Covid Conspiracies

A Computational Approach to Rumor and Conspiracy in a Time of Pandemic

Timothy R. Tangherlini & Vwani Roychowdhury

University of California, Berkeley and UCLA

The Covid-19 pandemic has led to an explosion of storytelling—much of it framed as believable first-person accounts—across many media. A large number of these stories reflect aspects of both rumor (which can be seen as a hyperactive transmission state of legend) and of conspiracy theory (Rosnow and Fine 1976; Tangherlini 1990; Fine et al. 2005). If we conceptualize folklore at least in part as the informal circulation of cultural expressive forms on and across social networks, thereby incorporating both the performance aspects of folklore and its dependence on social interactions embedded both in time and space, it should be of little surprise that the current situation has engendered a great deal of storytelling (Tangherlini 2018).

It is certainly well established that rumors love an information void (Shibutani 1966; Starbird et al. 2014). Given the current situation where high confidence information is hard to come by, and trusted information sources have been called into question by ideologically motivated groups, the conditions are perfect for the types of information cascades that rumors represent. Similarly, the information vacuum allows for the inventive alignment of stories, often from different domains of human interaction, into larger coherent narrative frameworks that rely on monological thinking and people's receptiveness to explanatory narratives (Goertzel 1994). We conceptualize these broad, interrelated storytelling cycles that often propose to uncover a nefarious background for an observable phenomenon such as the sudden appearance of the Covid-19 virus and its subsequent rampage across the globe as conspiracy theories (Shahsavari et al. 2020).

A great deal of interaction during this time of social distancing takes place online on social media platforms such as Facebook and Twitter, and on social media forums such as Reddit and 4chan. Unlike face-to-face interaction, social media has several features that make it particularly suitable to the propagation of rumor and the creation of conspiracy theories. First, the rapidity with which signals can propagate across these platforms is striking. Second, messages can be passed in part or in their entirety with simple clicks, while the original message can be edited quite easily. Third, there is a degree of anonymity on many of these platforms, confounding to an even greater degree the amount of trust a person may have in the source of the information. Fourth, given the assortativity of links on many social media sites (predicated on the notion of homophily in social networks), there is a tendency for these conversations to become self-reinforcing, creating what some have labeled "echo chambers" (Del Vicario et al. 2016). Fifth, there is an amplification of the signal that is uncommon in normal face-to-face interaction. This latter aspect of amplification becomes all the more critical in the context of automated agents, such as "bots", that can tirelessly send messages out into the social network again and again (Ferrara 2020).

Computational Modeling of Rumor and Conspiracy Theory

In our group's work in computational folkloristics, we aim to understand the dynamics of rumor propagation and conspiracy theory formation related to the Covid-19 pandemic in real-time. We hope to devise methods that will allow us to track how various stories gain traction in different forums, circulate, are modified and, in some cases, are dropped. We are also interested in understanding the interaction between the stories circulating in social media and news reporting about those stories. The traditional news media play an interesting role in this information eco-system, since the stories circulating in various social media forums become fodder for the reporting in two essential ways. First, the stories circulating on social media influence real world behaviors, thus leading to newsworthy events. These range from people ingesting untested remedies to people "resisting" public health measures. Second, the stories have entered the policy arena, with the president of the United States repeating rumors and conspiracy theories in press briefings, and directing government officials to explore legislative measures to address aspects of these stories. Both of these types of news stories may then feed back into the social media forums.

Our work is based on several key observations on storytelling in general, and online conversational behaviors in particular. Because computational measures require some

formalization of a problem so that they can be applied consistently, we have developed a model of storytelling inspired by Algirdas Greimas's actantial model (Greimas 1966), and the model of personal experience narrative proposed by William Labov and Joshua Waletzky (1967). To limit the scope of a story corpus, we rely on the intuition of George Boole who, in his classic definition of a discourse domain, noted that "In every discourse, whether of the mind conversing with its own thoughts, or of the individual in his intercourse with others, there is an assumed or expressed limit within which the subjects of its operation are confined" (Boole 1854). This latter aspect of our work allows us to hypothesize that, for any given domain, there should be an underlying generative storytelling framework that allows people to, once they have internalized that framework through the process(es) of enculturation, produce stories or story segments that align with the expected storytelling in that group (Tangherlini 2018). This observation aligns well with Carol Clover's now classic formulation of the idea of an "immanent narrative" underlying traditions such as epic singing, and also aligns well with fieldwork observations that people only infrequently tell complete stories (Clover 1986; Laudun 2001). This latter observation is particularly apt for social media, where jumping into a forum can feel like jumping into a conversation among strangers in a noisy bar.

