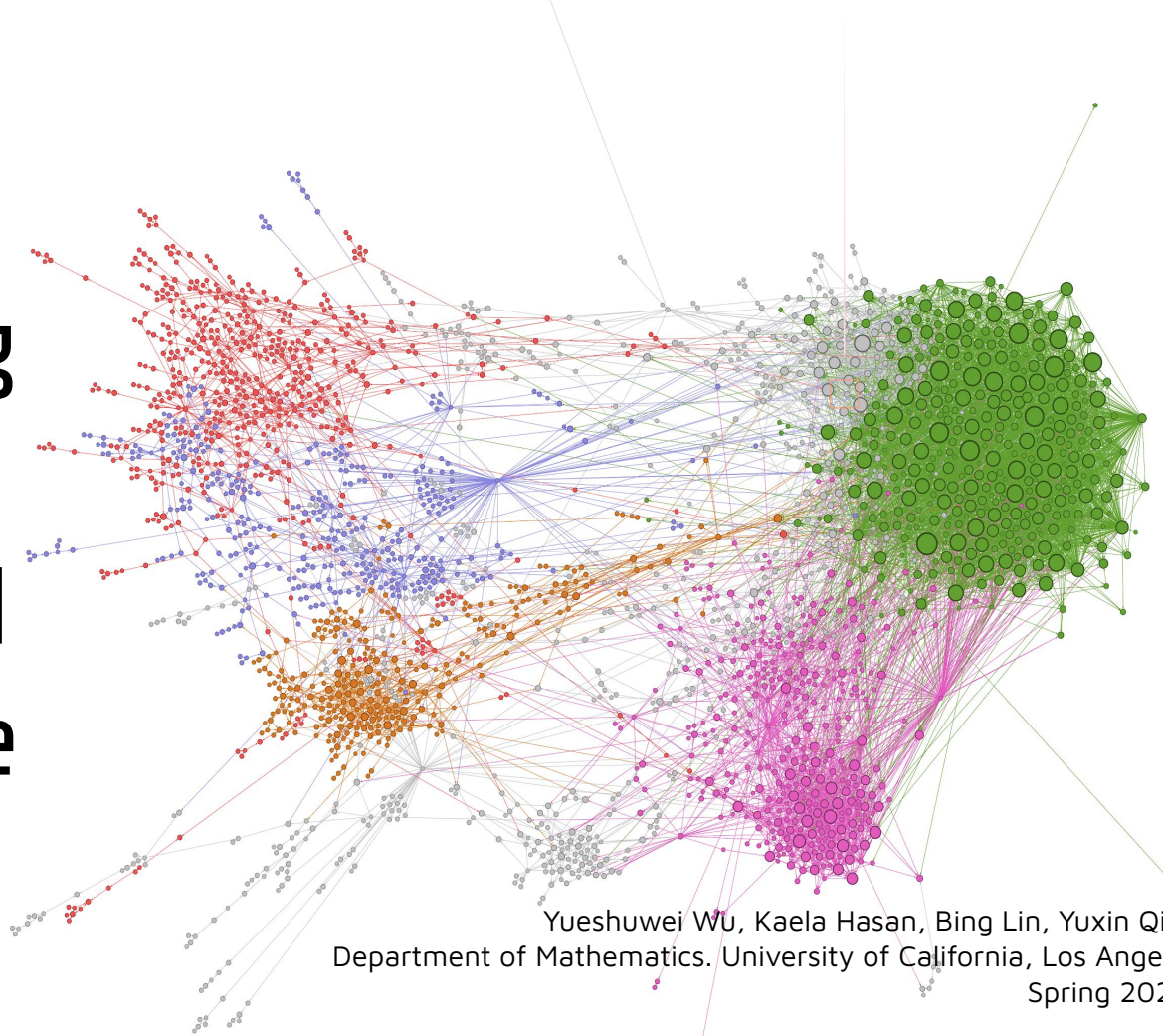
Public Opinion Warfare: Understanding Communities on Twitter and their Influence on the Web



