# From School Strike to Networked Movement: Diffusion Dynamics in the German-speaking #FridaysForFuture Network on Twitter

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## Introduction

FridaysForFuture has proven to be one of the most influential social movements of recent times. Initiated by Greta Thunberg and carried by students who skip school every Friday to call for climate justice and the safeguarding of their future, it emerged and flourished along with both recognition and criticism. On social media, #FridaysForFuture serves as a facilitator of offline movements and a public arena of political discourses, revealing the independent and interdependent trajectories of a plurality of online communities throughout cycles of protests. Based on diffusion network and cascade analysis, this study explores diffusion dynamics and connectivity formation in German-speaking #FridaysForFuture from its emergence to its expansion.

## Theoretical Background and Literature Review

Flexible communication networks and personalized engagement facilitated by ICTs have empowered individuals and marginalized groups to form collectivities in the absence of bureaucratic organizations. Gathered, moved, and organized by flows of ideas, projects, and visions from multiple affiliations, individuals are intersections of different communities across the changing field of social movements, while the trajectories of communities are delimited by the intersections of individuals (Diani & Mische, 2015). In social movement research, information diffusion, associated with mobilization and participation, is a long-standing concept of mechanisms explaining the prevalence of social movements and the spread of symbols and tactics. Successful movements require social affirmation from multiple sources and strong connectivities within the networks (Centola & Macy, 2007). Unlike diffusion in the small-world model's global friendship network in which weak ties spread certain types of behavior easily across communities, social movements first need to gain momentum within neighborhoods and small communities through the internal model and then realize political mobilization through the external model (Easley & Kleinberg, 2010).

Modeling-based research estimates when and how people would join collective action by setting a threshold of participation but cannot generalize complex contagion through network simulation. In social movement research, most empirical diffusion studies on digital social movements are primarily issues-centric, based on analysis of the key actors and the most proliferated messages in retweet networks, which may overvalue the connections between retweeted and retweeting actors without taking information traversal, intermediary actors, and retweets into account. To reveal the diffusion processes and emergence of communities in the German-speaking #FridaysForFuture network on Twitter, I discern the difference of network structures, underline group dynamics, and include diffused contents into the analysis, in order to answer the research question: How did different diffusion dynamics facilitate the emergence of #FridaysForFuture on Twitter?

**Methodology**

I collected tweets by querying for German-language tweets containing the hashtag #FridaysForFuture via Twitter API, from September 14, 2018, to March 18, 2019, covering tweeting activities from the emergence of the movement to the first global strike. By applying a community detection algorithm on the follow network and the infrastructure of diffusion and interaction, actors are classified into seven groups: (1) FFF, (2) news, (3) right-wing, (4) liberal left, (5) radical left, (6) Austrian, and (7) Swiss cluster. Assisted by a language model-based cluster analysis, (re)tweets are classified into seven topics: (1) movement and activism, (2) environmental issues, (3) government and politics, (4) parties and politicians, (5) leading activists, (6) youth, and (7) education and schooling. Finally, a diffusion network based on follow-following relations of actors infers[1] the information flows which move from actors to actors (Vosoughi, Roy, & Aral, 2018). Through the diffusion network, cascades of retweeted tweets and network metrics in different time windows show diffusion dynamics among communities.

**Findings**

Generally, the diffusion network interrogates how one's (re)post could trigger the retweeting activities of others. It is generated through 238,458 retweets (18,937 unique tweets) by 52,224 actors, in which the FFF activists and organizations are the main intermediaries and activators. Most of the tweets in #FridaysForFuture are about activism, introducing the movement, and calling for action for the upcoming strikes in target cities. At the same time, politics, environmental and educational issues, leading activists, and young participants are discussed in the online discourse as well.

A sliding window approach is applied to capture one-week changes in a one-day interval (Figure 2). FFF actors, enabled and endorsed by the movement, have the most significant size, outdegree, indegree, and betweenness values, corresponding to their role as central contributor, diffuser, adopter, and broker over time. While news and left-wing groups distributed and created posts at the beginning of the movement, right-wing

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[1] See Figure 1

groups joined the #FridaysForFuture network after its expansion and bridged their own messages intensively.

