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# *Olap*GN: A multi-layered graph convolution network-based model for locating influential nodes in graph networks

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### ABSTRACT

Complex networks necessitate the identification of key nodes owing to their ubiquity across the network. Traditional methodologies, such as machine learning-based and centrality-based techniques, evaluate node relevance only on network topologies or node properties. Nevertheless, both network topologies and node attributes must be considered at the time of evaluating the relevance of nodes. As a solution to this problem, this study presents *OlapGN*, a deep learning model that uses Graph Convolutional Networks to identify the most significant nodes in a complicated network. By integrating the two modules (deep learning and probabilistic nature), the proposed technique identifies overlapping groups and the most significant nodes within a complex network. The suggested approach determines the most significant individuals of the overlapping community after identifying their overlap. Several experiments have been conducted on actual social networks, such as VAST, Facebook, Medicine, Computer Science, and DBLP to evaluate the efficacy of the proposed model. In locating the overlapping communities and most significant nodes in heterogeneous complex networks, the proposed method has produced far better results than all other prevailing methods used for the purpose.

#### 1. Introduction

The life has become so complex today that the people find it quite difficult to meet one another personally. This can be attributed to several factors, such as time constraint, and day-to-day busy schedules An alternative or prominent solution to this problem lies in meeting the individuals can meet through various online networks. A social network is a group of people, as well as the relationships between those people. The links or edges between the individuals can be relationships, connections, or interactions. Facebook and LinkedIn are the examples of popular online social networks in which individuals share their thoughts and feelings on various issues. In these online social networks, the majority of individuals base their choices on the opinion of others. Their decisions are greatly affected by the ideas of others. Such individuals are sometimes referred to as influential users. With the rapid development of online social networks, social influence is increasingly pervasive and significantly impacts our everyday lives. In this way, our beliefs, behavior, etc. are influenced as a result of another individual [1].

People on social media platforms like Facebook, Instagram, Twitter, etc., maintain tight relationships with their network of friends, and

are highly influenced by their interactions. In online social networks, such as sports and political forums, it is often believed that individuals create a community. Many members of a community may belong to two or more communities at the same time, causing some communities to overlap. Consequently, overlapping characteristics are commonly seen in several online social networks. Individuals in these groups are significantly impacted by the most prominent users. These significant users play a crucial role in a variety of community-related activities. Moreover, prominent users play a key role in various facets of online social networks, including viral marketing, [2,3], the search for subject matter experts [4,5], and the dissemination of information [6,7]. Thus, online social network assessment is becoming an increasingly important aspect of social networks [1]. By evaluating the online social network's big data [8] from an influential standpoint, several benefits may be obtained, such as a better understanding of people's social behavior, the promotion of national security, and economic stability among others. Yet, the most challenging aspect of impact analysis is the identification of prominent users. This challenge depends on multiple topological relationships between users, different qualities to be evaluated, and various techniques for discovering influential users.

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