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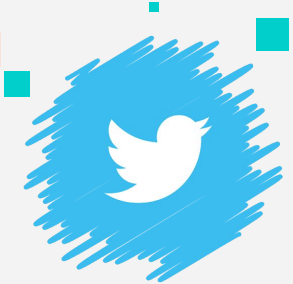
What we did



1. Study a retweet network on Twitter

2. This retweet network contains:
   5K hateful and normal users & 100K other users.

3. Compared different users' features and behaviors of different subsets

4. Investigated the community structure of the network,
   used the Louvain method for community detection.

5. Quantified the influence of certain communities.

Statistical - General Analysis - Likes

	Average likes received per follower
 Hateful	16.8
 Normal	10.5
 Other	6.8

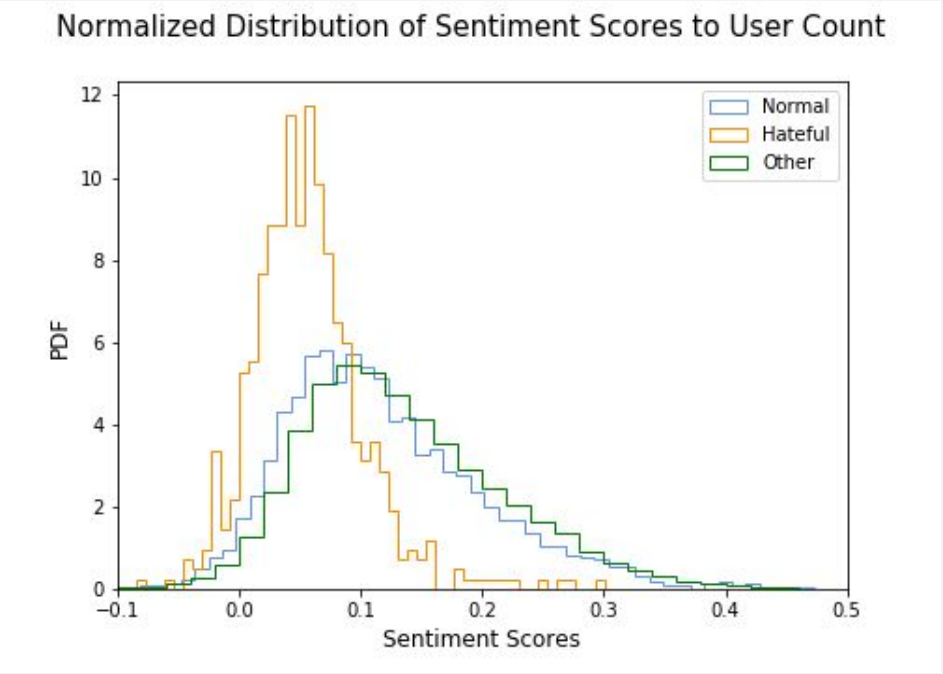
Motivations

- Estimate the influence of a user.

Observations

- Hateful users
  - Higher follower 'loyalty'
  - received more likes per follower on average.

Statistical - General Analysis - Sentiment score



Results

- The mean sentiment score of the hateful users is 0.056.
- The mean sentiment scores are 0.118 and 0.135 for the normal users and other users.

Observations

- Hateful users
  - more negative or neutral.

- Normal & others
  - more positive or friendly.

Tweets & Retweets – Hashtag analysis

Hateful		Normal		Others	
Hashtag	(%)	Normal	(%)	Others	(%)
MAGA	1.93%	**MAGA**	0.35%	ad	0.37%
Syria	1.03%	Syria	0.34%	**MAGA**	0.28%
WhiteLivesMatter	0.87%	ISIS	0.27%	Halloween	0.19%
JFKFiles	0.79%	**Brexit**	0.24%	WorldSeries	0.17%
agchatoz	0.75%	ad	0.23%	1	0.16%
AltRight	0.70%	Pakistan	0.22%	**Brexit**	0.16%
Iraq	0.70%	Somalia	0.21%	Pakistan	0.16%
RedPill	0.64%	WorldSeries	0.21%	**Trump**	0.13%
ma4t	0.64%	BREAKING	0.19%	PuertoRico	0.13%
Brexit	0.59%	Iran	0.18%	auspol	0.13%
Trump	0.54%	Iraq	0.18%	BREAKING	0.12%
Goldwater	0.52%	Rohingya	0.18%	MeToo	0.12%
UraniumOne	0.49%	Halloween	0.18%	AI	0.11%
SpencerAtUF	0.48%	**Trump**	0.17%	cdnpoli	0.11%
WhiteGenocide	0.46%	1	0.16%	PPP	0.11%

