Lorenz, 2020). Even entertainment-oriented streamers sometimes speak up about political issues, with a notable example being the Black Lives Matter protests in mid-2020. Some streamers expressed their opinions during live streams or produced videos related to the issue, while others held fundraising for Black Lives Matter (Lopez, 2020). Twitch politics is not confined to political streamers or viewers, but a broader pool of users and streamers on the platform, and the essay aims to study what Twitch politics looks like.

## 4. What makes political content creators choose it?: The importance of streaming chat function and systematic dependence on audiences

People who want to create political content on a streaming platform may choose Twitch because it provides an easy environment to start streaming. Creating video content for YouTube can be efficient compared to producing text content (Munger & Phillips, 2020), and live streaming on Twitch is even more efficient because the time spent streaming is the same as the length of the show. The user-friendly interface of Twitch and the availability of the app "Twitch Studio" make it easy for anyone to start streaming using their PC or mobile phone. The only requirements are an electronic device to run the program and objects to show viewers, primarily the streamer themselves.

As the previous literature thoroughly examines, the existence of various ways to pursue financial revenue also makes Twitch more attractive (Johnson & Woodcock, 2019; Sjöblom et al., 2019). Twitch offers direct revenue streams such as subscriptions, viewer donations through Twitch currency called Bits, and advertisement revenue. Streamers can also earn money through external sources such as sponsored product placement and third-party donation platforms. Although not all streamers can earn a stable income, the potential for financial rewards is a factor that attracts users to the platform. Hence, Twitch provides an ideal platform for political content creators to brand themselves as micro-celebrities, as they use webcams and microphones (Sjöblom et al., 2019) to create a personal connection with their audience, which helps them establish credibility (Marwick, 2015). They can also connect with their audience by including links to other social media platforms in their profiles (Sjöblom et al., 2019).The chat function on Twitch enables the communication between streamers and viewers, creating a space for mass communication that was not possible in traditional media outlets (Munger, 2021). Viewers can instantly react to what the streamer says or does by using Twitch emotes or normal languages, which helps create a relatable and accountable relationship between the streamer and the audience (Lewis, 2020).

Twitch's real-time chat function provides an attractive feedback loop for political

content creators and audiences to have a discussion on political topics in real-time, which can be very attractive to political content creators. While platforms like Twitter and Facebook allow for discussion on political topics, there is usually a time lag between users' responses. However, Twitch's chat function allows political content creators to express their opinions in real-time while engaging with their audience, giving the impression of a live discussion. This engagement can attract potential viewers interested in expressing their opinions on contentious political topics. Overall, the effective streaming chat function which enables political streamers to have a real-time discussion with their audiences can be the most important feature of Twitch politics. Exploring the role of streaming chat on political communication in the social media context can have some implications for the political communication literature as we little know how it affects inter-user communication patterns.

The other important trait of Twitch is that the creation of the content is also dependent on viewers at the same time. Not to mention the audience is a source of revenue that streamers are making (Johnson & Woodcock, 2019), their content creation itself is also inherently dependent on viewers and their chat posts because of the real-time nature of live streaming (Sjöblom & Hamari, 2017). Viewers' reactions during live streaming are crucial for political content creators, as their content tends to be talk show-oriented and requires smooth communication with viewers through streaming chat. Without active participation from viewers, political streaming cannot be successful and will only be a manifestation of the creator's political opinion. The audience users of Twitch have powerful agency and their participation is essential for the success of streamers. This highlights the need to study the audiences of political streams and their interactions with each other, not just the political streamers themselves.

## 5. Three Questions: Who are they, What do they broadcast and How do they interact?

In this paper, I answer three questions on Twitch politics. First, who are the political streamers on the platform? To study Twitch politics systematically, it is imperative to identify political streamers first from the population of streamers, who are mostly non-political. I have retrieved extensive lists of streamers who may stream political content and their information using Twitch API. Based on the information, I have leveraged supervised machine-learning techniques to find political streamers from the retrieved lists.

Second, what do they broadcast during their streaming? It is important to conduct a study on the types of political content that are discussed in streams, since we are unaware of the political content that exists on the platform and how it is addressed by political streamers. Are the topics that are widely covered by traditional media also get covered by streamers? Or, do they shed a light on other topics that are not fully covered by other media outlets? Observation of their topic choices can help us to comprehend the basic patterns of Twitch politics. I will answer the question by conducting various text analyses on the originally collected streaming chat post data.

Third, how do political actors, both political streamers and their audiences, interact with one another? In order to fully comprehend the political communication behaviors of Twitch users, which includes both streamers and their audiences, it is necessary to accurately capture the communication networks. I would focus on inter-audience communication in a stream that is done by mentioning others' usernames. How do

Twitch users in political chat rooms behave in terms of communicating with each other via streaming chat? By constructing and analyzing reference networks of each political stream, I will study political communication networks in Twitch political streams.

## 6. Question 1: Who are the political streamers?

In this section, I find political streamers out of extensive lists of streamers that are retrieved via Twitch API using the supervised machine learning method. In the first subsection, I briefly introduce Twitch API and how I have utilized it to get extensive lists of streamers. Then, I introduce the coding scheme to classify political streamers and the classified list of political streamers.

### *6.1. Using Twitch API to retrieve extensive streamer lists*

I have collected a week of streaming records[1] of Twitch broadcasting with the three game-names, "Just Chatting", "Talk Shows and Podcasts", and "Politics", which are identified the process fully described in A1, using Twitch API. The streaming records contain various information including user name, user id, streaming title, etc. I identified 53,550 unique ids for "Just Chatting", 5,853 for "Talk Shows and Podcasts" and 324 for "Politics". As I have also collected the Twitch profiles of those streamers as well, I merged broadcasting titles of streamings for a week and text information in their streaming profiles to create text data of all streamers.

### *6.2. Finding political streamers using supervised machine learning techniques*

I have used a supervised machine-learning technique to identify political streamers from the user data I have collected. The political streamers are defined by the following coding rules refer:

(1) If a streamer has broadcasted political content at least once (i.e. "Texas Abortion Law is a shame"), I coded her as a political streamer.
(2) If a streamer profile shows that she broadcasts about or is at least interested in politics (i.e. "I sometimes talk about politics"), I coded her as a political streamer.
(3) If a streamer explicitly identifies their political interest or partisanship on her profile (i.e. "I am Leftist", "This is conservative podcast"), I coded her as a political streamer.
(4) If a broadcasting title or streamer profile contains a representative term or hashtags of specific political movements (i.e. "#BLM", "#FreePalestine"), I coded her as a political streamer.

