Weak Ties and the Diffusion of Information in Dynamic Networks

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The diffusion of information depends on the nature of the information itself as well as the structure and properties of the social network supporting the diffusion. This research focuses on the role of weak ties in the flow of information in social networks. Weak ties connect individuals that are socially farther apart and in different communities, allowing resources to flow between different social groups. Strong ties exist among individuals that share similar characteristics and have access to the same resources i.e. in the same community. Weak ties provide individuals with the access to information that is non-redundant and outside of their social group. In a structural sense, weak ties form bridges between otherwise disconnected groups. Weak ties theory suggests that weak ties enable information to diffuse more rapidly through individuals in a network.

We consider the event where information is broadcasted to a subset of a social network and messages containing the information are spread through interactions between individuals in the network. The nature of the information requires the individuals to evaluate the information and exhibit different behaviors, such as information seeking, information spreading, or possibly departing the network, depending on their perception of the information.

We simulate this spread of information using a general diffusion model for dynamic networks, where individual nodes and their interaction edges may be removed as a result of the diffusion. The model incorporates tie strength between and within social groups by defining social relationships between nodes based on trust. We construct social networks consisting of two social groups. Starting with two disjoint groups, we increase the numbers of the weak ties by reconnecting edges and increasing the proportion of edges connecting different groups while keeping the network density constant. We simulate various diffusion scenarios and observe the effect of the social network structure and trust on the diffusion process in the context of weak ties. Ongoing research showed that networks with a small number of weak ties between groups resulted in larger diffusions than when the two groups were completely disjoint. The existence of weak ties is beneficial to the spread of the information, but strong ties are important in providing trust and influence individual behaviors through the information they spread.