Common hashtags of hateful and normal users

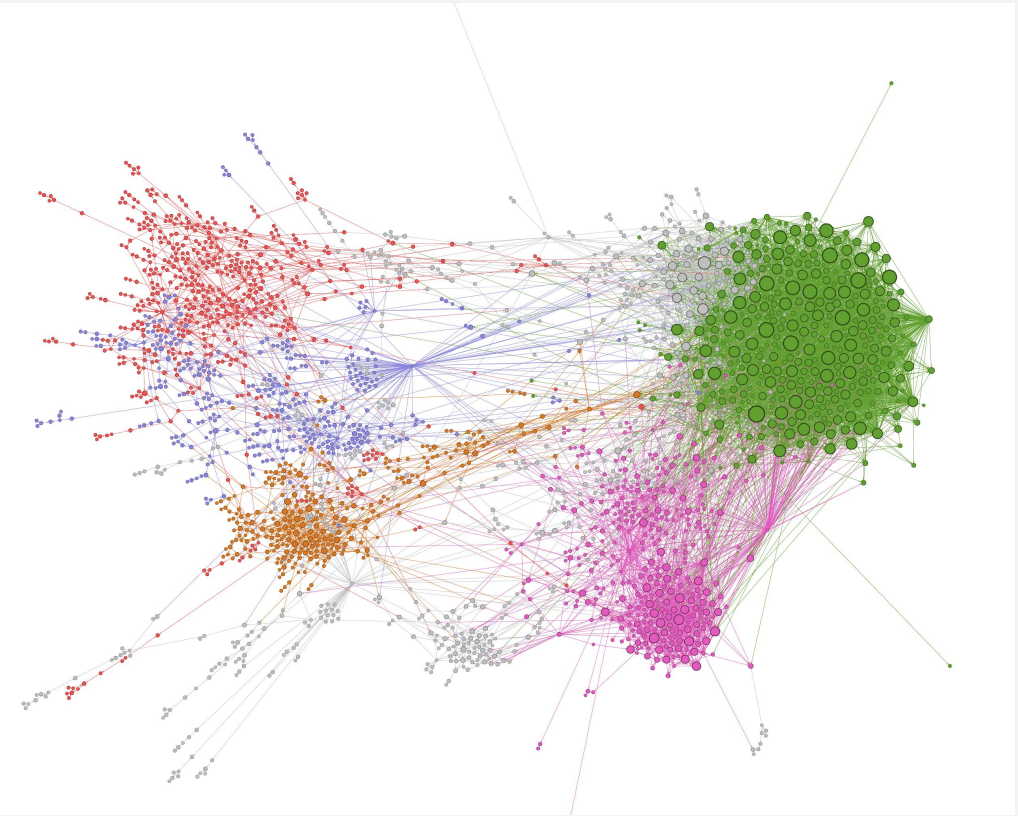
Common hashtags of normal and other users