The generative model for the forum posts that either recount a story in whole or in part has three main levels, offering a modification of the standard two-level model that has animated a great deal of narrative theory over the years. The goal of the model is to wed stable features of narrative to domain-specific aspects of storytelling related to a particular event or type of event, and also to the performance-specific aspects that form the basis of our ethnographic observations.[1] We labels these levels, in turn, the macro-, meso- and microlevels.

On the macro- or tradition level, the model posits that there are structural aspects of narrative that are genre-specific, albeit not genre-exclusive. For legend—and its closely related counterpart the rumor—this macrolevel consists of stable structural features recognized by Labov and Waletzky (1967), and modified by Nicolaisen (1987) for the folklore genre legend, and includes the orientation, the complicating action and the resolution. As a modification of the complicating action, we propose a two-part structure, comprising threat/disruption and strategy (Tangherlini 2018). Currently, our computational methods are not able to match actants to structural roles consistently.

Instead, our computational methods focus on the two other levels of the model: the mesolevel, which provides an understanding of the bounds of the discourse to which observed stories or story parts contribute; and the microlevel, which comprises the collected data in the form of blog posts and threads. The mesolevel provides the domain-specific anchoring of the story—the admissible actants and their range of possible actions given that domain. The microlevel, in turn, is the level that is observable, and includes all of the evaluative statements, framing elements and other aspects that make the performance of a story vibrant, even if that performance is simply a very brief conversation that alludes to a shared knowledge between interlocutors (Figure 1).

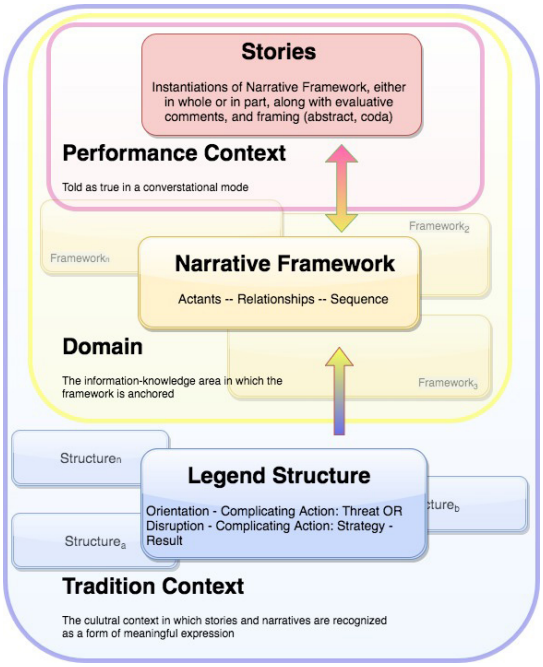


Figure 1: A three-level model of the generative processes undergirding legend and rumor (Tangherlini 2018).

Estimating Narrative Frameworks

Because of these interrelated features characterizing storytelling and story domains, we conceptualize the underlying narrative frameworks as a graph (which can be weighted and dynamically updated), where the nodes comprise the actants, and the edges comprise the interactant relationships. Although a complex hyperedge model may be more appropriate to capture complex relationships, we base this simpler model on the observation that most hyperedges can be decomposed into a series of pairwise edges. Aggregating thousands of storytelling events allows one to map the range of the admissible actants and relationships, as well as discover the emerging actant roles and interactant relationships. The more an actant is mentioned in the

1 The model is exhaustively presented in Tangherlini (2018).

storytelling, the more central they become to the network. Similarly, the more frequently an interactant relationship is mentioned, the more heavily that edge is weighted in the network. Evaluating this over time provides a dynamic view of the growth of these narrative frameworks.

The goal of our work, then, is to estimate the generative narrative framework graph for any corpus. This narrative framework identifies the main actants and presents the interactant relationships in a context-dependent manner. To illustrate the context dependent nature of these relationships, consider the Pizzagate conspiracy theory. One need only recognize that Hillary Clinton can play multiple roles in various domains of discourse to understand this context-dependent understanding of Hillary Clinton: in Democratic politics, she is a former presidential candidate; in the context of the Clinton foundation, she is a key and founding member; in the context of her family, she is the wronged spouse of Bill Clinton; and in the context of Satanic cannibalistic cults, she is a ring leader. Consequently, she, like many other actants, plays multiple roles in multiple domains, all dependent on context.

