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Link prediction in fuzzy social networks using distributed learning automata

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Article

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Abstract

Link prediction is an area of social network research that tries to predict future links using a social network structure. This paper proposes a novel link prediction method (FLP-DLA) that is based on fuzzy social networks and distributed learning automata (DLA). Distributed learning automata are reinforcement-based optimization tools which try to learn and converge to the optimal behavior from environmental feedback using graph navigation. In the preprocessing phase of the FLP-DLA, the proposed method tries to calculate a fuzzy strength for each link based on the information of the network, such as event time. In the main phase of the FLP-DLA, it uses these fuzzy strengths in addition to DLA to determine the strength of test links. In each iteration of the proposed method, the DLA tries to find a path between the endpoints of a random test link; following this, the FLP-DLA calculates the fuzzy strength of the obtained path using the fuzzy strengths of the links through the path, and rewards or penalizes the DLA based on the path strength. The main phase is repeated until the LAs converge to an action. Finally, we use the strength of the test links as the output of the link prediction. The results reported in this paper have proven satisfactory, indicating the usefulness of the proposed method for some social network datasets.

Keywords

Social network Fuzzy graph Learning automata

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