Common hashtags of all users

Observations

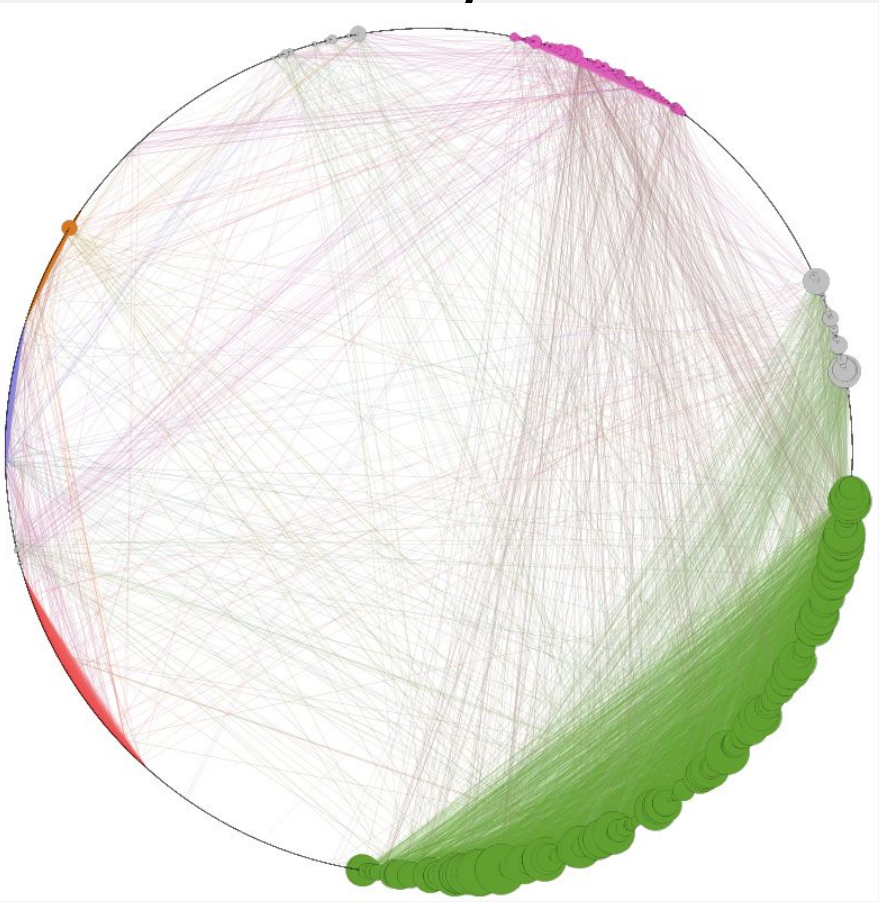
- All three groups shared some conservative political topics ("MAGA"/"Brexit").
- The hateful group:
  less social life-related tags
  ("Halloween"/"WorldSeries").
- Further assume hateful users are conservatives.

Network Analysis - The HN-Network



- Hateful users, normal users, and their retweeters.
- 4,646 nodes and 9,575 edges
- Low density close to 0.
- Applied the Louvain method for community detection.
  Got a modularity value of 0.644.
  The detection is reliable.
- Some large communities were detected.