Because of the straightforward nature of this approach, we have developed a computational pipeline that, given a corpus of sufficient size, allows one to rapidly generate the narrative frameworks undergirding that corpus. As such, the pipeline provides a method for creating summary narrative graphs, long a desideratum in fields as diverse as discourse analysis, political science, sociology and folklore (Bearman et al. 2000; Lehnert 1980). The pipeline is agnostic to the data source, whether it be a corpus of social media posts, news articles, or even public policy planning documents (Mohr et al. 2013). If there is no underlying framework, the results appear as a disconnected graph. For a well-established narrative framework, by way of contrast, the results appear as a single giant connected component.

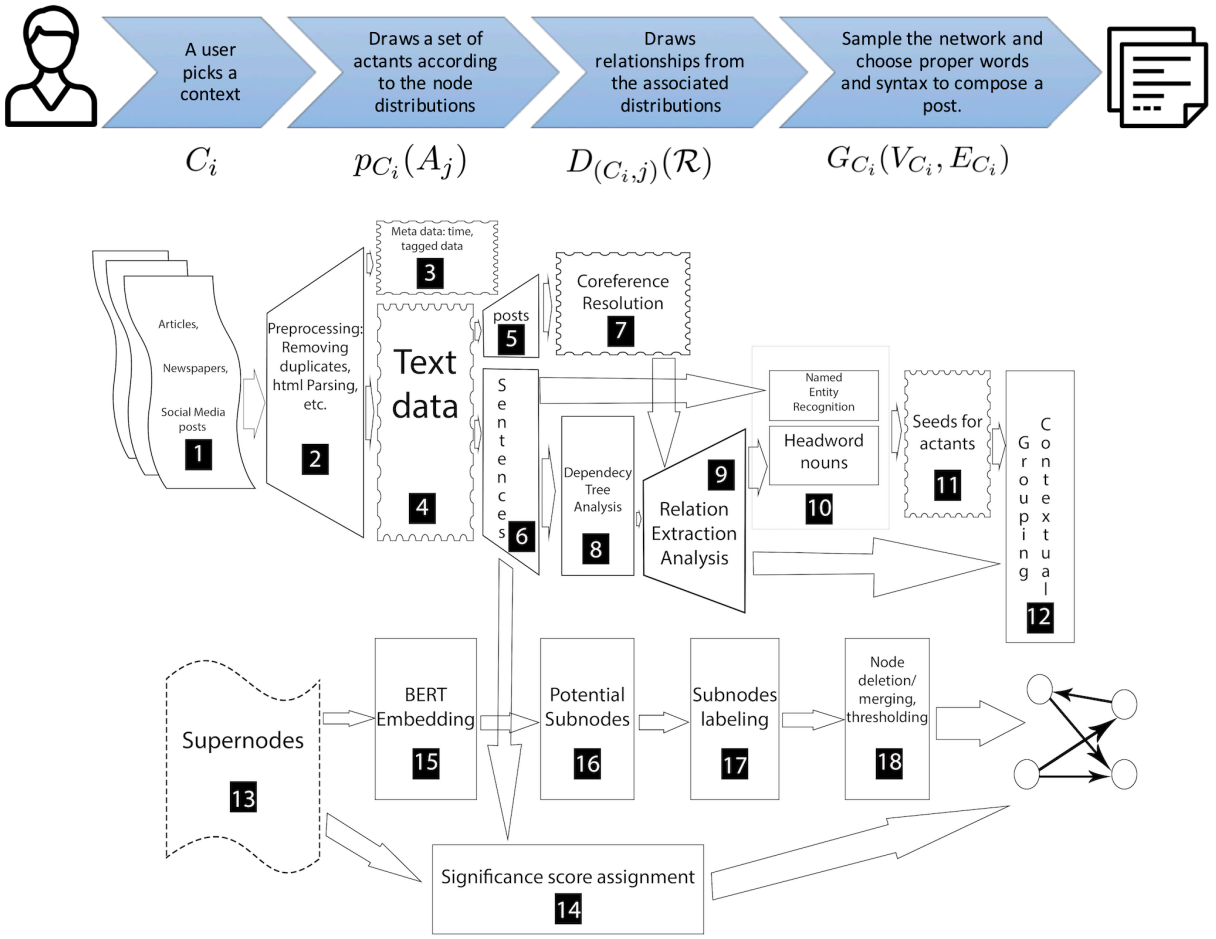


Figure 2: (a) an overview of how a person generates a post in this model (b) an overview of the pipeline (Tangherlini et al. 2020).

