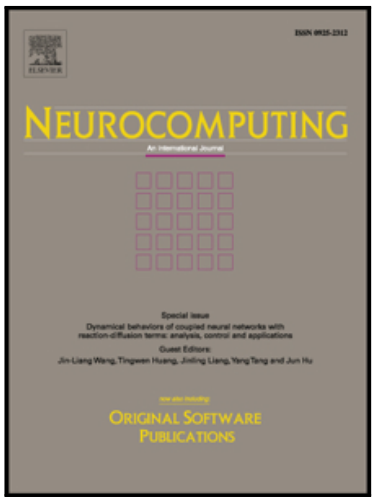

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PII: S0925-2312(17)30835-4
DOI: 10.1016/j.neucom.2017.04.064
Reference: NEUCOM 18432

To appear in: *Neurocomputing*

Received date: 12 November 2016
Revised date: 28 February 2017
Accepted date: 18 April 2017

Please cite this article as: Zhixiao Wang, Changjiang Du, Jianping Fan, Yan Xing, Ranking Influential Nodes in Social Networks Based on Node Position and Neighborhood, *Neurocomputing* (2017), doi: 10.1016/j.neucom.2017.04.064

Ranking Influential Nodes in Social Networks Based on Node Position and Neighborhood

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Abstract

Ranking influential nodes of networks is very meaningful for many applications, such as disease propagation inhibition and information dissemination control. Taking multiple attributes into consideration is a hopeful strategy. However, traditional multi-attribute ranking methods have some defects. Firstly, the computational complexity of these methods is usually higher than $O(n)$, inapplicable to large scale social networks. Secondly, contributions of different attributes are viewed as equally important, leading to the limited improvement in performance. This paper proposes a multi-attribute ranking method based on node position and neighborhood, with low computational complexity $O(n)$. The proposed method utilizes iteration information in the K-shell decomposition to further distinguish the node position and also fully considers the neighborhood's effect upon the influence capability of a node. Furthermore, the entropy method is used to weight the node position and neighborhood attributes. Experiment results in terms of monotonicity, correctness and efficiency have demonstrated the good performance of the proposed method on both artificial networks and real world ones. It can efficiently and accurately provide a more reasonable ranking list than previous approaches.

Keywords: social networks, node influence capability, K-shell decomposition, iteration information, neighborhood

1. Introduction

Ranking influential nodes of networks is an important topic with many applications [1, 2]. For example, in the communication network, influential nodes can be utilized to optimize the network structure [3]; in the disease propagation network, controlling influential nodes can effectively inhibit the spread of the disease [4]; in the social network, information dissemination can be accelerated with the help of influential nodes [5].

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