Network Analysis - The HN-Network



HN-Community - PageRank

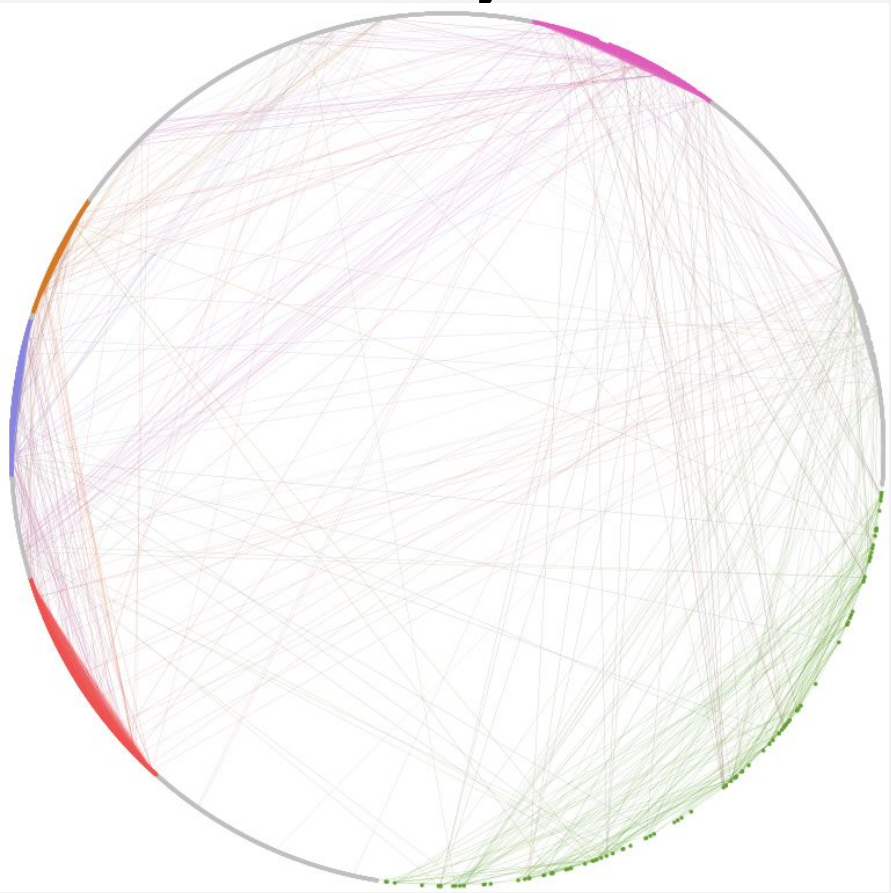
Motivation

- Visualize
  - connectivity of each community
  - inter-connectivity between communities.

Observations

- The most important users are in the green community
- Majority of the green community are hateful users(71%).
- High degree of interaction in the green community (subgraph density 0.037).

Network Analysis - Removing Hateful Users



Hateful users removed

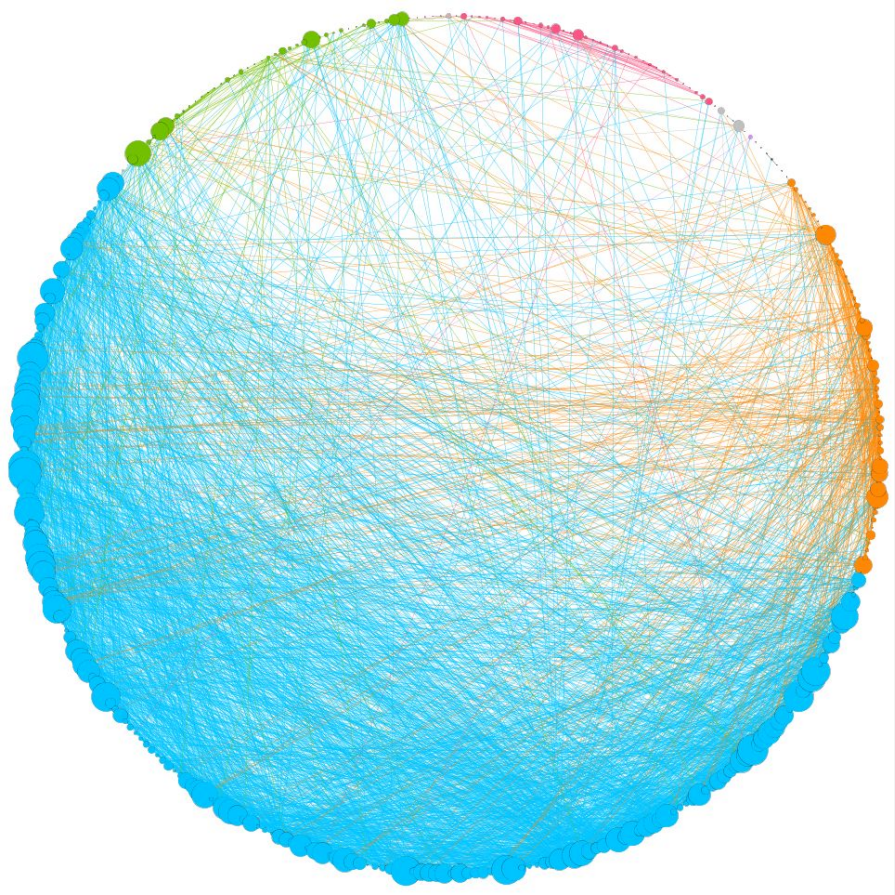
Motivation

- To confirm previous observations.

