Investigating the Observability of Complex Contagion in Empirical Social Networks

Social contagion is the mechanism by which ideas and behaviors spread across human social networks. Simple contagion models approximate the likelihood of adoption as constant with each exposure to an "infected" network neighbor. However, when adopting an idea or behavior carries personal or social risk, an individual's adoption likelihood may also depend on the number of distinct neighbors who have already adopted. Such *complex contagions* are thought to govern the spread of social movements and other important social phenomena. Online sites, such as Twitter, expose social interactions at a large scale and provide an opportunity to observe the spread of social contagions "in the wild." Much of the effort in searching for complex phenomena in real world contagions focuses on measuring user adoption thresholds. In this work, we show an alternative method for fitting probabilistic complex contagion models to empirical data that avoids measuring thresholds directly, and our results indicate bias in observed thresholds under both complex and simple models. We also show 1) that probabilistic models of simple and complex contagion are distinguishable when applied to an empirical social network with random user activity; and 2) the predictive power of these probabilistic adoption models against observed adoptions of hashtags used on Twitter. We use a set of tweets collected from Nigeria in 2014, focusing on 20 popular hashtags, using the follow graphs of the users adopting the tags during their initial peaks of activity.

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