As I already know that there would not be as many political streamers in the list of "Just Chatting" compared to "Talk Shows and Podcasts" and "Politics" as described in A1, I adopt the following strategy to produce training sets with enough target values, and political streamers, to ensure the machine gets trained properly. First, I have hand-coded all components from the "Talk Shows and Podcasts" and "Politics"

[1] from 21-08-31 00:25 EST to 21-09-08 16:44 EST

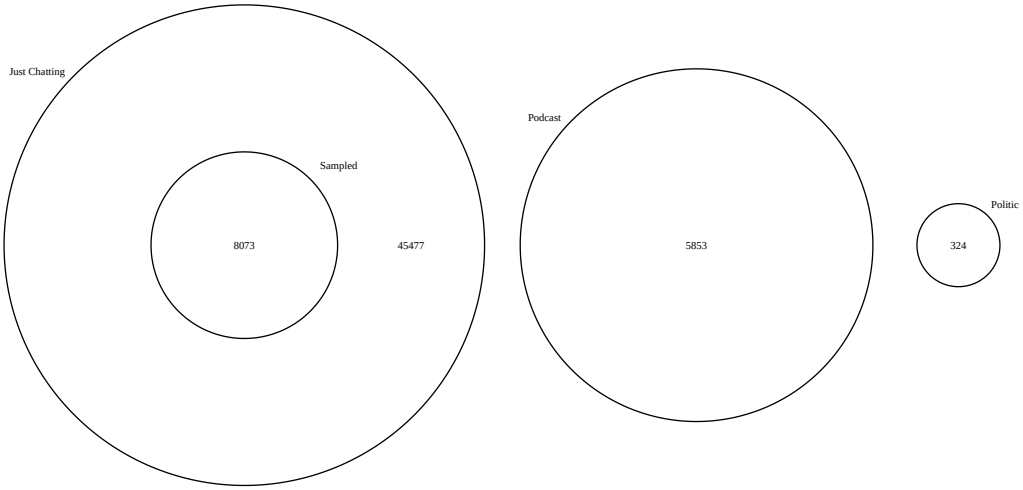


**Figure 2.** Venn Diagram of Twitch Streamer Data

sets in Figure 2. Then, I extracted the top 30 words from the combined text data of political streamers and filtered out nonessential words, such as articles and be-verbs, and other common words that are widely believed to be commonly used by most Twitch streamers (i.e. stream, live, etc.). I have used these keywords as a filter to sort out observations that are more likely to be coded as political from "Just Chatting" data. The process gives the "Sampled" set with 8,037 streamers that is right inside of the "Just Chatting" set in Figure 2. I hand-coded all of these streamers and identified 225 political accounts. The whole process gives me a total of 14,250 hand-coded train data with 550 political streamers.

**Table 1.** ML Models Performance

| Model | Precision | Recall | F-1 |
|---|---|---|---|
| Logit + Count | 0.822 | 0.721 | 0.760 |
| Logit + TFIDF | 0.907 | 0.640 | 0.703 |
| XGBoost + Count (learning rate = 0.5) | 0.855 | 0.745 | 0.788 |
| XGBoost + TFIDF (learning rate = 0.5) | 0.868 | 0.732 | 0.781 |

I have trained logistic regression and XGBoost classifiers using the train data. And I have specified models with the count and TF-IDF vectorizer for each algorithm. As the target value of the dataset is infrequent, I have used precision, recall, and F-1 score, which are known to be more appropriate to evaluate imbalanced data, to evaluate the performance of classifiers. Table 1 shows the performance of the 5-fold cross-validation results of each model. XGboost models mostly outperform logistic regression models in all three criteria, while it is hard to say which vectorizer is outperforming. Therefore, I have four hyperparameters of the XGBoost models with different vectorizers: *colsample_bytree, learning_rate, max_depth* and *n_estimators*. I have used the Gridsearch method to find a combination of hyperparameters to produce the best macro F1 score. The best score of each model with different vectorizers looks almost identical: 0.796

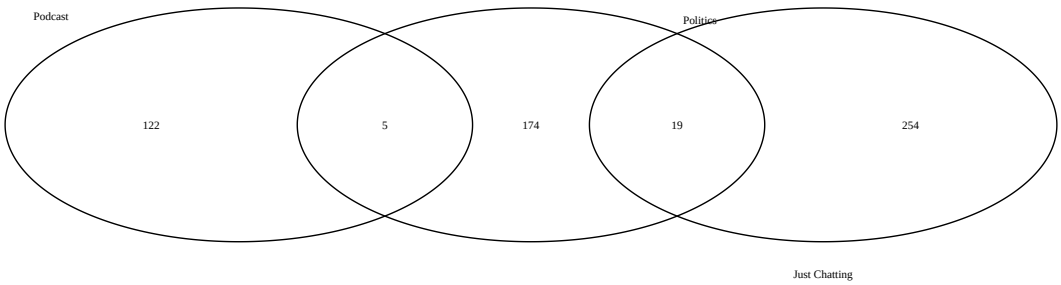


**Figure 3.** Venn Diagram of Political Streamers

for the model with TFIDF vectorizer and 0.795 for the model with count vectorizer. Although the difference is negligible, I have used the model with TFIDF vectorizer for machine labeling the rest of the unlabeled data as it shows slightly better performance. Through this process, I was able to identify additional 48 political accounts from 45,477 just chatting streamer accounts. Adding 550 political accounts identified during the hand-coding process, I was able to identify 598 political accounts in total.

However, there can be duplicates in the list, as the streamers are able to switch the 'game name' of their streaming whenever they want. For example, a hypothetical streamer A can stream one day with "Just Chatting" game name on the other day with "Politics" game name. In this case, streamer A would be in the intersection between the "Politics" set and "Just Chatting" set in Figure 3. I was able to find 24 streamers who have ever streamed with more than a single game name. There are 19 accounts that have at least once streamed both in "Just Chatting" and "Politics" and 5 streamers who have ever streamed with "Talk Shows and Podcast" and "Politics". After dealing with the duplicates, I was finally able to identify 574 unique political accounts on Twitch. Figure 3 shows the breakdown of these 574 political streamers: 254 streamers have streamed only with "Just Chatting", 174 streamers have streamed only with "Politics", 122 streamers have streamed only with "Talk Shows and Podcasts", 19 streamers have streamed with both "Just Chatting" and "Politics", and 5 streamers have streamed with both "Talk Shows and Podcast" and "Politics".

## 7. Question 2: What do political streamers broadcast?

### *7.1. Collecting Chat Posts from political streamers' live streaming using 'chat bots' - Descriptive Figures*

I have used chatbots that get connected to each stream and exist in the channel until it gets offline (Flores-Saviaga et al., 2019) to collect chat posts from streams provided

by political streamers I have identified.[2] The bots allowed me to download all chat posts in the stream's associated IRC (Internet Relay Chat) with various information, ranging from the text of chat posts to the user-name of the sender (Flores-Saviaga et al., 2019). Using the pipeline, I have collected chat posts of political streamers from 2021-12-11 to 2022-03-25.

Due to the time lag between the identification process of political streamers and actual chat post data collection, there has been some loss in the number of political streamers. I was able to collect chat posts of 478 political streamers out of a total of 574, which means the survival rate is above 83%. The reasons for the loss can be diverse. Some streamers might have quit streaming at all, or some might just want to cease it for a while.