Observations

- A much sparser network.
- Hateful users contribute significant interaction within the retweet network.
- Hateful Users community accounts for around 9% of the total nodes, but generates more than 30% of the interactions in the network.

Network Analysis - H-Network



Hateful user Authority Rank

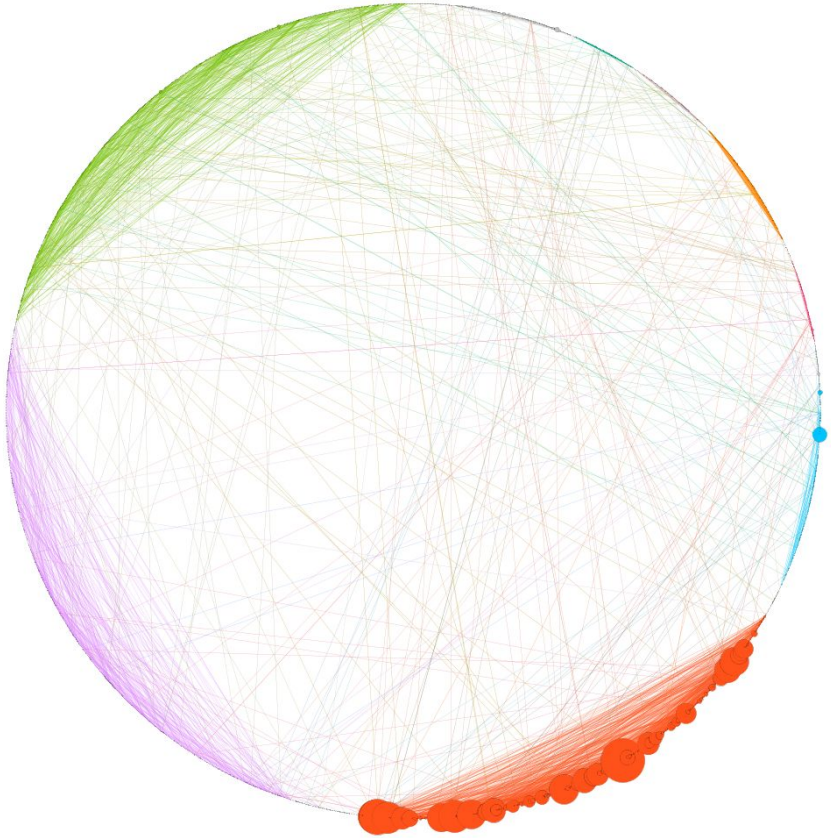
Motivation

- Study the network of hateful users.

Observations

- 347 hateful nodes, 2,900 edges with a network density close to 0.024. The network is fairly dense.
- Less dense than the green community (0.037). Hateful users are connected by some normal and other users.
- The blue community is a subgraph of the green community. (~75% of users overlap)

