

Graph model and its application to community detection in social networks

Hoang Van Dung

Abstract: This thesis explores graph-based models and their application to community detection problems in social networks. As social media platforms generate vast, complex relational data, traditional clustering methods often fail to capture the intricate, non-linear interactions between users. This study systematically investigates how graph theory, particularly through spectral clustering and modularity optimization, can be effectively utilized to identify latent community structures. A novel hybrid model is proposed, integrating graph embedding techniques with hierarchical clustering to improve both the accuracy and scalability of community detection. The model is validated against real-world datasets from platforms such as Facebook and Twitter, demonstrating superior performance in terms of modularity and normalized mutual information compared to baseline algorithms like Louvain and K-means. Furthermore, the research addresses challenges related to overlapping communities and dynamic network evolution. The findings underscore the robustness of graph-based approaches in revealing meaningful social groupings, offering significant implications for recommendation systems, targeted marketing, and the analysis of information diffusion.

Keywords: Graph theory, community detection, social networks, graph models