The cascade analysis, considering each retweeted tweet as a cascade and each post owner as the source, indicates how well each message diffuses, distinguished by communities (Figure 3) and topics (Figure 4). FFF clusters were generally most likely to gain significant attention and spread broader and faster than other groups. In contrast, the cascades activated by right-wing actors were also greater, but not broader, faster, or deeper. While the cascades by radical left and Austrian clusters diffuse deeper and faster, actors from news groups and liberal left triggered cascades to spread broader. Regarding the topics of the tweets, posts about the leading activists and schooling were generally diffused faster and broader, while posts on movement were spread deeper and faster. Though the most significant part of #FridaysForFuture protested for climate justice and better environmental politics, tweets on environmental issues neither triggered great retweeters nor diffused broader.

Among the communities (Figure 5), the FFF hubs retweeted and were retweeted across groups about the movement, political youth, party/politics criticism, and activism for coal phase-out and forest protection. In contrast to the reciprocal reposting activities between left-wing, news, and activist groups on #FridaysForFuture, right-wing actors and groups from other German-speaking countries are relatively isolated. The topic distribution of the right-wing actors features a unique pattern focusing on truancy, hypocritical activists, and instrumentalized children.

**Conclusion**

The German-speaking #FridaysForFuture network on Twitter not only serves as an organizing agent for protest participation and movement mobilization but also features an issue network for political discourse. The mobilization endeavors of FFF clusters, promotion of news community, engagement of left-wing and news community, as well as the counter-public hosted by right-wing actors to attack the movement enabled its emergence and prevalence.

**References**

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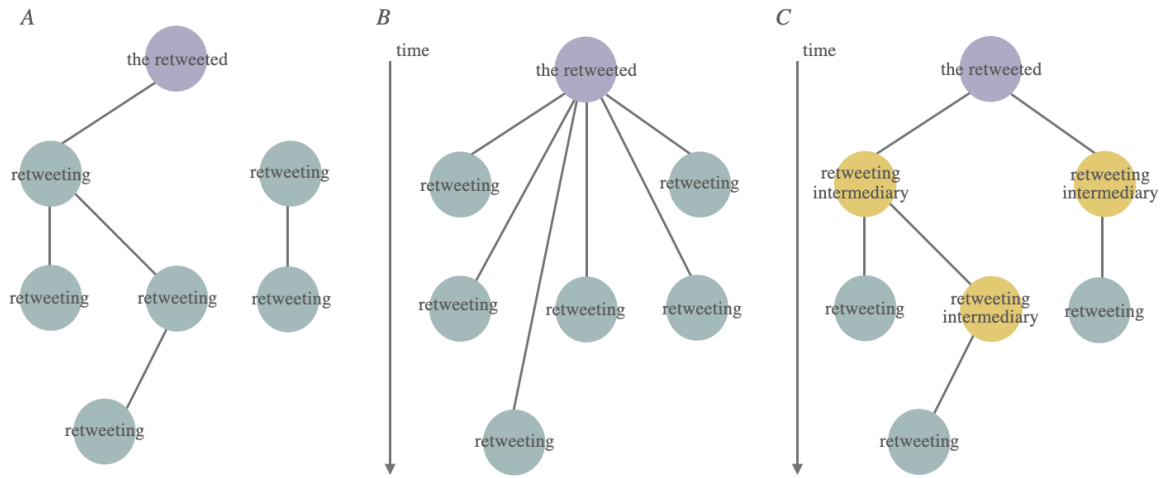
**Figure 1**: Example networks on one #FridaysForFuture post (cascade). (A) follow network. (B) retweet network. (C) diffusion network.