Network Analysis - N-Network



Normal user community & Authority Rank

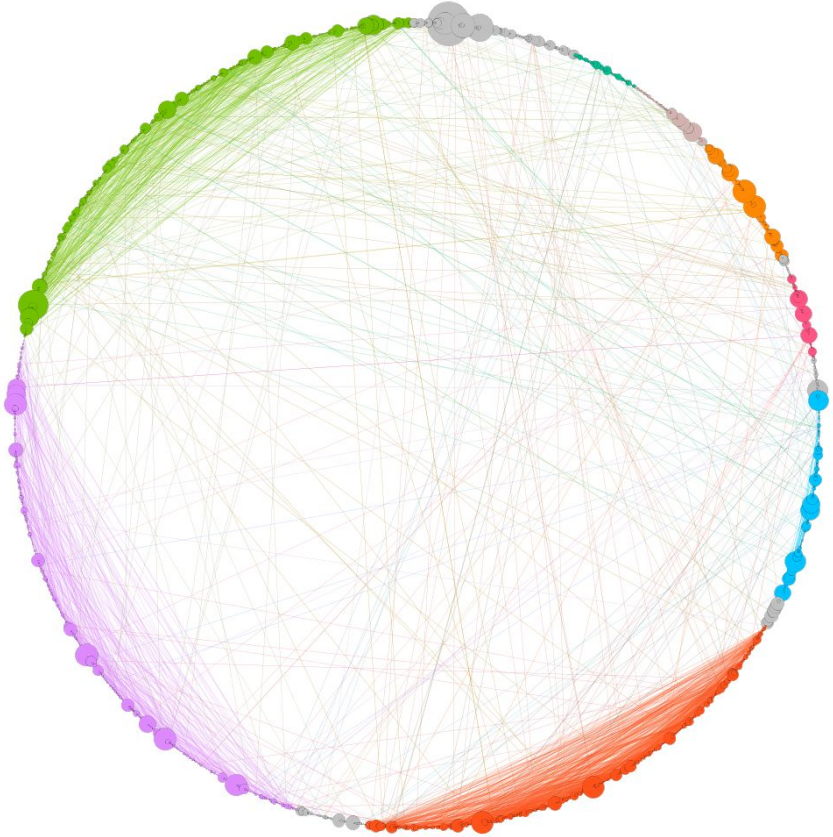
Motivation

- Study the network of normal users.

Observations

- 1946 normal nodes, 2327 edges
  Network density close to 0.001.
- The network is not nearly as dense compared to the hateful users.
- The red community nodes have high Authority and Hub centrality scores

Network Analysis - N-Network



Normal user community & PageRank

Motivation

- Study the network of normal users.

Observations

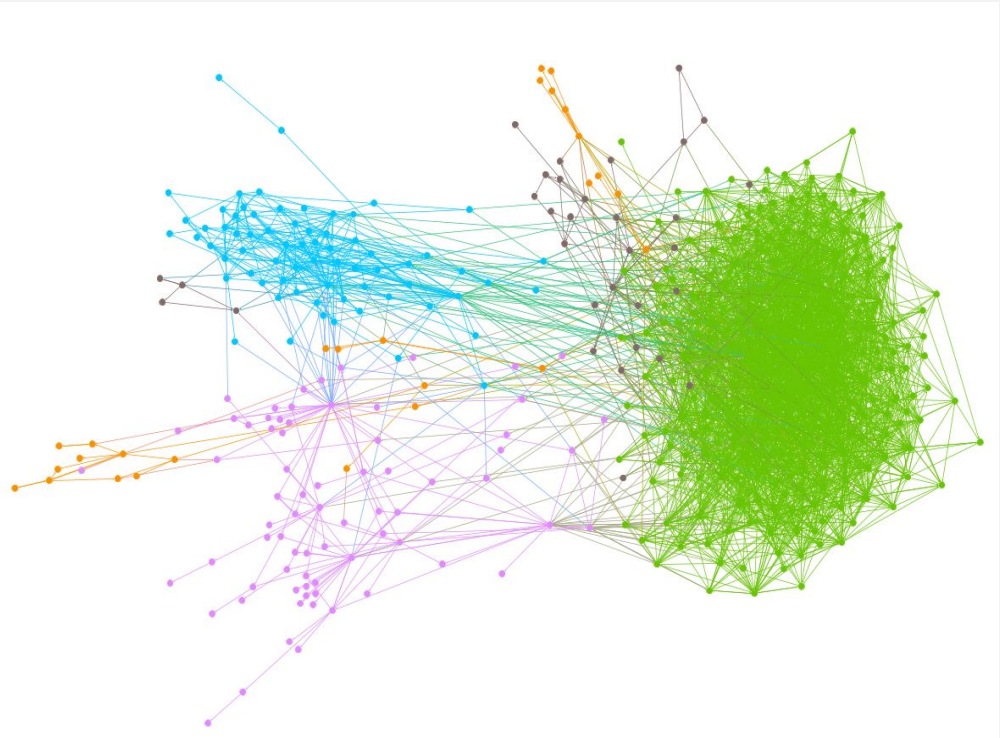
- 1946 normal nodes, 2327 edges
  Network density close to 0.001.
- The network is not nearly as dense compared to the hateful users.
- The red community nodes have high Authority and Hub centrality scores
- High PageRank centrality nodes were more uniformly distributed across communities

What are these normal users posting on Twitter?