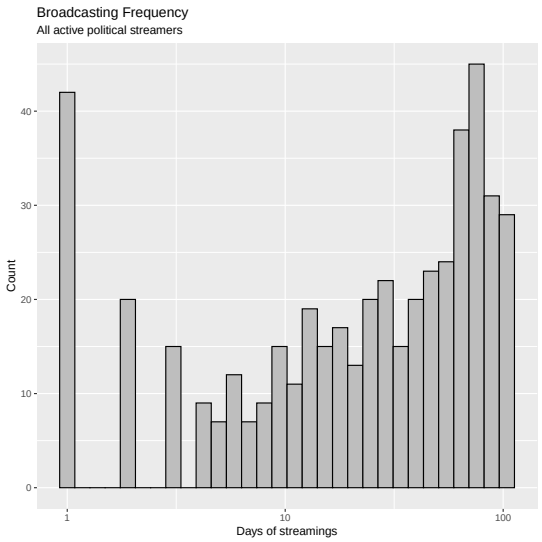


**Figure 4.** Frequency of streamings by political streamers

Figure 4 shows how often political streamers turned on their streams during a month of data collection period on a daily level. As the data collection went through from December 11, 2021, to March 25, 2022, the maximum value in the plot is naturally 105. While the plot is right-skewed, 342 of the active political streamers have streamed more than 10 days while 228 of them have streamed more than 30 days during about three months of data collection. In other words, most parts of the data I have collected could capture the regular interaction among viewers and streamers although there are some actors who rarely broadcasted.

Figure 5 shows the number of chat posts on each streamer's channel, both at the aggregated and daily levels. The logged scales of both histograms are close to a normal distribution, having a small number of extreme values on both the right and left-hand sides. The total number of chat posts I have collected from all channels is 33,649,628. The channel with the biggest number of chat posts has 16,945,559 chat posts while there is a channel with only 2 chat posts from a single user. The mean and median of the number of chat posts from the active political streamers' channels are 70,396 and 2,430 respectively. If we observe this on a daily level, which divides the number of

[2]Thanks to one of the authors of Flores-Saviaga et al. (2019), Joseph Seering, it was possible to successfully go through the data collection process. Streaming chat posts collection was largely done based on the codes in his Github:`https://github.com/josephseering/twitchtext`

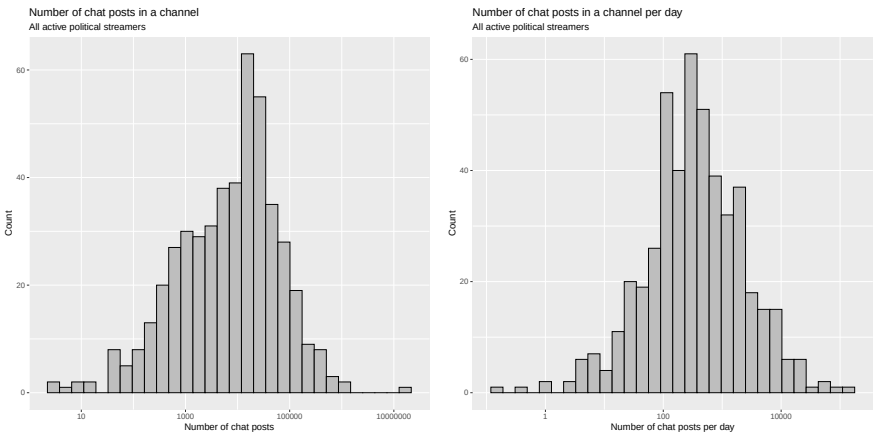


**Figure 5.** Number of chat posts

chat posts of a channel by the number of days streamings were on air, the mean and median values are 2,224 and 339 respectively. In other words, we expect to see at least 350 chat posts in the streaming of a political channel that is located in the middle of the distribution.

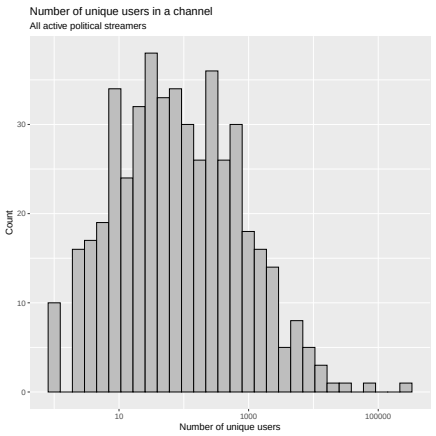


**Figure 6.** Number of unique users in a channel

Figure 6 shows the distribution of the number of unique usernames that have posted at least one chat post on a channel. The logged scale histogram shows a slightly right-skewed distribution. The most popular channel has 267,206 unique users while there is a channel with only a single unique user. The sum of all values is 646,073, while the mean and median values are 1,351 and 70, respectively. As the extreme value on the right-hand side is driving a substantially higher mean value compared to the median, we can expect if we choose a channel randomly, we are likely to choose a channel with around 70 unique users who have posted at least one chat post during its streaming.

Figure 7 shows the frequency of chat posts by a single user from all channels. The mean chat frequency of all users in a channel shows a nearly normally distributed pattern while the max chat frequency has a weakly left-skewed distribution. The mean and median values of the mean chat frequency are 45.3 and 28.5 respectively while those of the max chat frequency are 2,475 and 377.

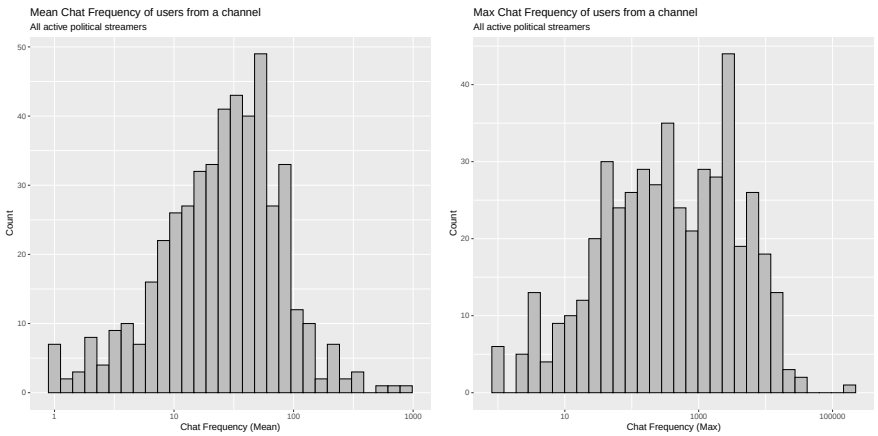


**Figure 7.** Frequency of chat posts

### *7.2. What is discussed in political Twitch streams?: Topic models of the chat post data*

In this section, I will show what is discussed in political streams by conducting topic modeling of chat post data. Topic modeling is a tool that is now widely used in both social science and computer science (Liebman, Roberts, Stern, & Wang, 2020; Roberts, Stewart, & Tingley, 2019), which can help us observe general trends in the text corpus I have collected by examining broad categories among chat posts. By conducting a topic modeling, we can find topics, which can be defined as sets of words that tend to occur simultaneously within documents (Liebman et al., 2020).