(A) shows the embedding follow network between actors who retweeted a post and the actor who originally posted that tweet. (B) shows a regular retweet network where the actor who originally posted the tweet is surrounded by those who retweeted the post. (C) There are two scenarios when two actors close a connection: (1) Retweeter Y follows original tweeter X, and Y reposted the tweet earlier than Y's followings (2) Retweeter Y follows intermediary X, X reposted the tweet earlier than Y, and X is the last person who reposted the retweet by Y among Y's followings. (3) Retweeter Y does not follow the original tweeter X or other retweeters.
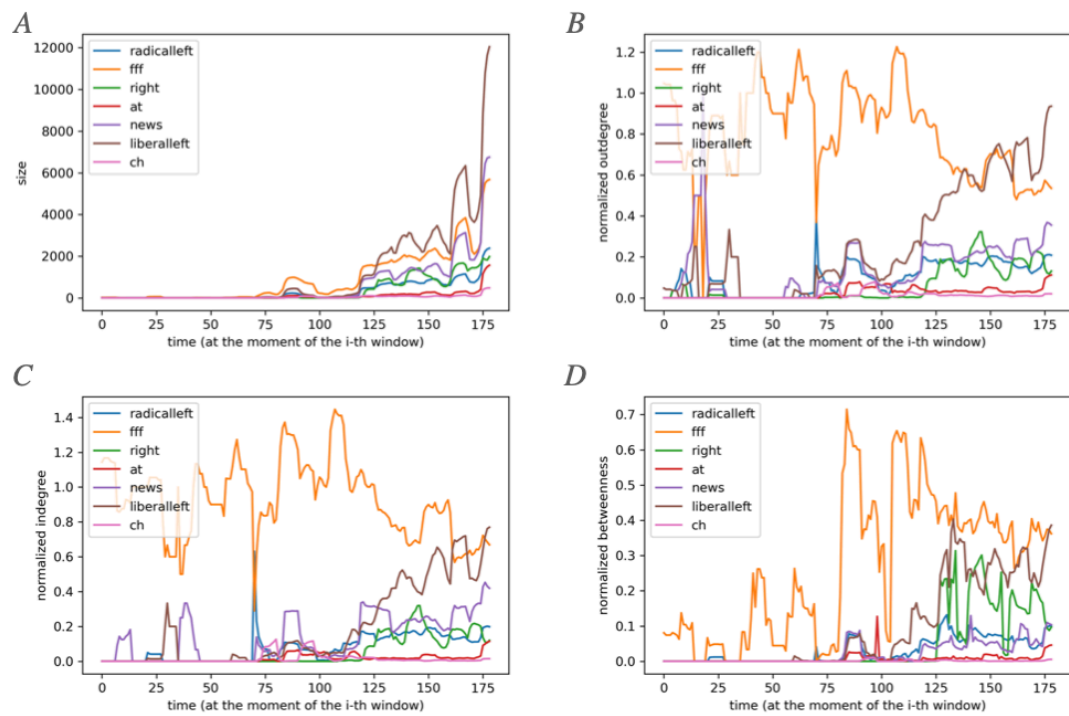


**Figure 2**: Network metrics of #FridaysForFuture diffusion networks created in every seven day interval, categorized by groups of involved actors. (A) number of unique actors. (B) normalized indegree. (C) normalized outdegree. (D) normalized betweenness.