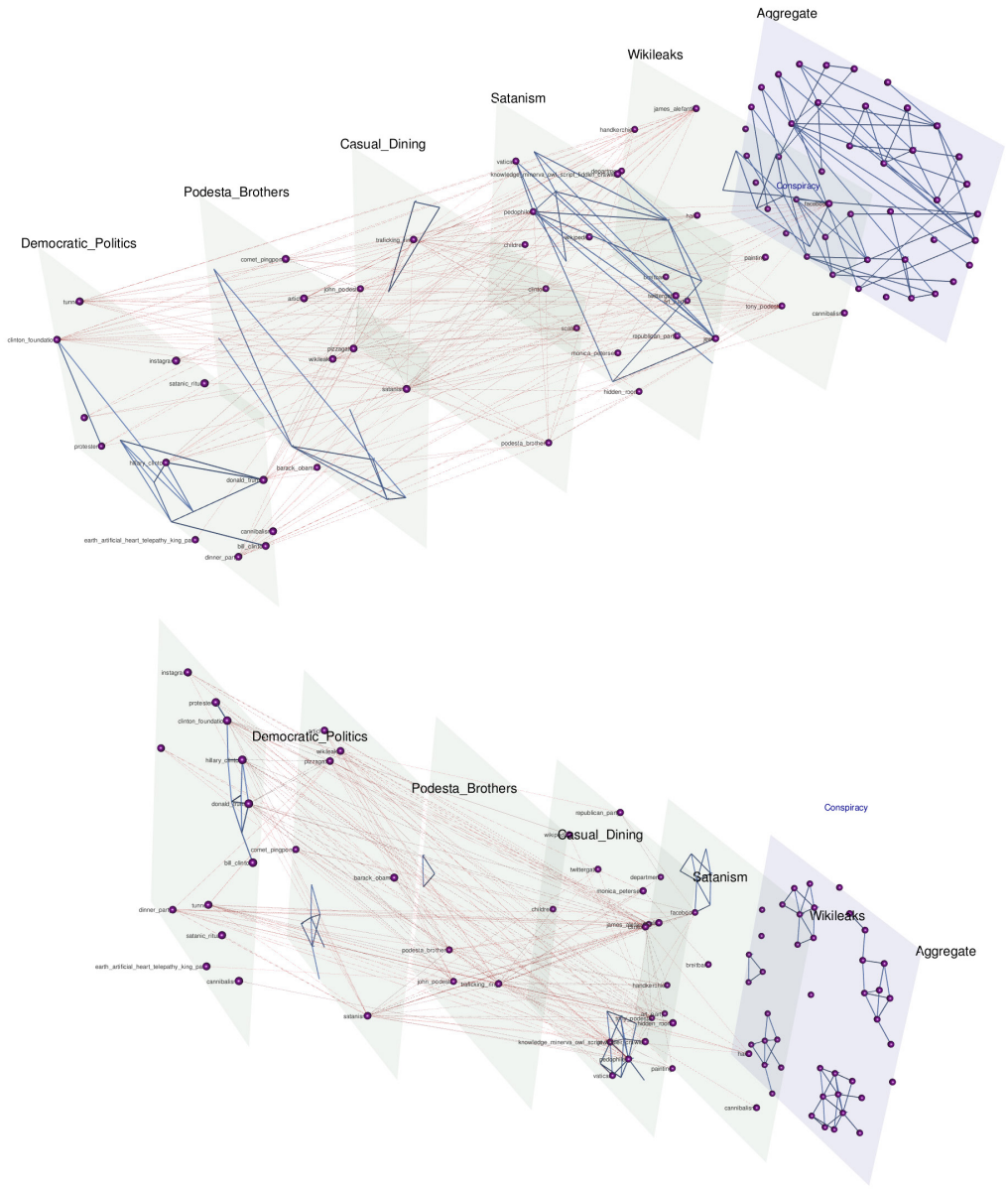


Figure 3: (a) shows the effect of Wikileaks emails in aligning otherwise unlinked domains; if the Wikileaks nodes and edges are removed from the graph, the aggregate network becomes a group of unconnected components; and (b) shows the automatically discovered main actants in an unlabeled corpus of reddit discussions related to Pizzagate. Not only do our methods match the graph presented in the NY Times (purple edges), but we also discover the importance of Bill Clinton and the Clinton Foundation to the conspiracy theory as presented by the main "theorists" themselves. (Tangherlini et al. 2020)