Due to the computational challenges, I sampled 5% of chat posts from each political stream. As the number of chat posts collected varies a lot by stream due to the difference in the size of the audience and the broadcasting frequency, I sampled 5% of chat posts from each channel instead of sampling at an aggregate level. The total number of sampled chat posts is 1,682,739. I identified a topic as political if one or more politically relevant keywords can be identified within the top 15 keywords within a topic. Based on the criteria, I was able to find 45 political topics out of a total of 150 topics. In other words, 30% of topics identified through the analysis can be seen as political. The extensive lists of political topics are reported in Figure A2 and A3. Political topics also appear as frequently as other topics as the sum of the expected topic proportions of political topics is 0.29, almost identical to the proportion of political topics (0.3). Other patterns also do not show significant differences: the mean and median values of the expected topic proportions of political topics and all topics are almost indistinguishable.[3]

I have categorized political topics into seven categories based on the political keywords in those topics: 1) International issues, 2) US politics, 3) Identity politics, 4) Ideological debate, 5) Politics in general, 6) Public health and politics, and 7) Environmental issues. Table 2 shows the number of topics categorized into each category, and how much proportion a category can account for the corpus of political chat posts and all chat posts.

The most frequently appearing political topics in Twitch streams are international

[3]The mean value of the expected topic proportion of political topics is 0.006, which is the same as that of all topics. The median value of the expected topic proportion of political topics is also 0.006, which is also the same as that of all topics.

**Table 2.** Topic Proportions

| Category | Number of topics | Proportion (Political) | Proportion (Total) |
|---|---|---|---|
| International issues | 11 | 25% | 7% |
| US politics | 10 | 21% | 6% |
| Identity politics | 9 | 21% | 6% |
| Ideological debate | 7 | 15% | 4% |
| Politics in general | 4 | 9% | 3% |
| Public health and politics | 2 | 4% | 1% |
| Environmental issues | 2 | 4% | 1% |

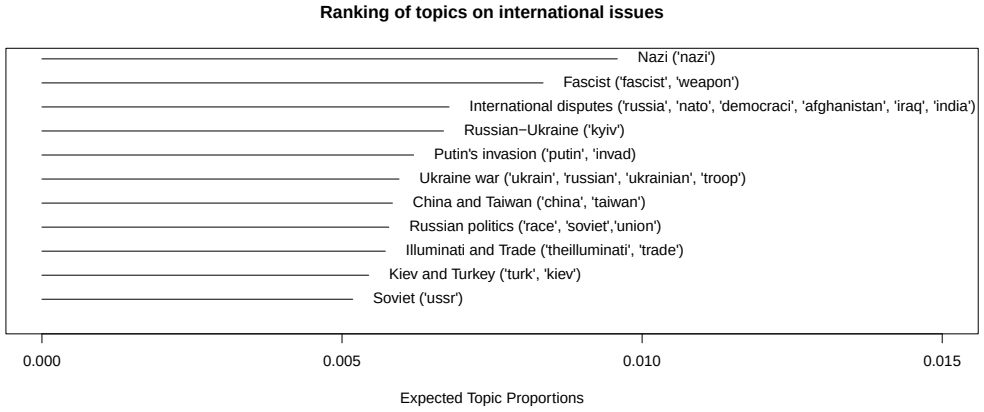


**Figure 8.** Topic Ranking: International issues

issues. Topics that are categorized as international issues also occupy the largest proportion in both political chat posts (25%) and all chat posts (7%) corpus. Figure 8 shows more details about the topics on international issues. What is apparent is that the prevalence of international issues in Twitch is largely due to the very specific incident that occurred during the data collection time frame, the Ukraine invasion by Russia, as six topics are directly related to the war or Russia. Other than those related to the war, other topics address international disputes of other NATO-related countries ("International disputes") and the China-Taiwanese conflict ("China and Taiwan").

Topics related to US politics also appear frequently: the number of topics is 10 and they account for 21% of political chat posts and 6% of all chat posts. As Twitch is the most popular in the United States, this finding is not that surprising. Figure 9 shows the topics of US politics. There is a topic about Trump ("Trump and Gender") and Biden ("Biden politics"), the two most popular politicians in the United States. Alexandria Ocasio Cortez was also mentioned in chat posts ("AOC"). Topics related to controversial violent events, such as Kyle Rittenhouse incident ("Kyle Rittenhouse") and police violence ("Florida Police Violence"), and the Black Lives Matter protest ("BLM") appear in political streams as well.

What is interesting is that topics related to identity politics appear as frequently as topics related to US politics and international issues. The number of topics is 9 and they account for 21% of political chat posts and 6% of all chat posts. Figure 10 shows what identity politics-related topics look like. Trans right related topic is the most frequently appearing topic in the political chat post corpus ("Trans Right"). Gender issues are also widely covered in streams as we can find three topics that can be read

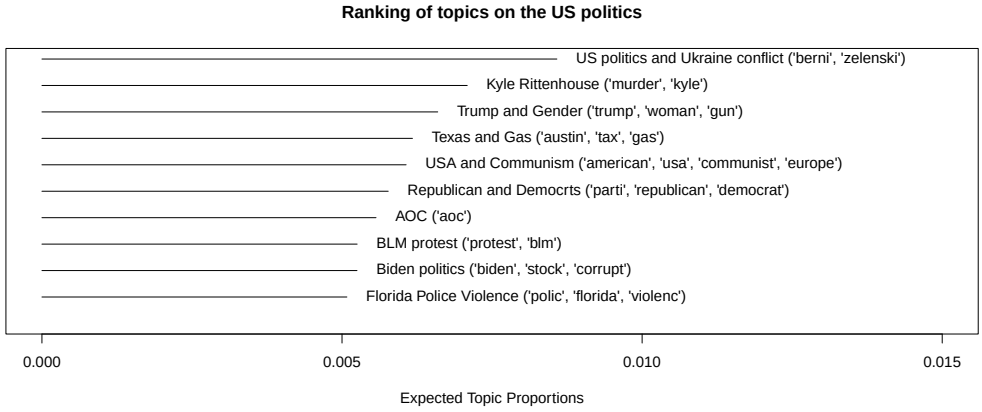


**Figure 9.** Topic Ranking: The US politics

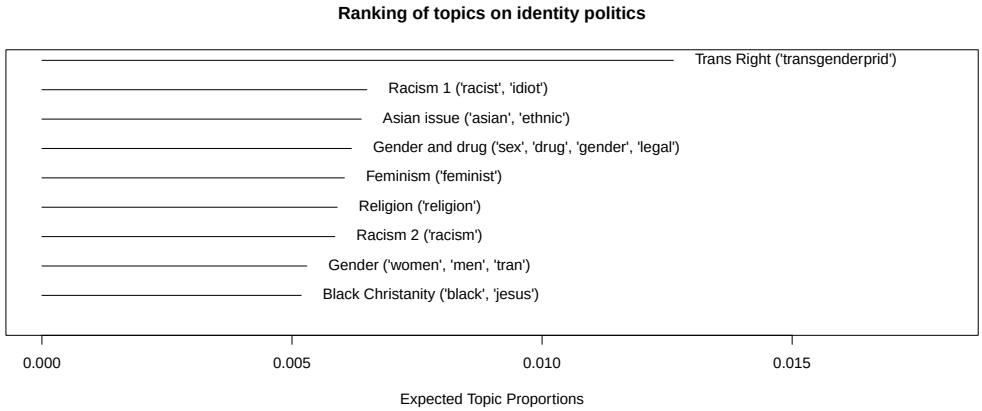


**Figure 10.** Topic Ranking: Identity politics

as gender politics related. Racism is also an issue in political streams. Three topics address racism or race-related issue ("Asian issue"). This finding is consistent with the literature which points out Twitch and online space with streaming chat function could act as a virtual third place to reveal their identity (Hamilton et al., 2014) - audiences could feel the streaming chat in Twitch political streams as the place they can reveal their identity and issues related with it.

