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# Social Network-Epistemology

M. Alfano*, S. Cunningham*, W. Meulemans†, I. Rutter‡, M. Sondag†, B. Speckmann† and E. Sullivan*
*TU Delft, the Netherlands
Email: {m.alfano|s.cunningham|e.e.sullivan-mumm}@tudelft.nl
†TU Eindhoven, the Netherlands
Email: {w.meulemans|m.f.m.sondag|b.speckmann}@tue.nl
‡University of Passau, Germany
Email: ignaz.rutter@uni-passau.de

This abstract describes how tools from network analysis and visualization can successfully support the study of philosophical questions in social epistemology. Social epistemology has become a hot topic not only in philosophy but also in popular culture. Since the Brexit referendum and the 2016 American presidential election, people have begun to worry about filter bubbles, echo chambers, and the amplification of polarization by social media [4], [5]. These are the sorts of phenomena that social epistemologists should be well-equipped to explain and evaluate. Most contemporary social epistemology presupposes a minimal network of just two nodes (speaker and hearer) [1]–[3]. To make sense of phenomena such as filter bubbles, polarization, and echo-chambers, though, we need to expand the universe of epistemic agents and enrich the relations among them. In other words, we can no longer abstract away from the network. Instead, we need a networked methodology as the basis for a properly social epistemology.

We introduce a particular network structure, namely the $(m, k)$-*observer*. We argue for its epistemic value and show that such observers are extremely rare in social media discussions of controversial topics. Our specific use case concerns a discussion of vaccine safety on Twitter.

**$(m, k)$-observers.** Consider an epistemic network $\mathcal{N} = (V, E)$, where $V$ is a set $\{v_1, v_2, \ldots, v_n\}$ of nodes and $E \subseteq V \times V$ is a set of directed edges between nodes from $V$. The nodes represent epistemic agents, and an edge $(u, v)$ represent that "$u$ testifies to $v$". We call a node a $k$-*observer* if it receives testimony from exactly $k$ distinct sources. However, simply adding more epistemic sources to the network in this way does not go far enough. If each of those sources is simply re-broadcasting (amplifying) the testimony of a single further source there is little epistemic benefit (see Fig. 1). To capture independence of sources, we call two nodes $m$-*independent* with respect to a node $v$ if any path in $\mathcal{N}$ between the two sources that does not go through $v$ has length at least $m$.

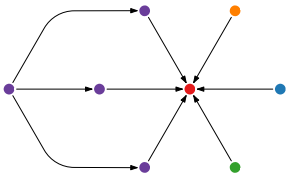

Fig. 1. An observer receives information from six sources, but not all are independent.

An $(m, k)$-*observer* is then a node $v$ in an epistemic network that receives testimony from $k$ distinct sources, that are pairwise $m$-independent with respect to $v$. For example, a $(2, 3)$-observer is a node that receives testimony from 3 distinct sources, and each of those sources is a distance of at least 2 from each of the other sources (unless they communicate via the $(2, 3)$-observer itself).

**Epistemic value.** We argue that $(4, 4)$-observers are especially epistemically well-positioned. Given the well-known small-world effect [6], we can expect that the maximum value of $m$ for human social networks is 6. Thus we propose that a distance of 4 is sufficient for independence. Furthermore, we propose that having at least 4 independent sources is ideal: Only 2 sources does not go beyond polarity, while 3 independent sources collapses into a simple majority opinion. Thus, 4 sources allows for the weighing of evidence that unlikely to embody the pathologies associated with filter bubbles, echo chambers, and group polarization. Observers that have 4 independent sources are drawing on a multitude of information that *structurally* places the observer in the position to weigh discrete evidence before forming a judgment about a topic and be open minded to a new view-point.

**Use case: discussion of vaccine safety on Twitter.** We developed a tool that computes and visualizes observers along the dimensions of $m$ and $k$ (see Fig. 2). Our results show that $(4, 4)$-observers are extremely rare in social media discussions. The polarity of the network suggests that a "diversity of view-point" measure would help to bridge the gap between being structurally well-positioned and an all-things-considered desirable epistemic position.

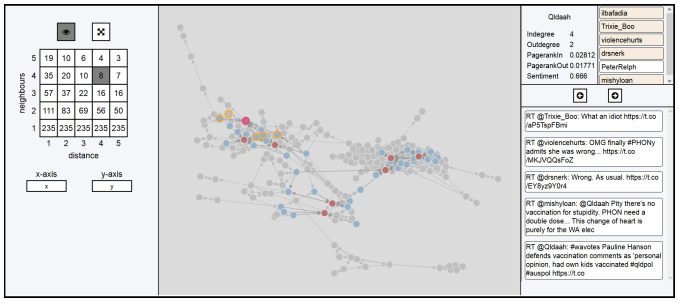


Fig. 2. Our tool showing the $(4, 4)$-observers in a Twitter network.

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