ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

# Invitation to the Doctoral Seminar

**Dipl.oec. Dipl.-Ing. Dunja Pucher, BSc**
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**"The exact subgraph hierarchy and its local variant for the stable set problem for Paley graphs"**

N.1.44 | Wednesday, 4 December 2024 | 10:00 a.m.

## Abstract

The stability number of a graph, defined as the size of the largest set of pairwise non-adjacent vertices, is NP-hard to compute. The exact subgraph hierarchy provides a sequence of increasingly tighter upper bounds on the stability number, starting with the Lovász theta function at the first level and including all exact subgraph constraints for subgraphs of increasing orders into the semidefinite program to compute the Lovász theta function. However, for Paley graphs, which are a class of strongly regular and vertex-transitive graphs, we demonstrate that the bounds obtained from the exact subgraph hierarchy remain identical to the Lovász theta function up to a certain threshold level.

To address this limitation, we introduce the local exact subgraph hierarchy, which is specifically designed for vertex-transitive graphs such as Paley graphs. We prove that this new hierarchy yields upper bounds on the stability numbers of vertex-transitive graphs that are at least as tight as those obtained from the exact subgraph hierarchy. In addition, computational experiments confirm that the local exact subgraph hierarchy provides significantly tighter bounds for Paley graphs, offering a meaningful improvement

for this class of graphs.

Franz Rendl and the Department of Mathematics look forward to seeing you at the talk!