PREFACE

Besides user interaction and communication, online social networks also provide a platform to propagate information, ideas, innovation, news, etc., as in the form of word-of-mouth spreading. Influence maximization is a fundamental problem to identify a small set of individuals, which have maximal influence spread in the social network, using word-of-mouth spreading. Unfortunately, the influence maximization problem is NP-hard. It has been depicted that the hill-climbing greedy approach gives a good approximation guarantee. However, it is inefficient to run a greedy approach on large-scale social networks. Identification of influential users has grown as one of the major research topics in social network analysis. In this thesis, broadly four different aspects of influence maximization are studied: 1) incorporating complex diffusion models, 2) exploring contextual features, 3) dealing with multiple products and network diversity, and 4) application of information diffusion.

There are some diffusion models like the competitive threshold model that may not be sub-modular and monotonic, which leads to the inapplicability of greedy-based methods. Therefore, to address the influence maximization problem for a wide range of diffusion models, a learning automata-based discrete particle swarm optimization (LAPSO-IM) algorithm is proposed. A local influence evaluation function expected diffusion value (EDV) is extended to approximate influence spread within the two-hope area. To optimize local influence evaluation function, LAPSO-IM redefines the update rule of particle's velocity based on learning automata (LA) action to overcome the weakness of premature

convergence. The use of LA in the proposed algorithm avoids premature convergence and produces a more effective seed set to maximize influence spread.

Further exploring the role of contextual features, a community-based context-aware influence maximization (C2IM) algorithm is proposed to identify more effective seed users. The algorithm utilizes a community-based framework to improve the time-efficiency that reduces the search space significantly. C2IM considers the user's interests (known as topics) as a contextual feature to address the effectiveness of seed. The traditional diffusion models are extended to context-aware diffusion models and proved that C2IM is NP-hard in nature under these diffusion models. The proposed framework first introduced a community detection algorithm to partitions the network into subnetworks. Then devise a non-desirable nodes finder technique to identify non-candidate nodes. Further, the seed selection algorithm is introduced to compute the most influential seed nodes based on the diffusion degree of nodes.

Nowadays, multiple connections between two nodes exist in some networks, which are referred to as multiple featured networks. A novel framework multiple influence maximization across multiple social networks is proposed to deal with multiple products and network diversity. The proposed framework first performed a mapping to couple a set of networks into am multiplex network via direct linkage strategy. Then proposed a heuristic method to find the most influential user over multiple product diffusion multiplex networks. Further, it also proved that the MIM2 problem is NP-hard, and the expected influence spread function is sub-modular under traditional diffusion models.

Finally, an application of information diffusion is also studied. A community-based link prediction algorithm is proposed using an information diffusion perspective to predict the missing links in the social networks. A community detection algorithm is presented, which divides the network into clusters based on label propagation. Then a novel algorithm that is based on community information and influence probabilities is proposed to predict target links. Incorporation of community information in the link prediction ensures a positive influence on the likelihood scores if the associated nodes belong to the same community, otherwise influence negatively.