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REGULAR PAPER

An efficient method for node ranking in complex networks by hybrid neighbourhood coreness

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Abstract

Contagion spread is a common phenomenon observable on a variety of complex networks. The knowledge of key spreaders and contagion dynamics facilitates the design of applications that can either reduce the spread of unwanted contagion or amplify the proliferation of desired ones. Hence, it is essential to identify and rank the influential (key) spreaders in complex networks. Extended neighbourhood coreness (Cnc+) is one such method that uses the k-shell index to identify and rank the influential spreaders. The neighborhood of a node plays a very important role in contagion spread and the combination of local and global topological information of a node can better capture the spreading influence of the nodes. In this paper, a measure, namely, hybrid Cnc+ coreNess (HCN) is proposed that extends Cnc+ by including first and second order neighbourhood of a node (local information) along with the k-shell index. In experiments, HCN is compared with state of the art methods for both real and artificial datasets. The results show that HCN is accurate and better than state of the art methods. Further, least variation in ranking accuracy is observed in experiments of parameter variation for artificial networks. Computational complexity analysis shows that the proposed method achieves high accuracy incurring a small computational penalty.

Keywords Node ranking · k-shell centrality · Neighborhood coreness · Spreading influence · Hybrid corenesse

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