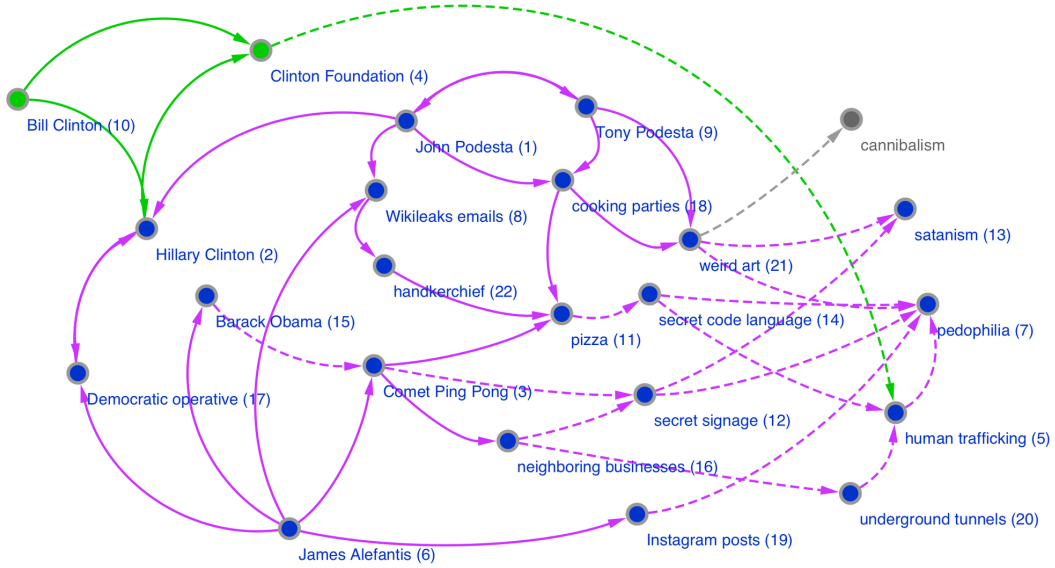


Figure 3: (b)

Applications of the Method

The results of applying this approach to a series of tens of thousands of posts on social media concerning the Pizzagate conspiracy theory—a theory that alleged a relationship between Clinton, various Democratic party operatives, Satanic pedophilic child trafficking and a northern Washington DC pizza restaurant, were fairly striking. For instance, our top-level graph captured the overall contours of the conspiracy theory, while also highlighting the reliance of the conspiracy theorists on the trove of leaked Wikileaks emails hacked from the Democratic National Committee as a means for linking the otherwise unrelated domains of Democratic politics, casual dining, DC area businesses and Satanic child sex trafficking (see Figure 3). The study also reveals how conspiracy theories often are created through the alignment of multiple, otherwise unaligned domains of interaction. This alignment is only possible because the theorists either collectively or individually have access (or gain access) to special, often hidden or secret knowledge, which they can interpret given their own (implicit) skill at understanding this knowledge. In the case of Pizzagate, it was the trove of Wikileaks emails that provided this key, while in the case of Q-Anon, for instance, it is the "bread crumbs" left by the eponymous Q on various messaging boards.

The limits of visualization software often make it difficult to present the rich semantic labeling that characterizes the relationships between actants. In our system, we are devising methods to provide this rich labeling in smaller or "zoomed-in" views of the graph (Figure 4).

Narrative Frameworks and the Emergence of Conspiracy Theories in Social Media

In the context of Covid-19, we have focused on two corpuses: one derived from Reddit and 4chan, and one derived from a series of news reports focused on conspiracy theories. Unlike the Pizzagate conspiracy theory, where Wikileaks is used by the conspiracy theorists as a Rosetta stone and thus allows for a single dominant narrative framework to move to a position of prominence, the pandemic discussions have yet to settle on a main narrative framework.

