

Case Study: Information diffusion networks

- ❖ **Mememes:** transmissible units of information, such as ideas, behaviors, news links, hashtags, and, yes, also images with captions (**image macros**)
- ❖ The definition of meme is due to Richard Dawkins, in analogy to genes transmitted from parent to offspring
- ❖ Like genes, memes can mutate and have fitness
- ❖ A tweet can carry several memes



Networks from Twitter

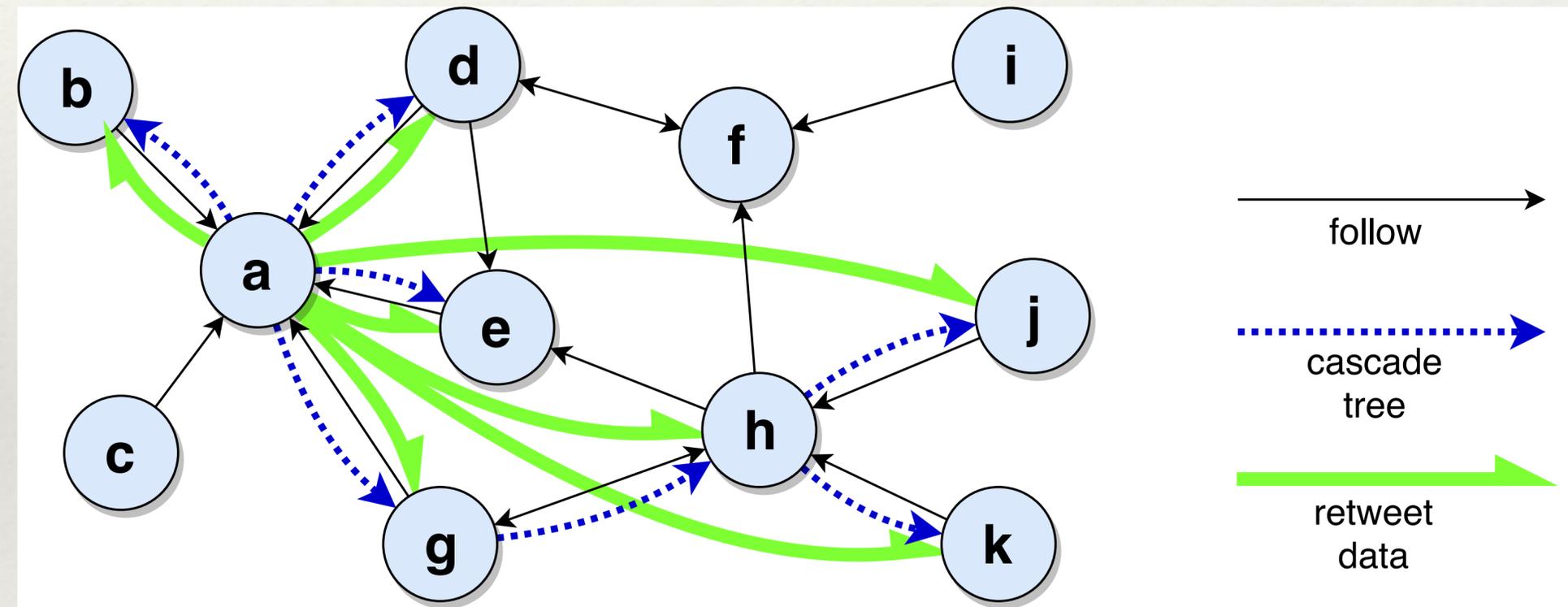
- ❖ We can track, map, and analyze the spread of memes on **Twitter**
 - ❖ **Retweet network:** link from retweeted user to retweeter user
 - ❖ **Mention/reply network:** link to user who replies or who is mentioned
- ❖ Tweets are time-stamped; we can aggregate the temporal networks
- ❖ Can focus on a particular meme (eg, a hashtag) or multiple ones (eg, a set of accounts or links to a news source)



