ALPEN-ADRIA UNIVERSITÄT KLAGENFURT

Invitation to the Doctoral Seminar

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"Exploitation of Structural Properties in Polynomial Optimization"

N.2.35 Wednesday, 14 January 2026 10:00 a.m.

Abstract

Many problems in various fields, such as graph theory, dynamical systems, and deep learning, can be successfully modeled as polynomial optimization problems (POPs). These are optimization problems in which both the objective function and the constraints are polynomial. Over the past three decades, significant research efforts have been devoted to approximating or even solving these generally very difficult problems. In particular, this has been achieved through the moment–SOS hierarchy proposed by Lasserre and Parrilo, which approximates POPs via semidefinite programs (SDPs). However, the size of these SDPs increases rapidly with the number of variables or the degree of the polynomials, often making them intractable on modern computers. To mitigate this issue, recent methods exploit structural properties of the polynomials, such as symmetries and sparsity. In this context, Wang, Magron, and Lasserre have proposed a hierarchy based on term sparsity, which takes advantage of polynomials with few nonzero terms. After introducing polynomial optimization, we will propose in this talk, which is based on joint work with Daniel Brosch, a symmetric variant of the term sparsity hierarchy, allowing us to exploit the symmetries of the problem as

well. To this end, we study chordal extensions of the term sparsity pattern graph that preserve the automorphism group of the term sparsity graph. In particular, we focus on the case of optimizing symmetric polynomials, that is, polynomials invariant under the action of the symmetric group, where we show that the corresponding sequence of term sparsity graphs stabilizes with respect to chordality as the number of variables increases.

Angelika Wiegele and the Department of Mathematics look forward to seeing you at the talk!