Tutorial Proposal: Efficient Compression and Queries of Large Graphs

Abstract

As the volume and ubiquity of graphs increase, a compact graph representation becomes essential for enabling efficient storage, transfer, and processing of graphs. Given a graph, the graph summarization problem seeks a compact representation that comprises a summary graph and corrections, allowing for the exact recreation of the original graph from the representation. Studies in this field aim to explore general, queryable compressed storage structures for graph data, which are considered a potential solution for graph processing tasks in memory-constrained scenarios. In this tutorial, we first highlight the importance of graph summarization in a variety of applications and the unique challenges that need to be addressed. Subsequently, we provide an overview of the existing methods for the graph summarization problem and the research on its various variants. Finally, we discuss the future research directions in this important and growing research area.

Duration

Total Time: 1.5 hours (90 minutes)

Outline

Time	Session	Content
0:00 – 0:25 (25 min)	Part I – Introduction	Background knowledge, problem definition, challenges, and application significance of Graph Summarization.
0:25 – 0:50 (25 min)	Part II – Existing Methods for the Problem	Various methods for solving the graph summarization problem, including basic greedy algorithms and various efficient heuristic algorithms based on locality-sensitive hashing.

0:50 – 1:10 (20 min)	Part III – Various Variants for Graph Summarization	Various variant definitions and solution approaches of the graph summarization problem in different scenarios.
1:10 – 1:25 (15 min)	Part IV – Future Research Directions	The applications and open challenges for Graph Summarization.
1:25 – 1:30 (5 min)	Discussion & Q&A	Audience interaction and closing summary.

Organiser Biographies

Fan Zhang is a professor at Guangzhou University. He is also the co-director of the Big Data Computing and Intelligence Institute and the executive deputy director of the Intelligent Transportation Joint Lab. His research interests focus on the topics of large-scale graph data, including cohesive subgraphs, graph summarization, network stability, and influence study. He has published over 30 papers in top-tier venues such as SIGMOD, KDD, VLDB, ICDE, AAAI, IJCAI, VLDB Journal, and TKDE, mostly as the first author or corresponding author. He received the CCF Technology Achievement Award in Natural Science in 2022 and the ACM SIGMOD China Rising Star Award in 2023. In recent years, he serve as (S)PC member or reviewer for VLDB, KDD, TheWebConf, ICDE, AAAI, TKDE, etc. His research is supported by the National Natural Science Foundation of China and the key enterprises such as Alibaba and South China Road & Bridge. More information can be found on his academic homepage (fanzhangcs.github.io).

Qingshuai Feng is an Assistant Researcher and Postdoctoral Fellow at Great Bay University (GBU). His research interests lie in large-scale graph data management and efficient path query processing, with a particular focus on shortest path analysis, dynamic graph indexing, and transportation network optimization. He has published papers in top-tier venues such as VLDB, ICDE, KDD, and EDBT. Dr. Feng also serves as a reviewer for leading international journals, including ACM TODS. Further information is available on his LinkedIn profile: www.linkedin.com/in/qingshuai-feng