Title: Diffusion of ideas and complex propagations

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STATE-OF-THE-ART

The present paper participates in the ongoing debate on which network structure is more efficient in terms of diffusion. According to the “weak ties hypothesis”, open networks facilitate the spread of information, as they reduce the redundancy of the diffusion process. On the other hand, the “cohesion theory” posits that close social structures (highly clustered networks) promote trust, and thus facilitates information sharing and transmission.

In order to reconcile these theories, Centola et al (2007) defined two different diffusion processes, namely simple and complex. In complex propagations, the number of contacts with “infected” neighbors affects the probability of contagion, while in simple propagations only the first contact matters. According to this literature, open networks boost diffusion in simple propagations, and clustered networks perform better in complex propagations.

RESEARCH GAP

We aim to check the validity of the simple vs. complex propagations hypothesis for the efficiency of network structure in diffusion processes. Do really open networks work better than clustered networks in simple propagations, and worse in complex propagations?

THEORETICAL ARGUMENTS

We model diffusion as a percolation process. We introduce social reinforcement in the baseline model to compare between simple and complex propagations, and we use small world networks to compare between open and clustered networks.

METHOD

We simulate the model in different settings represented by the network structure (with N=10,000 agents), the initial value of the idea, and the social reinforcement intensity. The minimum quality requirement of agents are random draws from a uniform distribution first, and then from a Beta distribution skewed towards high values (a few early adopters, many reluctant to adopt agents). For each setting we run R=50 simulations, and look at the average value of the diffusion size across the different runs. In all simulations the diffusion process is initialized with 10 early adopters.

RESULTS

We find two main results. First, open networks promote diffusion in simple propagations, as expected. Second, and contrary to previous research, in complex propagations both open and clustered networks can improve diffusion, depending on the scenario. We argue that it is not only the nature of the diffusion process but the distribution of “skepticism”, or resistance to contagion of agents, that determines the performance of different network structures.