



THE HONG KONG UNIVERSITY OF SCIENCE & TECHNOLOGY

Department of Mathematics

PhD Student Seminar

**When Does A Spectral Graph Neural Network Fail in
Node Classification?**

By

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Abstract

Spectral graph neural networks (GNNs) utilizing various graph filters have received considerable attention due to their promising performance in graph learning problems. However, it is known that GNNs do not always perform well. While graph filters provide theoretical foundations for model explanations, it remains unclear when a spectral GNN will fail. This paper aims to comprehensively understand spectral GNNs performance on node classification. We focus on conducting theoretical analyses, starting by investigating prediction errors. Then we introduce some graph indicators in spatial and spectral domains that measure complex relationships between graph structure, node labels, and graph filters. With these indicators, we obtain alternate expressions of prediction errors and intuitive interpretations of GNNs failure from different perspectives. We apply our prediction error analyses to typical filters and provide synthetic experiments to verify our theoretical conclusions. We also propose practical strategies for filter design and use simple models for empirical validation. Extensive experiments and visualization results consistently support our theories and hypotheses.

Date : 4 May 2023 (Thursday)

Time : 10:00am

Venue : Room 1103 (near Lift 19)

All are Welcome!