Hashtag	(%)	Hashtag	(%)
MAGA	3.68%	BoycottNFL	0.45%
UraniumOne	1.05%	FreeSpeech	0.45%
Brexit	1.00%	Iran	0.45%
Trump	0.78%	FakeNews	0.44%
JFKFiles	0.72%	LockHerUp	0.43%
cdnpoli	0.69%	bbcqt	0.41%
ThursdayThoughts	0.65%	DemocratLiesMatte	0.38%
DrainTheSwamp	0.65%	yyc	0.36%
Israel	0.55%	MoggMentum	0.36%
AnOpenSecret	0.51%	VoteGOP	0.36%

- **conservative users are playing important roles in this retweet network, regardless of whether the users are hateful or normal.**

Network Analysis - Conservative Network



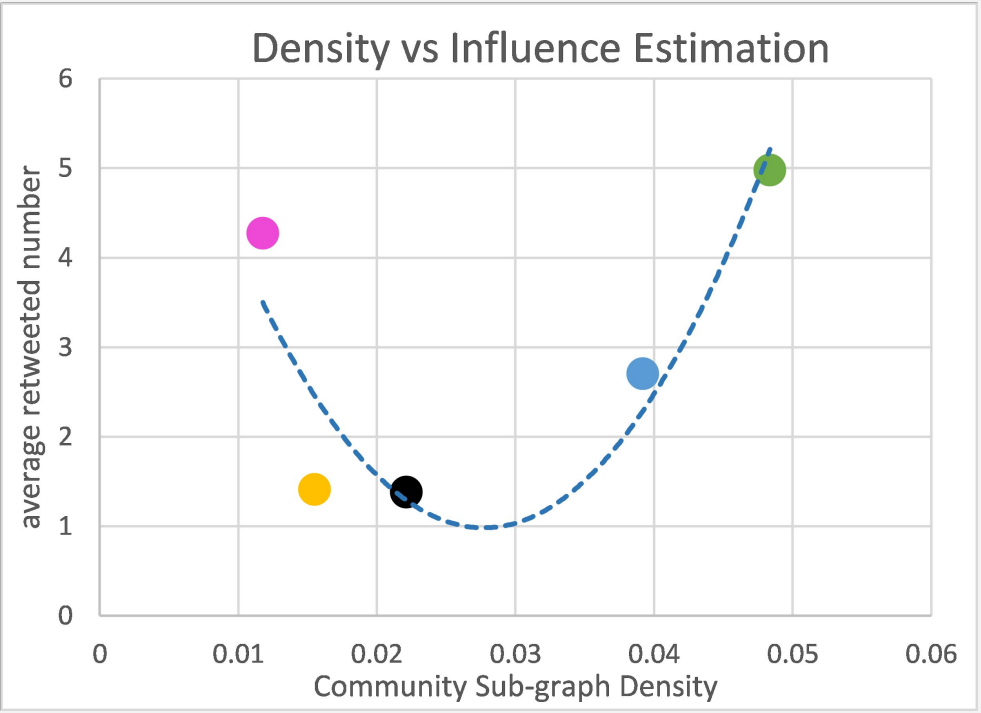
Motivation

- Study the structure of of conservative users network.

Observation

- 556 nodes and 3,907 edges Network density of approximately 0.013.
- Conservative users are surprisingly well-connected.

Network Analysis - Influence Estimation



Motivation

- Examine influences, in terms of the dissemination of opinions.
- average retweeted number:
  average out-degrees of the non-conservative retweeters of that conservative community

Observation

- Seemingly **quadratic** relationship between the community's density and the estimated average retweeted number.
- Possible methods for maximizing the spread of conservative opinions
  - Through a tightly connected group
  - Through a fairly loosely connected one

  Not something in between

Conclusions & Takeaways

- Hateful users are
    - Closely connected conservative users
    - More efficient at spreading opinions.
    - Higher follower “loyalty” as compared to normal users.

- Conservative users play important roles in this retweet network.

- In terms of conservative users, high impact on retweeters resulted from extreme cases of connection, but not intermediary cases.