**Diffusion of ideas and complex propagations**

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The present paper performs a theoretical study that participates in the debate on which network structure is more efficient in terms of diffusion (Fleming et al 2007). According to the “weak ties hypothesis” (Granovetter 1973), open networks with long ties between otherwise unconnected neighborhoods facilitate the spread of information, as they reduce the redundancy of the diffusion process (Burt 2005). On the other hand, the “cohesion theory” (Coleman 1988) posits that close social structures promote trust, and thus facilitates information sharing and transmission. Therefore, networks with overlapping neighborhoods (highly clustered networks) are better suited to promote diffusion (Uzzi & Spiro 2005). In order to reconcile these theories, Centola et al. (2007) define two different diffusion processes, namely simple and complex propagations (Centola et al. 2007, Centola & Macy 2007, Centola 2010). In complex propagations, the number of contacts with “infected” neighbors affect the probability of contagion, while in simple propagations only the first contact is important. According to their work, open networks boost diffusion in simple propagations, and clustered networks perform better in complex propagations.

This paper presents a percolation model of diffusion (Solomon et al 2000) to validate their hypothesis. We introduce social reinforcement to compare between simple and complex propagations, and we use small world networks to compare between open and clustered networks. Our simulations show the need for a more nuanced theory.

We argue that it is not only the nature of the diffusion process but the distribution of “incredulity” or resistance to contagion of agents, that determines the performance of different network structures. We find that open networks promote diffusion in simple propagations. Nonetheless, for uniform distributions of incredulity, open networks boost diffusion in complex propagations as well, contrary to the findings by Centola et al. (2007). On the other hand, for incredulous populations (with a few enthusiastic adopters and many reluctant) clustered networks outperform open networks in complex propagations.

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