Topics with texts related to ideological standings can also be found. The number of topics is 7 and they occupy 15% of political chat posts and 4% of all chat posts. Figure 11 shows more details about the topics of ideological debate. More than half of the topics are directly and indirectly related to referring leftists while only two topics are indirectly related to conservative or right-wing ideas. This finding could be indirect evidence that there could be some self-reinforcing communication with co-partisans in right-wing-oriented political streams. Two other categories, "Public health and politics" and "Environmental issues", have two topics and account for 4% of political chat posts and 1% of all chat posts respectively.

One thing to note is that a Twitch-specific mode of communication, the usage of "emotes" in streaming chat, has been quite widely used in political communication as

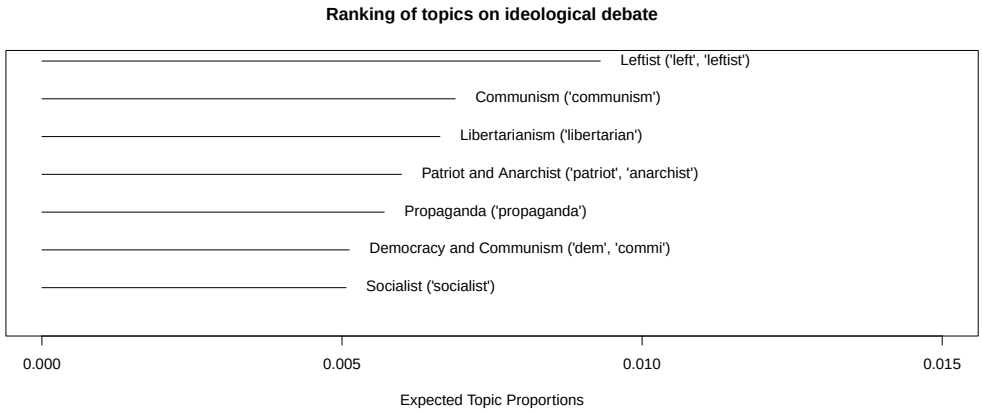


**Figure 11.** Topic Ranking: Ideological debate

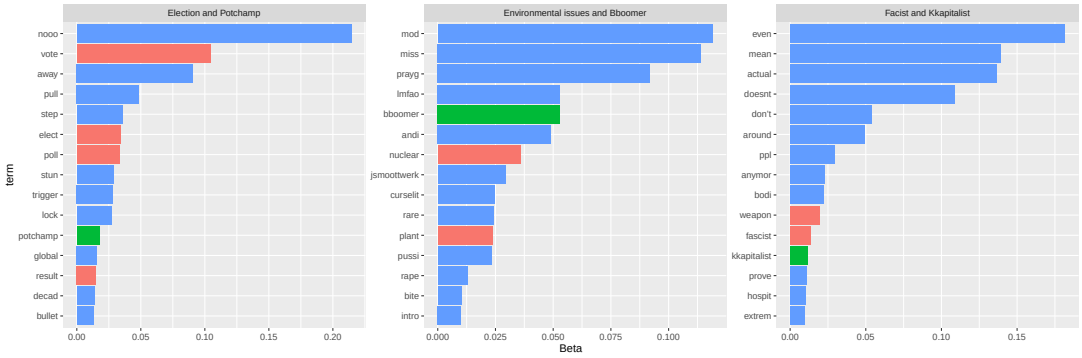


**Figure 12.** Emote usages in political streams

**Figure 13.** Kkapitalist and Bboomer

well. Twitch emotes are some sort of emojis that are used in Twitch streaming chats. Figure 12 shows, three emotes, 'Potchamp', 'Bboomer', and 'Kkapitalist' have been quite frequently used in chat posts that are classified to belong to political topics. In other words, political communication on Twitch is not only through 'texts' but also via context-specific 'emotes', which would need more attention from communication scholars. Figure 13 shows two emotes that are used, 'Kkapitalist' and 'Bboomer'. These emotes are designed to make fun of a snobbish capitalist rich and Boomers by nature. So, the usage of these emotes could tell us the political characters of some Twitch users: they might be anti-capitalists at least to some extent, and anti-boomer. Or, we can interpret the usage with more context. For instance, it can be the case that

some users connect the boomers with the environmental issues as keywords related to environmental issues co-appear with bboomer in "Environmental issue and Bboomer".

## 8. Question 3: How do they interact?

### *8.1. Reference network in chat posts within a political stream*

Using the collected chat post data, I have created 'reference' networks of chat posts from each political streamer. Twitch users who participate in streaming chats often refer to a streamer or other users for many other purposes. They might want to send emojis, ask questions related or just chat with other users. How do Twitch users in political chat rooms behave in terms of communicating with each other via streaming chat? And what types of content would they send? In this section, I depict what user reference networks in political streams look like and show what can we learn from them.

I have identified all unique users who posted at least a single chat post for each channel and regard them as nodes for reference networks. Edges for the network have been created in the following order: 1) I have found the chat posts that contain '@'. 2) Then, I regarded a set of words right after the symbol as a user they are referring to. 3) If I am able to find the user whose name is the same as the word I found in 2), I regarded there is a directed edge from the user who posted the chat post toward the other user who was mentioned by the chat poster. Out of 478 active political streamers, I created 279 directed reference networks of channels that have at least an edge, a chat post that mentions another user in the same stream.

#### *8.1.1. Network Descriptive Statistics*

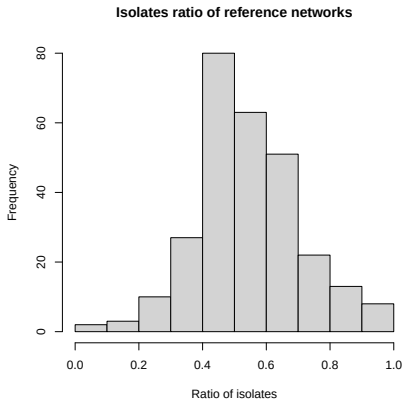


**Figure 14.** Ratio of isolates

The first thing that should be noted is reference networks mostly have a number of isolates. Figure 14 shows the distribution of the ratio of isolates in 279 mention networks. It shows a nearly normal distribution of values with a mean above 0.5. This shows that almost half of the users in reference networks do not ever post a chat with a mention ('@'). The pattern is not that surprising as most users publish chat posts to comment about the ongoing streamings they are watching, which does not need to

mention somebody.

