The Hong Kong University of Science and Technology

Department of Mathematics

PhD THESIS EXAMINATION

Towards Expressive Deep Representation Learning Frameworks for Challenged Graph-based Problems

By

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ABSTRACT

Graphs are pivotal in various fields as a robust framework to represent and analyse relationships and dependencies among entities. Real-world graph-based tasks pose significant challenges due to the vast scale and intricate complexity of graphs. In this thesis, we propose a series of works that develop graph learning frameworks to tackle various practical problems caused by low-quality data and complex graph properties. The proposed solutions include BiGCN, a robust model for handling noisy graphs; WGNN, a framework achieving expressive node embeddings even with limited attribute information and effective missing value imputation; DEMUF, a superior performer in enhancing the performance of both homophilic and heterophilic graphs. The thesis also offers a comprehensive theoretical analysis of graph neural networks, providing valuable insights, intuitive explanations, and informed decision-making guidance for model design. Additionally, we demonstrate the potential of graph learning in combinatorial optimization through DynGNN, a strategy that guides Ising machine algorithms to converge towards more accurate and reliable solutions.

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Time : 10:00 am

Venue : Room 3598 (Lifts 27/28)

***Thesis Examination Committee*:**

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The student's thesis is now being displayed on the reception counter in the General Administration Office (Room 3461).