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A variable action set cellular learning automata-based algorithm for link prediction in online social networks

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Abstract

Link prediction (LP) is a crucial issue in the online social network (OSN) evolution analysis. Since OSNs are growing in size on a daily basis, a growing need for scalable LP algorithms is being felt. OSNs are innately evolutionary, such that the characteristics, behavior, and activities of their components (including nodes and links) change over time. In analyzing social networks which are based on the time evolution model, LP helps us realize the logic of social network growth. Deriving time patterns of evolutionary changes according to the communities and neighbors of nodes in a network can be aptly used for LP. This article introduces a new algorithm based on irregular cellular learning automata (ICLAs) for LP in the

near future in OSNs. The algorithm we propose here models the network as an ICLA. The ICLA weighs the real links in the network according to entities' participation in forming communities over consecutive time periods. This method lies in the premise that social networks include communities. Based on the communities formed over successive time periods, the presented method calculates the probability of link formation between every pair of nodes which are unconnected at the present time, estimating the chances of their connection in the near future. Experiments performed on real social networks show that the proposed algorithm produces good results in predicting link formation in OSNs.

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Availability of data

The static datasets described in Sect. 5.1 and support this study's findings are openly available at <http://www.linkprediction.org/index.php/link/resource/data> [59]. Online datasets Astro-ph, Hep-ph, Hep-th, and Email-Enron, are available at <http://konect.uni-koblenz.de/networks> [60, 61]. Also, the College-MSG dataset is available at <https://snap.stanford.edu/data> [62].

Notes

1. Arxiv.org eprint archive.

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