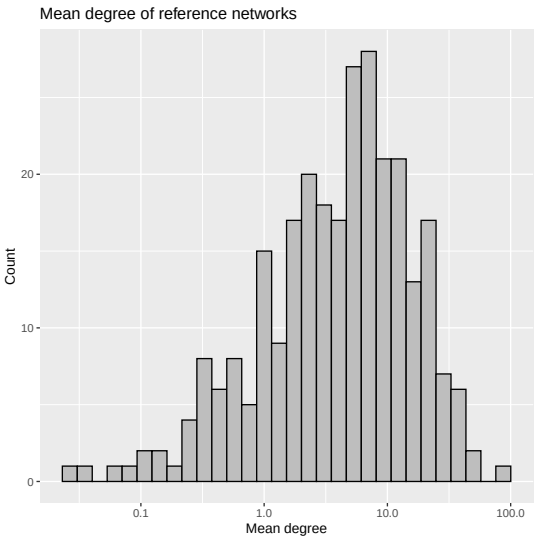


**Figure 15.** Distribution of mean node degrees

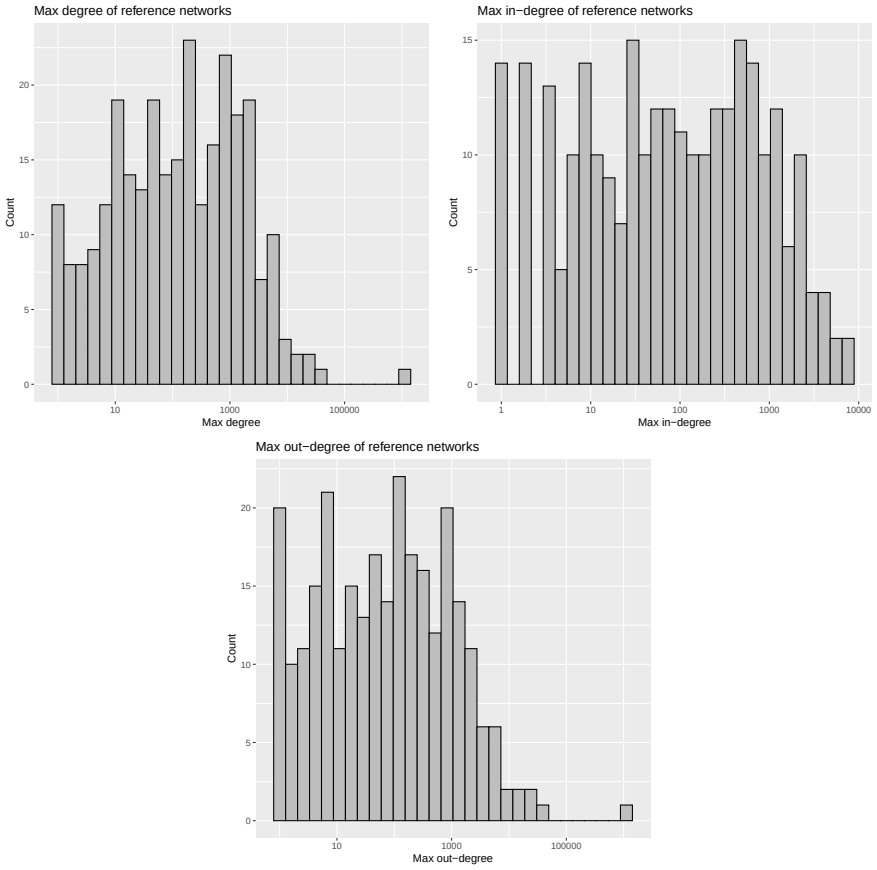


**Figure 16.** Distribution of max node degrees

Then, how many mentioning chat posts do users send or receive? The histograms

for the mean degree of all nodes in each mention network are shown in Figure 15. The distribution of logged values shows a nearly normal distribution. The mean value is 7.9, while the biggest mean degree of all nodes is 84.3. Figure 16 shows the distributions of maximum node degree, also with the plots only with in- and out-degree. What is very notable is that maximum values of out-degree are mostly bigger than those of in-degree. This shows that few verbose users who mention other users a lot drive the whole distribution of maximum values for all degree, as the most of values from the maximum all-degree histogram (upper left) matches with those of the maximum out-degree histogram (down). While the mean value of the maximum all degree is 5130.5, the median is 125. Apparently, the mean value has been highly inflated by a few huge values as histograms show. The users who actively mention other users can be a channel owner, or moderator[4], who normally help a channel owner when she streams by answering others' questions or maintaining their own rules for streamings, or just active user who refers to other users a lot. We would be able to regard these users as opinion leaders of reference networks as they own a comparatively large amount of edges in the system.

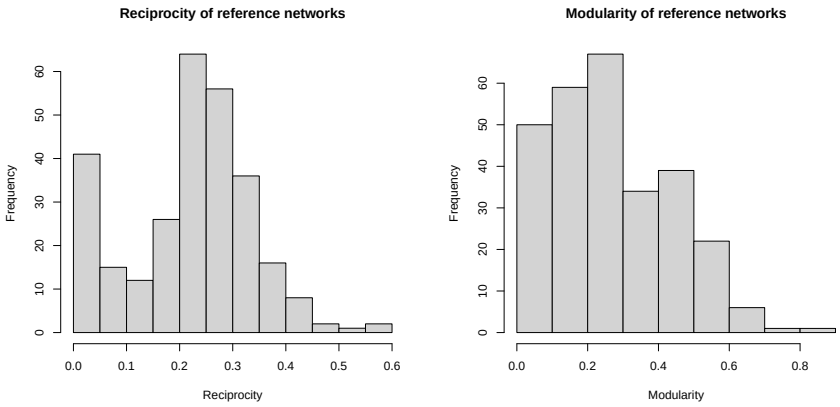


**Figure 17.** Distribution of reciprocity and modularity

The reciprocity and modularity scores of all reference networks are displayed in Figure 17. The reciprocity score shows the proportion of reciprocal ties in each network while the modularity score reflects how connected nodes within a community are. The mean value of the reciprocity score is 0.22, which means 22% of connections among nodes are reciprocal. So, about one-fifth of dyads refer to each other during their interactions. Modularity score ranges from -1 to 1, while the former refers to a complete disconnection within a community in networks, the latter means all the nodes inside a community are fully connected. The histogram shows that all reference networks show at least more than half-connectivity within communities as all graphs have a value bigger than 0. Thus, we can say nodes inside the communities that are detected in each reference network are somewhat well-connected to one another.

Figure 18 shows how many mention networks follow the power-law distribution. I have fitted a power-law distribution for each network and conducted the Kolmogorov-Smirnov test to see whether I can reject the null hypothesis that a network could have been drawn from a fitted power-law distribution. It turns out that over 96%

[4]I have excluded a user with a formal moderator badge as there are a lot of bots with it. However, in reality, there are users who perform the moderator role without the badge.