Play with the interactive diffusion network tools at osome.iuni.iu.edu

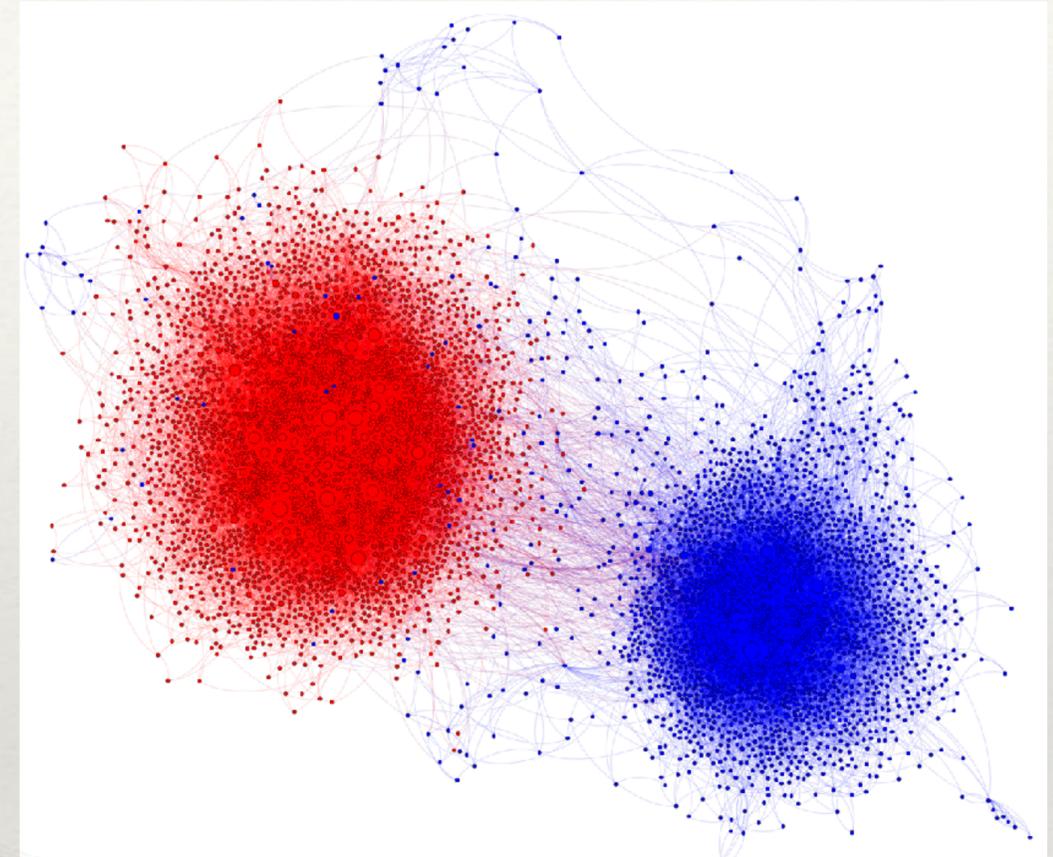
Retweet networks

- ❖ In the data, each retweet cascade network is a star (all retweets point to original tweet)
- ❖ The actual cascade tree is difficult to reconstruct, but we can make some guesses based on the follower network and timestamps



Echo chambers

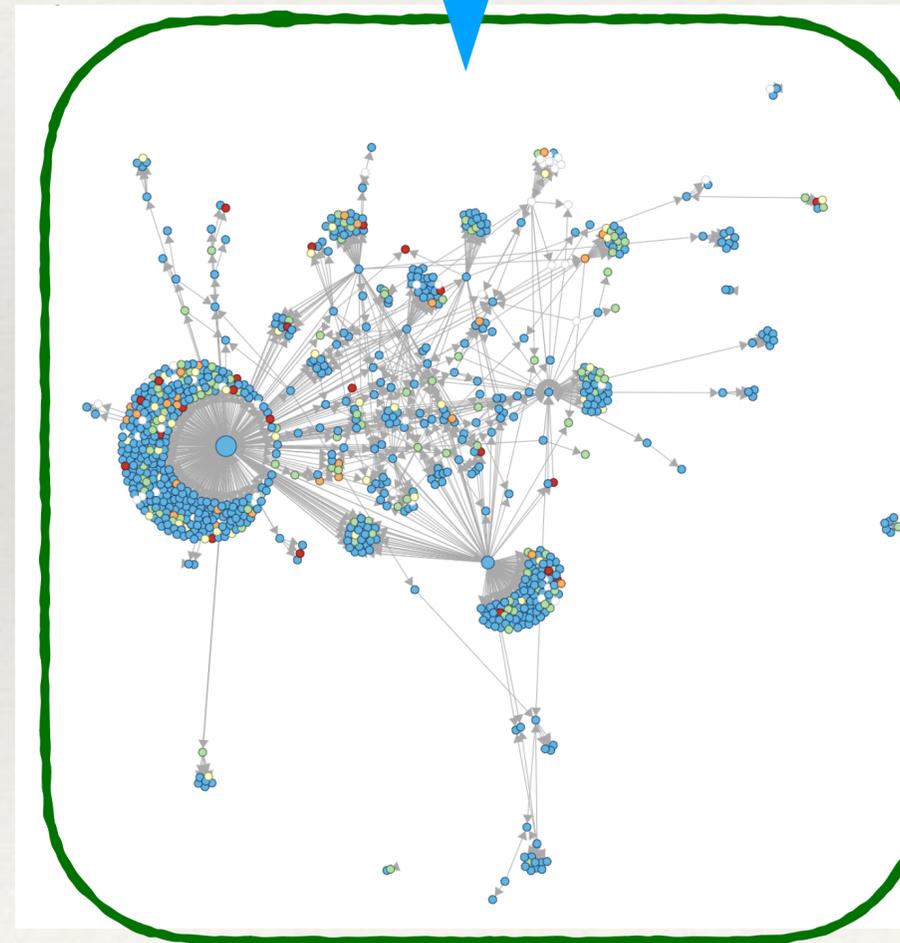
- ❖ Examples:
 - ❖ Retweets of tweets with progressive (blue) and conservative (red) political hashtags during 2010 US election ($k=3$ core)
 - ❖ Retweets of tweets with links to low-credibility (purple) and fact-checking (orange) sources during 2016 US election ($k=5$ core)



