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Article

Identification of Influential Nodes based on Temporal-aware Modeling of Multi-Hop Neighbor Interactions for Influence Spread Maximization

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Abstract: This paper presents the identification of highly influential nodes based on temporal-aware modeling of multi-hop neighbor interactions to maximize the spread of information in online social networks (OSNs). The objective is to choose a set of influential nodes that have higher temporal multi-hop interactions and more topological connections in large-scale OSNs to maximize information dissemination and minimize spreading time. An influence diffusion process that is solely based on topology is not able to capture the influence spreading efficiently. A temporal multi-hops social interaction based centrality is proposed to choose nodes of higher spreading ability considering the nodes' neighbors and neighbors-of-neighbors temporal modeled interactions and topological connections. The temporal-aware interactions are modeled to find users who are more active recently. First, we model the influence between users considering the temporal interactions of the user and its neighbors. A subset of nodes with a higher influence value and more topological connections with direct neighbors is selected. Secondly, we select the Top-K higher influential spreader nodes from the subset of nodes considering the node neighbors and neighbors-of-neighbors temporal modeled social interactions and topological connections. Finally, the proposed algorithm is evaluated using the epidemic spreading models. The experimental results show that the algorithm is able to extract highly influential nodes that maximize the spread of information and minimize contagion time.

Keywords: Influence Maximization; Social Interaction; Information Diffusion; Social Network; Centrality Measures; Contagion Time.

1. Introduction

People are generally more favorable to accept opinions from family members, friends, and friends of friends. The Dunbar theory [1] stated that the human brain can manage 150 stable relationships. However, the growth of smart devices, broadband communication technologies and, in particular, online social networks (OSNs) and social networks (SNs) websites has changed the concept of relationships in terms of both numbers and interactions. OSNs provide platforms for information sharing and interactions that are efficient and convenient. These platforms enable users to share information with a large number of people. OSNs are becoming human-centric and play important roles in the studies of human behaviors and activities [2]. Social connections enable users to share and propagate information, ideas, opinions, and judgments to other users. The process of transferring information that significantly affects the decisions of others is known as wielding influence [3]. Influence is the capacity and capabilities of an individual to have an effect on the behaviors, opinions, decisions and characters of others in SNs [4]. In OSNs, information flows when users influenced each other. Social Influence plays a significant role when the individual is uncertain or has a disagreement. People tend to be more inclined to consider information positively when it is received from a number of friends and when the information is deemed recent. This second variable

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