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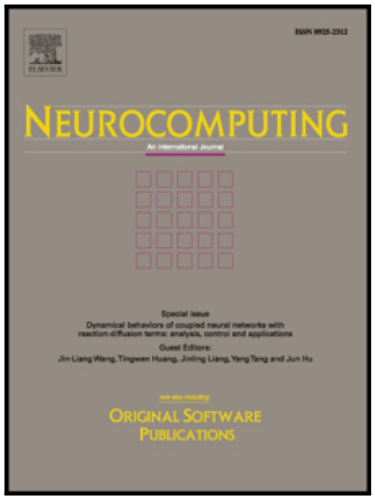

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Exploring temporal community structure and constant evolutionary pattern hiding in dynamic networks

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Abstract

Detecting the temporal communities and analyzing their evolution in dynamic networks is an important question for understanding the structure and function of complex networks. Most existing methods deal the temporal community detection and evolution as a two-step processes and only apply to unweighted and undirected dynamic networks. In this paper, we proposed a new clustering method based on non-negative matrix factorization from a fully probabilistic perspective, to explore temporal and constant community structure as well as the importance of nodes in any type dynamic networks synchronously. In detailed, we first denote the important matrix of node in dynamic networks, the community membership matrix, the similarity matrix at each snapshot and the probability transition matrix of community between the two consecutive snapshots. Second, we constitute the temporal community detection method from the view of generating networks. Third, we introduce a gradient descent algorithm to optimize the objection function of the proposed model. The experimental results on both artificial and real dynamic networks demonstrate that the superior performance of our proposed method is over some widely-used methods.

Keywords: Non-negative matrix factorization (NMF), Temporal community detection, Evolutionary pattern mining, Nodes' importance identifing

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