Extracting communities from networks

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Abstract

Analysis of networks and in particular discovering communities within networks has been a focus of recent work in several fields, with applications ranging from citation and friendship networks to food webs and gene regulatory networks. Most of the existing community detection methods focus on partitioning the network into cohesive communities, with the expectation of many links between the members of the same community and few links between different communities. However, many real-world networks contain, in addition to communities, a number of sparsely connected nodes that are best classified as "background". To address this problem, we propose a new criterion for community extraction, which aims to separate tightly linked communities from a sparsely connected background, extracting one community at a time. The new criterion is shown to perform well in simulation studies and on several real networks. We also establish asymptotic consistency of the proposed method under the block model assumption. This is joint work with Yunpeng Zhao and Liza Levina.

Keywords: block model; community detection; network partitioning