香港浸會大學理學院
HKBU Faculty of Science

DEPARTMENT OF COMPUTER SCIENCE

PhD Degree Oral Presentation

PhD Candidate:	Ms. SUN Longxu
Date	22 October 2024 (Tuesday)
Time:	9:30 am – 11:30 am (35 mins presentation and 15 mins Q & A)
Venue:	1) DLB 637, 6/F, David C Lam Building, Shaw Campus 2) ZOOM (Meeting ID: 942 8441 4894) (The password and direct link will only be provided to registrants)
Registration:	https://bit.ly/bucs-reg (Deadline: 12:00 nn, 21 October 2024)

Efficient Community Search and Interactive Refinement in Complex Graphs

Abstract

Graph is a powerful model to represent the topological relationship between entities. Community search is a graph query processing task to find query-dependent communities over graphs online and has diverse applications, including social circles discovery in social graphs, protein-protein structures identification in biology networks, tag recommendation, and infectious disease control. However, existing community search over complex networks suffers from several limitations, e.g., inefficient intimate-community search with edge weights; difficult modeling of cross-layer communities in multilayer graphs, leading to a poor distinguishment on the degree of connections in internal layers and cross-layers; a limited generality of interactive community search with human-in-the-loop.

To address these challenges, we first study the intimate-core community search problem in weighted graphs. We develop the Local Exploration K-core Search (LEKS) framework, which first constructs a small-weighted spanning tree to connect query nodes and then expands it level by level into a connected k-core, ultimately refining it into an intimate-core community. For accelerating scalability, we develop a weighted-core index and two index-based algorithms for the expansion and refinement phases of LEKS. Next, we tackle the cross-layer community search (MCS) problem in multilayer graphs. We formulate the MCS problem to find a (k,d)-core connected subgraph containing query vertices, achieving the largest number of cross-layers. We prove that the MCS problem under full-layer connectivity is NP-hard. We propose exact exploration and efficient (k,d)-core-index based heuristic search methods. Finally, we explore the interactive community search problem, allowing user interactions for adding or deleting vertices to improve community search results. We propose a generalized community model and interactive framework with three key components: personalized adding/deleting recommendations, parameter auto-tuning, and fast partial refinement. Extensive experiments on real-world ground-truth datasets demonstrate the efficiency and effectiveness of our proposed algorithms, validating their practical applicability and superiority over existing methods.

***** ALL INTERESTED ARE WELCOME *****