Instead, in our pipeline discovery, we find a series of emerging narrative frameworks, each of which proposes a different explanatory theory. Although several of the conspiracy theories are based on existing and long-standing conspiracy theories, others, such as the suggestion that the virus is activated by microwaves emanating from the new 5G network, are novel. A particularly prominent one, and one that has encouraged people to take real-world action, proposes that the virus is a hoax, no worse than the common cold, and that the hospitals are not in any dire situation; this has led to the "film your hospital" movement, which has been compared by analysts to the truther campaigns that suggested that President Obama's birth certificate was fake (Sommer 2020).

The interaction with the news is equally intriguing. While the news often "chases" after the formation of conspiracy theories, as was clearly the case in the well-documented Pizzagate conspiracy theory, the news and social media appear to be in a cycle of mutual reinforcement for the Covid-19 pandemic, where conspiracy theories are

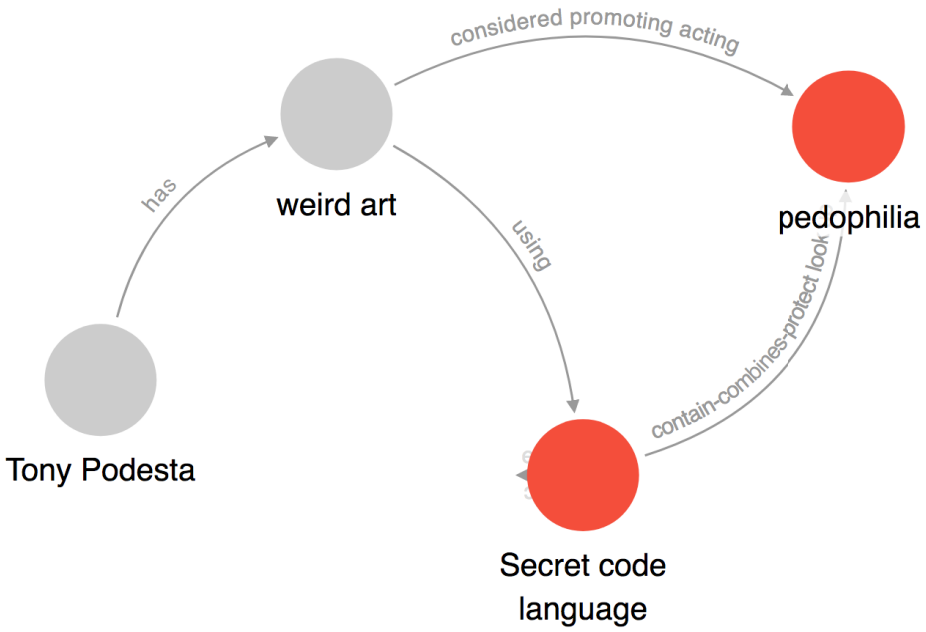


Figure 4: A zoomed in view of the relationship between Tony Podesta, weird art and pedophilia in the Pizzagate graph. The relationship edges are automatically generated by the pipeline and consist of the highest ranked relationship labels for a particular edge.

picked up by the news and then feed back into the social forums, where they take advantage of mentions in the news as validation of the narrative itself.

In the news reporting that we considered, we discovered that the general mentions of conspiracy theories, or the specific conspiracy theories themselves, lagged considerably behind the emergence of these in social media. In January, for instance, conspiracy theory reporting focused almost entirely on Q-anon and other non-Covid-19-related conspiracy theories (Figure 6a). Conspiracy theories began to be reported on more closely with Covid-19 in mid-March (Figure 6b) and, by mid-April, reporting on conspiracy theories was very closely linked to Covid-19 reporting (Figure 6c) (Shahsavari et al. 2020).

We expect to witness several phenomena as the Covid-19 pandemic continues to develop. If theories about monologic belief systems and their role in conspiratorial thinking are correct, then several of the conspiracy theories should align to form a single, totalizing narrative framework (Goertzel 1994). It appears that this may already be happening in the context of the 5G narrative, the bioweapons narrative and the globalist cabal narrative. A single conspiracy theory may then emerge as the dominant narrative about the pandemic, while smaller frameworks are either abandoned or break off to form alternative explanatory theories. Another phenomenon that may emerge is the lack of coordination across these narratives, with a constant churn in the discussion space. New narrative framework nucleations will appear in these discussion forums, gain some momentum, and then be abandoned. Certainly, these developments will be worth watching. Our methods can support this type of coarse level of surveillance, while providing early clues to guide more directed analysis.