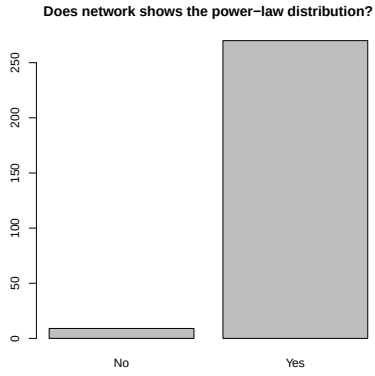


**Figure 18.** Does network shows the power-law distribution?

of networks follow the fitted power-law distribution, which refers to the possibility that the preferential attachment mechanism might have played its role during the tie formation. In a Twitch context, the preferential attachment might be a product of more visibility on streaming chat when a user refers to other users a lot (out-degree) or is mentioned by other users frequently (in-degree). The more a user posts chat posts during the streaming by referring to other users, the more likely the name of the user being exposed to other users. Also if a user is mentioned by other users more than a few times, then the visibility of the name increases. This could lead to more mention from other users as other users are more likely to recognize the name.

## 9. Conclusion

In this article, I have investigated the social media platform that has not gained enough attention from social scientists, Twitch. Focusing on the streaming chat function, which is the core of communicative technologies of the platform, I have answered three main questions I have raised: 1) Who are political Twitch streamers? 2) What contents are covered in the political streams? 3) How do audiences of political streams interact with each other?

To answer the first question, I have leveraged Twitch API and supervised machine-learning techniques to find 574 political streamers. As this has been the only attempt to thoroughly identify political actors from the platform, the study can contribute to the literature to suggest the pipeline to find political users. The pipelines to identify political streamers and collect chat posts and collected data would be completely open and shared with the article. To answer the second question, I have used topic modeling to observe what content is covered in political streaming. As we have not known what content is covered by the political streamers, the study makes a contribution by creating informative snapshots of political streamings' content. To answer the third question, I have created and analyzed user-reference networks in each political streamer's chatroom. Although Twitch has been regarded as the virtual third place that fosters participatory communities by other scholars (Hamilton et al., 2014) we have not known how much this is true for political streamers' audiences and the patterns of communication among them.

Though, there are still rooms to be improved. The current study only used text data

from streaming titles and streamers' profiles of streamers who have used three-game names. However, there can be streamers who speak about political issues without political streaming titles or profiles. Improvement in the weakness of future research can help us to identify political streamers and study Twitch politics more thoroughly.

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## 10. Appendix

### *A1. Game name identification*

The first step of the process is getting to know what "game-names" political streamers use. "Game-names" are tags of Twitch live-streaming that refer to what streamers are broadcasting. As Twitch is a mainly game-oriented platform, most of game-names are the names of games they are playing, such as League of Legends and Fortnite. However, there are game names that are not directly related to gaming activities, ranging from "Just Chatting" to "Cooking".

It is quite apparent that streamers who stream with the game name "Politics" can be classified as political streamers and can be added to the list. In addition, based on the information from the site "Twitchmetrics", which provides various information of Twitch streamers including rankings by category based on the information they received through Twitch API, I was able to know that political streamers also use the game name "Talk Shows and Podcasts" (Twitchmetrics, 2022). However, there are also some streamers who stream political content without using "Politics" or "Talk Shows and Podcasts" as the game name of their streams. The best example would be Hasanabi, who has been thoroughly described in the previous section: He never broadcast with "Politics". Instead, he uses "Just Chatting" as the game name when he is streaming about political issues. This might indicate the possibility that I might be able to find political streamers out of all Twitch streamers who stream with "Just chatting" tag. The challenging part is that most of the streamers who do not explicitly stream their gaming activity (sometimes they even stream their gaming activity with "Just Chatting" game name) but do something else choose to use "Just Chatting" as their game name. The topics vary from talk shows by herself or with other streamers to vlogging their traveling activities. In other words, when I use Twitch API to get information on live streaming with "Just Chatting" game name, I will get a list of streamers who stream very different topics. But, before including "Just Chatting" game name to the list of game names that might have political streamers, I conducted preliminary analysis on "Just Chatting" streamers to see whether there are political streamers who are using the game name.

Using Twitch API "Get Streams" function, I have retrieved the list of streamers who stream in English with the game name "Just Chatting".[5] As there are a substantial number of streamers who have only a single viewer, I stopped when the list ends up with a streamer with a single viewer count. I was able to identify 873 streamers who were streaming at the time by making "Get Stream" requests through Twitch API. "Get Stream" request retrieves various information about the ongoing streaming: user id of the streamer, viewer count, the title of the streaming, URL of a thumbnail image, etc. Then, how can I know whether streaming covers political content or not? I found thumbnail images and titles of streamings can be helpful.

By using URL information in the retrieved data of live streaming, I was able to download all thumbnails of 873 streamings. Thumbnails are basically the screen viewers were watching at the time I made the "Get Stream" request. Therefore, by downloading thumbnail images, I can retrieve visual information of ongoing streamings. By combining visual information and text information from streaming titles, I was able to identify some political streamings. Figure 2 shows the thumbnail images of political streamings. Upper left of figure 1 is a thumbnail image of the streaming by "Central_Committee" with the title "DNC WORKING TO BLOCK NINA TURNER

