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Link Prediction in Stochastic Social Networks: Learning Automata Approach

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Highlights

- A stochastic link prediction (SLP) is proposed for online stochastic social networks.
- The SLP tries to find the similarity probability distribution for the future links.
- The proposed method has capability to predict future links in online and offline graphs.

Abstract. Link prediction is a main social network challenge that uses the network structure to predict future links. The common link prediction approaches to predict hidden links use a static graph representation where a snapshot of the network is analyzed to find hidden or future links. For example, similarity metric based link predictions are a common traditional approach that calculates the similarity metric for each non-connected link and sort the links based on their similarity metrics and label the links with higher similarity scores as the future links. Because people activities in social networks are dynamic and uncertainty, and the structure of the networks change over time, using deterministic graphs for modeling and analysis of the social network may not be appropriate. This paper proposes a new link prediction method based on learning automata for stochastic social networks. In a stochastic social network, the weights associated with the links are random variables. To do this, we first redefine some of the similarity metrics for link prediction in stochastic graphs and then propose a method based on learning automata to calculate the distribution of the proposed similarity metrics assuming that the probability distributions of the link weights are unknown. Also, the proposed method has capability to use in online stochastic social networks where the social network changes online and the future links must be predicted. To evaluate the proposed method we use different synthetic stochastic social networks and present that the stochastic link prediction achieves better results in comparison to the classical link prediction algorithms in the stochastic social networks.

Keywords: Stochastic Social Network; Link Prediction; Learning Automata.

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