Conclusion

Although observation and modeling can be important as we develop a more sophisticated understanding of how storytelling develops and functions during a global crisis, it may be equally important to apply our knowledge of these processes to help efforts to minimize the risk posed by people taking real-world action motivated by these explanatory narratives. Our methods, for instance, could be used to track the emergence of potentially dangerous information, such as the efficacy of household cleaning products as medicines to combat the virus, that form part of widely-accepted narratives on social media. Interestingly, these narratives about using household goods to combat Covid-19 *predate* Trump's misinformed suggestion that cleaning products are the subject of scientific testing for people suffering from the

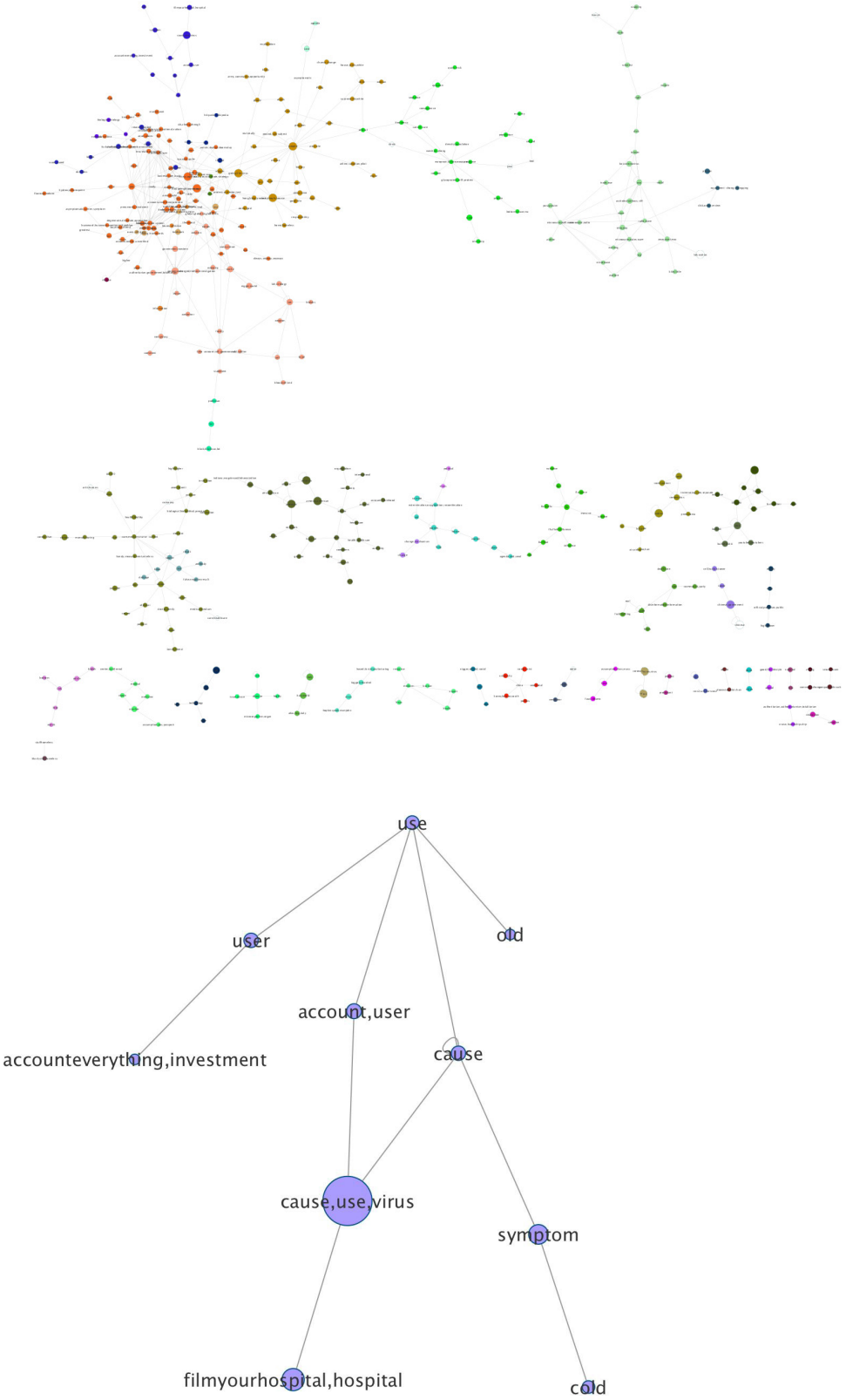
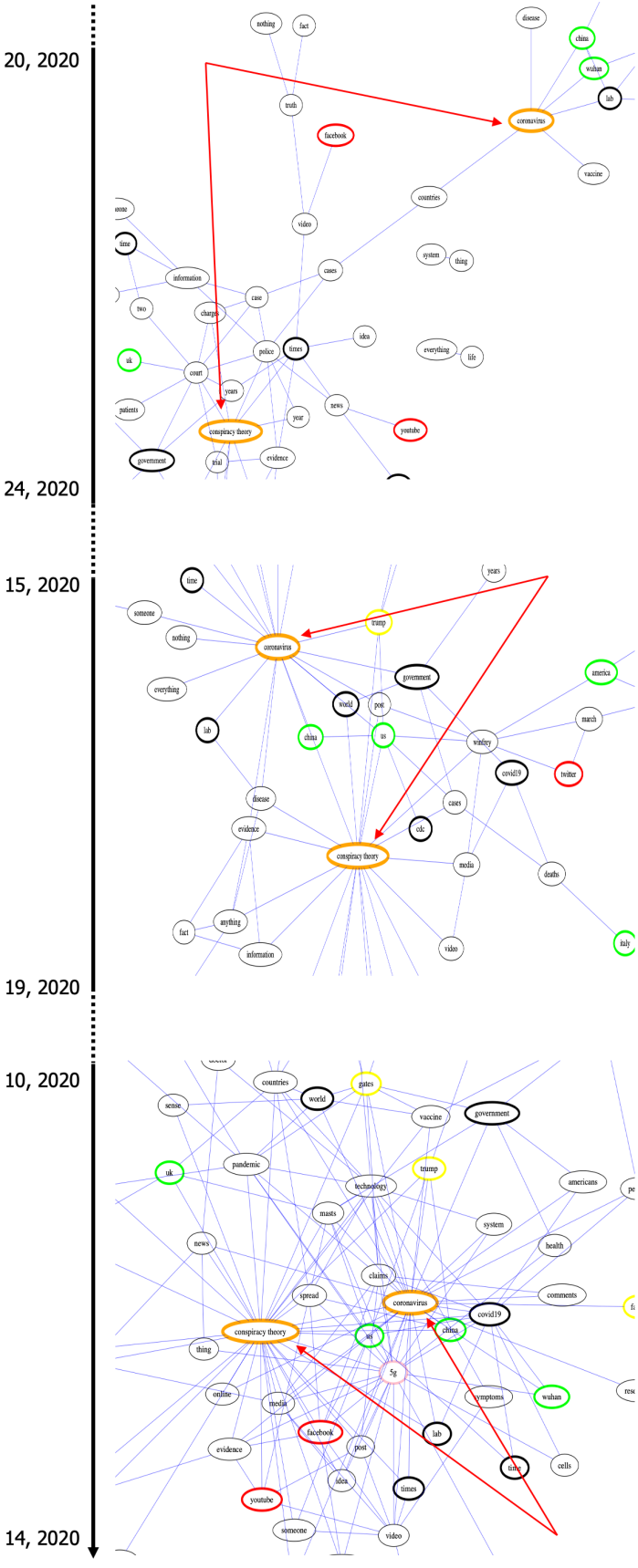


Figure 5: (a, above) An overview of the 52 different narrative framework "communities" in the overall social media discussion forum space. (b, below) A close up of a narrative framework, linking nodes from a series of communities, proposing that the Covid-19 virus is a hoax, and urging people to "film your hospital."



virus. Similarly, given the generative nature of our model, the approach may be helpful for public health officials who need to rapidly produce messaging that can disrupt the spread of information that has the potential for broad negative social impact, such as stories insisting that the virus is essentially harmless (which have led people to defy stay-at-home orders).

There can be little doubt that the current pandemic is an opportunity for folklorists to apply our hard-earned knowledge of the complex mechanisms that underlie storytelling in and across human societies. Among our many goals as scholars should be to document the ubiquitous storytelling that has rushed to fill the information vacuum, as well as to assist in developing methods that allow us to track these developments across many different media in a consistent and reproducible manner, allowing us to use this knowledge for the broader public good.

Figure 6: A time series overview of the reporting on conspiracy theories in news harvested from Google's GDELT project. The timeline illustrates the increased reporting on conspiracy theories starting in late January and the progressively closer relationship between conspiracy theory reporting and Covid-19 reporting.

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