They show the accumulative value x (size, indegree, outdegree, betweenness) of actors in each group in the y-th interval (from day y to day y+7).
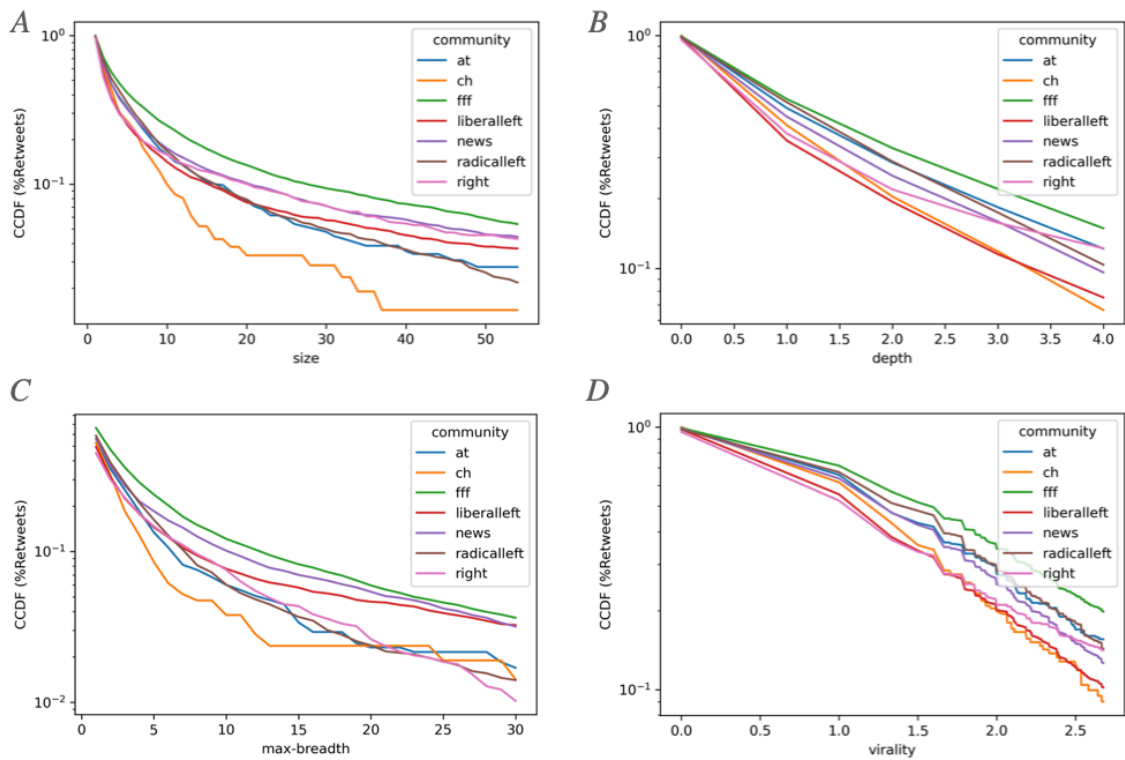
**Figure 3**: Complementary cumulative distribution functions (CCDFs) of #FridaysForFuture cascades, categorized by communities. (A) size. (B) depth. (C) maximum breadth. (D) structural virality.

CCDFs show the probability x of one post from one group to have value y (size, depth, max-breadth, structural virality). In Figure 3B, the probability for one post from right wing groups to diffuse deeper (depth greater than 3) was higher than from most other groups.
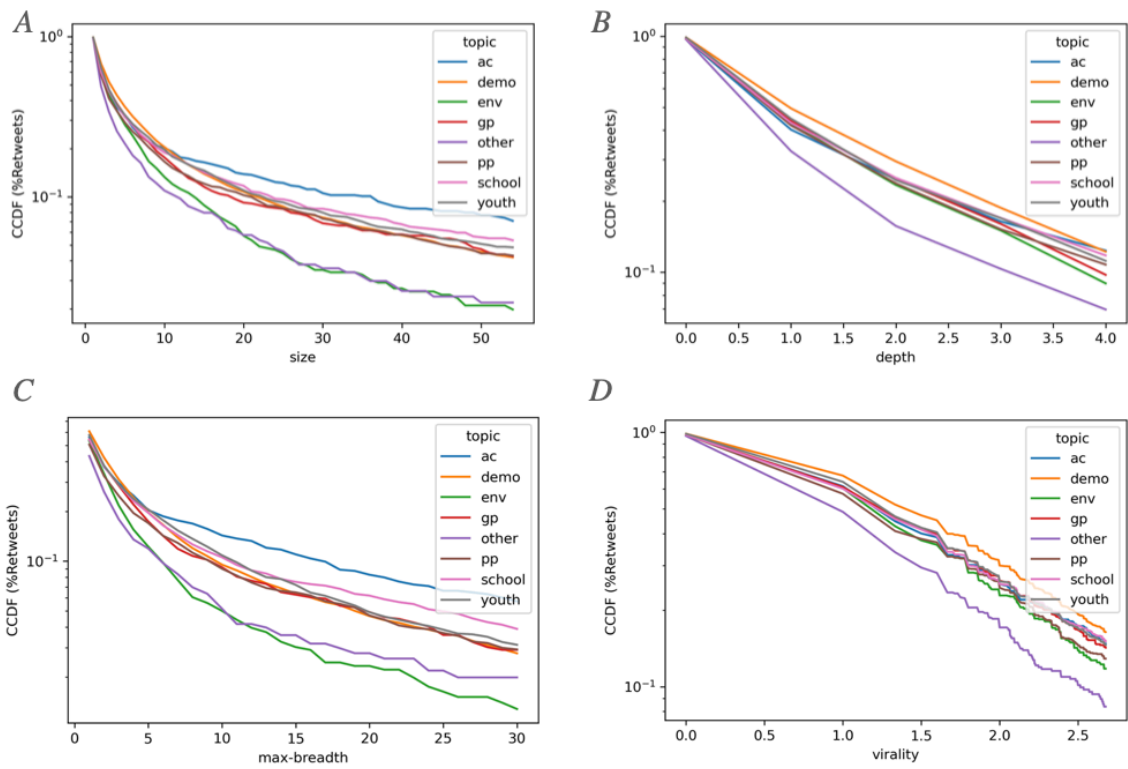
**Figure 4**: Complementary cumulative distribution functions (CCDFs) of #FridaysForFuture cascades, categorized by topics. (A) size. (B) depth. (C) maximum breadth. (D) structural virality.