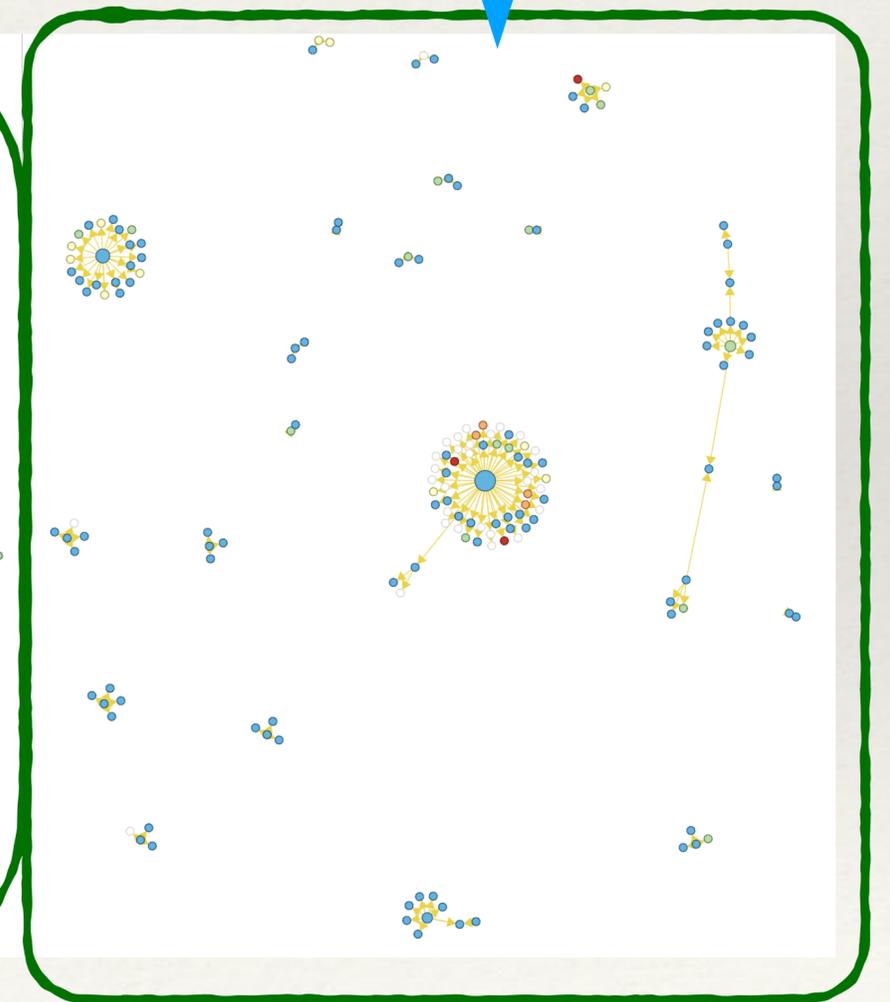
Virality

- ❖ Multiple ways to measure the virality of a meme:
 - ❖ Number of users exposed
 - ❖ Depth of diffusion tree
 - ❖ Fraction of users who retweet to users who are exposed
- ❖ Misinformation is often more viral than actual news reports