[5]The list has been retrieved at 12:00 PM, June 30th, 2021

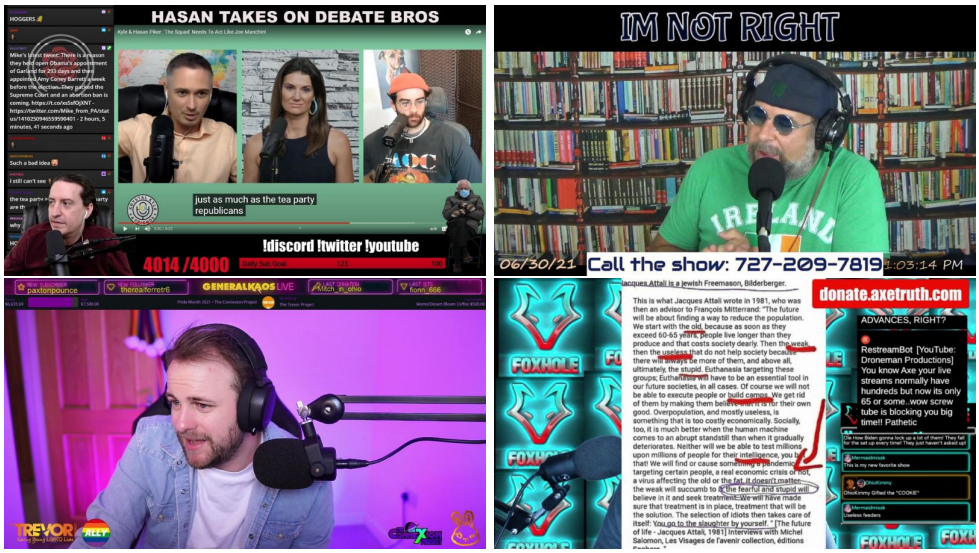


**Figure A1.** Example of political streamings with "Just Chatting" game name

— HASAN MALDING OVER DEBATE BROS — NYC MAYOR'S RACE VOTE COUNT MASSIVE ERROR — ". Upper right is a thumbnail image of the streaming by "ImNotRightNetwork" with the title "Where are our freedoms?". Lower left is a thumbnail image of the streaming by "GeneralKaosLive" with the title of "(rainbow emote) TREVOR PROJECT FUNDRAISER (rainbow emote)Helping to prevent suicide and giving back to the LGBTQ+ communty - !Charity !CXP ". The lower right is a thumbnail image of the streaming by "Axe_Truth" with the title of "Discouraged & Division in the ranks Candace Owens vs Kim Klacik". When we use both textual information from the titles and visual information from the thumbnail images, they can definitely be classified as political streamers. All of the titles touch on some political terms, such as "Mayor's Race", "freedom", "LGBTQ+", "Candace Owens vs Kim Klacik". Also, the composition of thumbnail images shares some characters. The upper left and lower right both show political content (one is visual and the other is textual). And except for the lower right, all three streamers use a similar broadcasting setting: a very huge microphone with their face exposed. Overall, there are political streamers who broadcast with the game-name "Just Chatting".

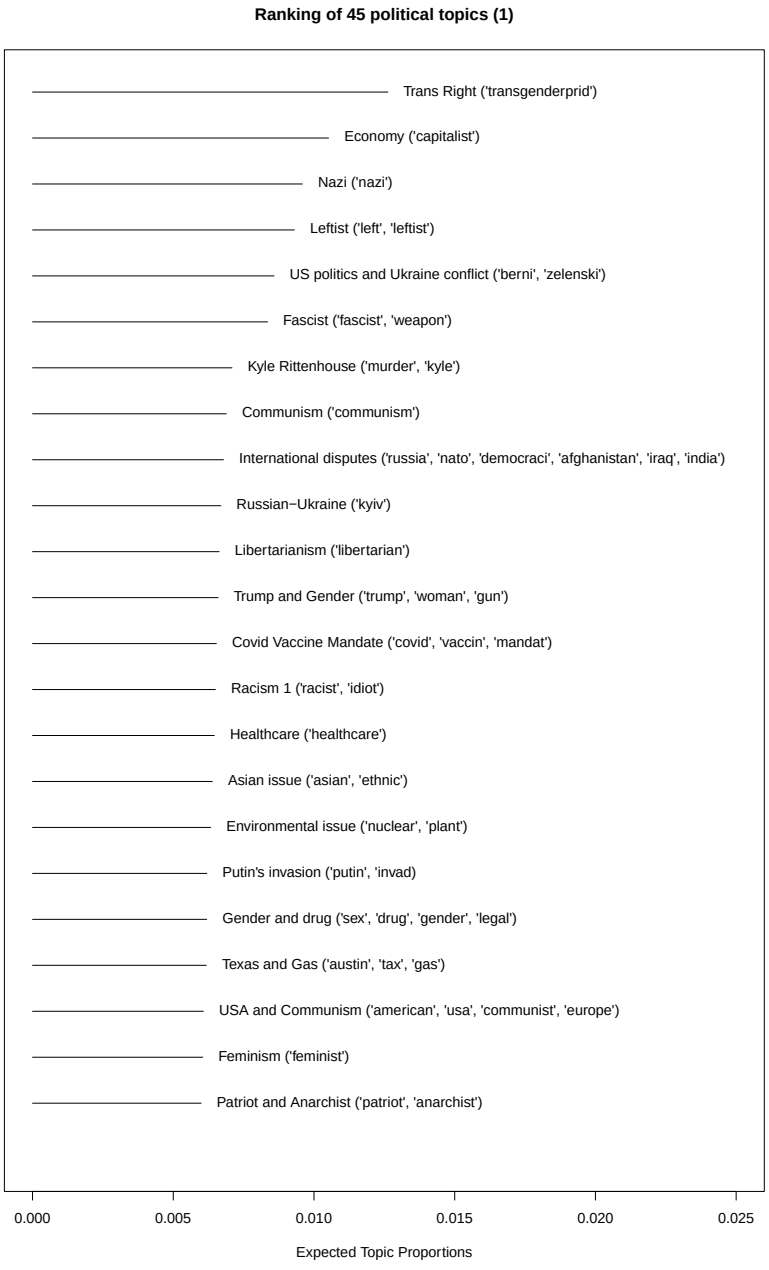


**Figure A2.** Identified Political Topics (1)

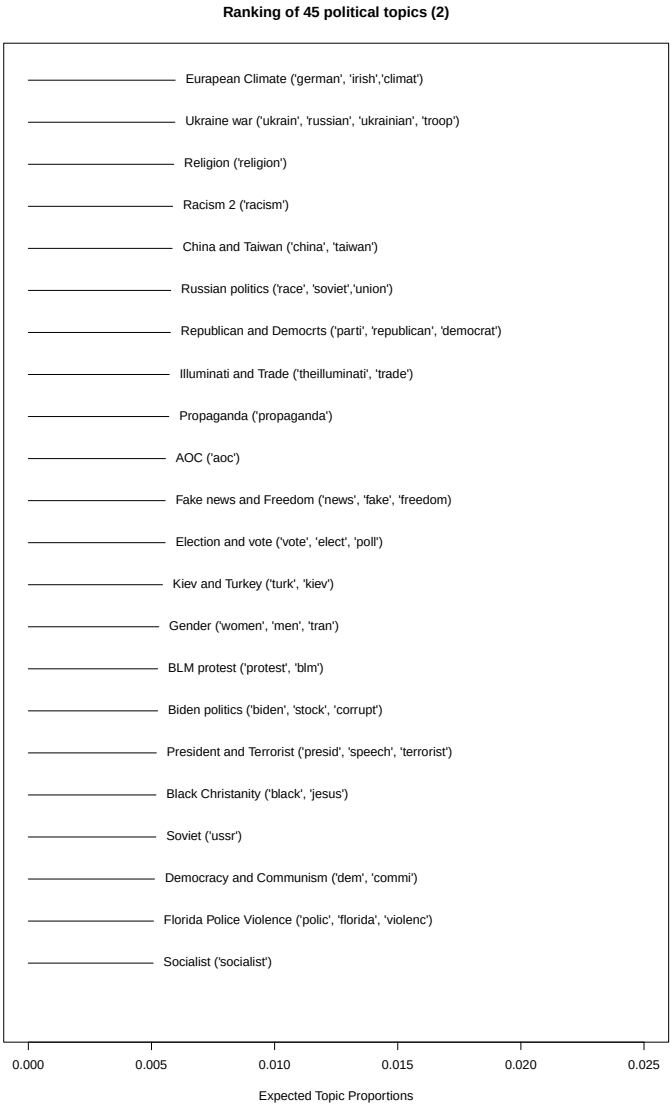


**Figure A3.** Identified Political Topics (2)