CCDFs show the probability x of one post related to one topic to have value y (size, depth, max-breadth, structural virality). In Figure 4C, the probability for one post related to "other" topics to diffuse faster (virality greater than 7) was lower than other "topics".
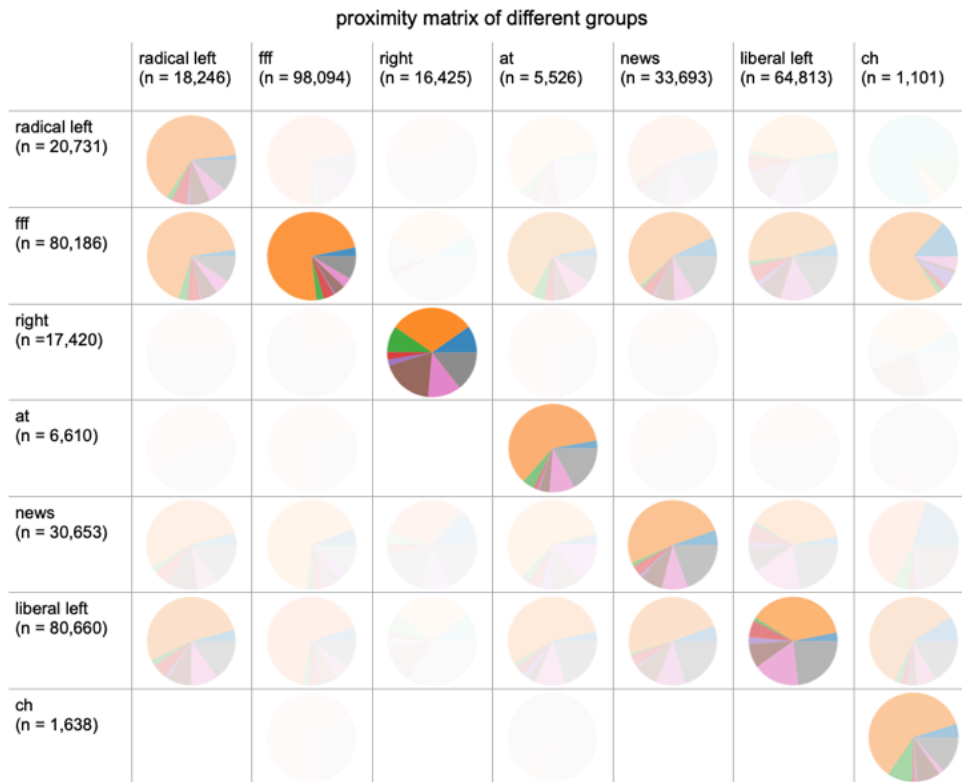
**Figure 5**: the proximity matrix of communities of interests
- n in rows: number of retweets / n in columns: retweeted posts
- who retweeted whose posts with which focus
- opacity of pie charts is based on the intensity of intergroup activities in relation to the total activities