misinformation about
White Helmets



facts about White
Helmets

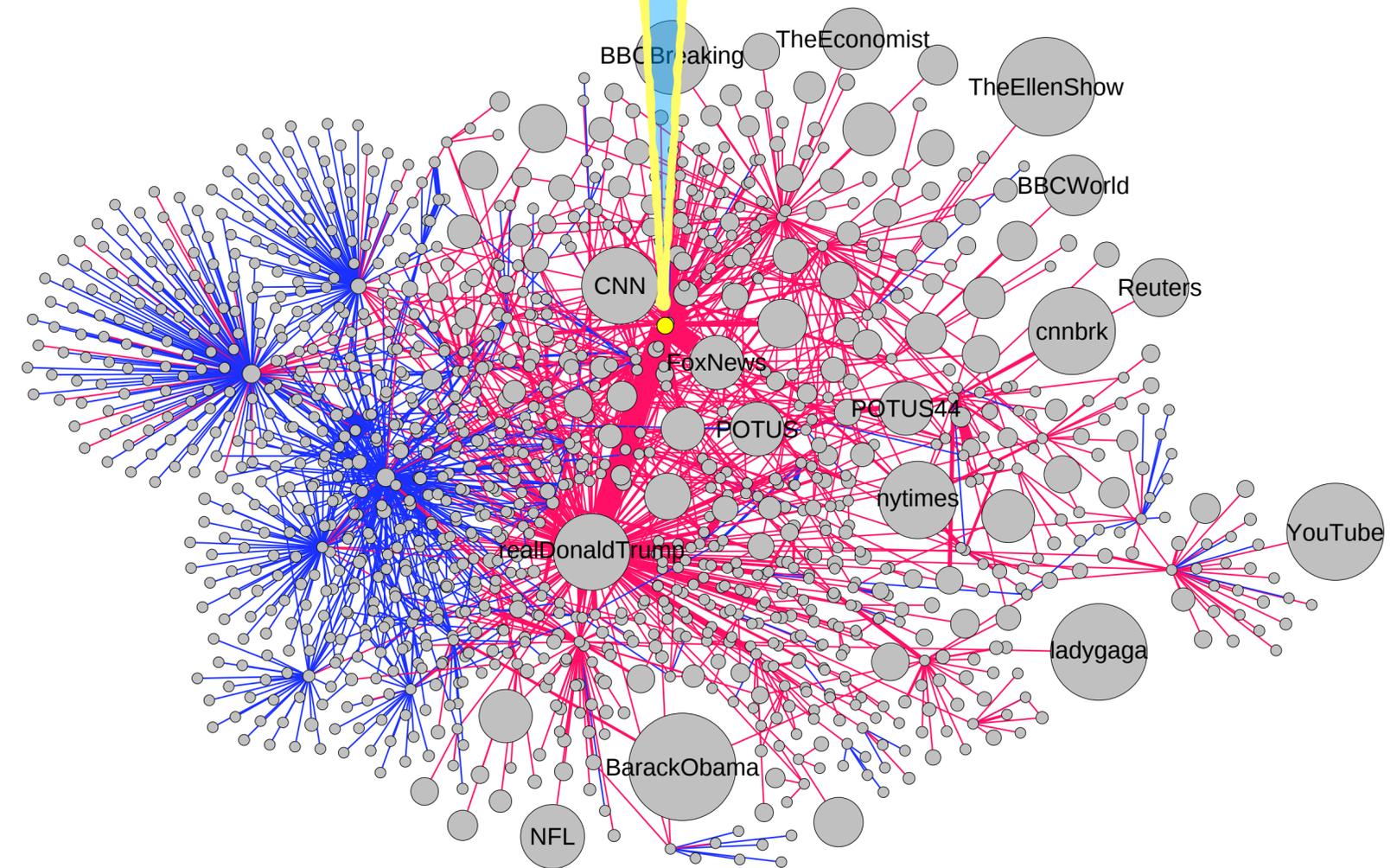


Source: hoaxy.iuni.iu.edu

Influence

- ❖ Multiple ways to measure the influence of an account:
 - ❖ Number of followers (in-degree in follower network)
 - ❖ Number of users exposed (out-degree in retweet network)
 - ❖ Number of retweets (out-strength in retweet network)
 - ❖ Fraction of retweets to followers
- ❖ Social bots can target influential accounts hoping for retweet

Bot (yellow node) replies to tweets mentioning an influential user (@realDonaldTrump) and links to fake news article



Blue links: retweets and quotes. Red links: mentions and replies. Node size: number of followers.

Social bots

- ❖ Accounts controlled by an entity via software
- ❖ Malicious social bots can impersonate humans, deceive, and manipulate diffusion networks:
 - ❖ Fake followers
 - ❖ **Amplification:** fake retweets
 - ❖ **Astroturf:** appearance of organic virality
- ❖ All social media platforms and users are vulnerable

