

Predictive Analysis for Social Diffusion: The Role of Network Communities

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The diffusion of information and behaviors over social networks is of considerable interest in research fields ranging from sociology to computer science and application domains such as marketing, finance, human health, and national security. Of particular interest is the possibility to develop predictive capabilities for social diffusion, for instance enabling early identification of diffusion processes which are likely to become "viral" and propagate to a significant fraction of the population. Recently we have shown, using theoretical analysis, that the dynamics of social diffusion may depend crucially upon the interactions of social network communities, that is, densely connected groupings of individuals which have only relatively few links between groups. This paper presents an empirical investigation of two related hypotheses which follow from this finding: 1.) inter-community interaction is predictive of the reach of social diffusion and 2.) dispersion of the diffusion phenomenon across network communities is a useful early indicator that the propagation will be "successful". We explore these hypotheses with case studies involving the emergence of the Swedish Social Democratic Party at the turn of the 20th century, the spread of the SARS virus in 2002-2003, and blogging dynamics associated with real world protest activity. These empirical studies demonstrate that network community-based diffusion metrics do indeed possess predictive power, and in fact can be more useful than standard measures.

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