Otto-von-Guericke-Universität Magdeburg
Fakultät für Mathematik

Auf Einladung des Institutes für Algebra und Geometrie spricht

Sebastian Debus

(Otto-von-Guericke-Universität Magdeburg)

über das Thema

The even Vandermonde map and sums of squares at infinity

Zeit: Dienstag, 1. November 2022, 13.00 Uhr, G02-210

Zu diesem Vortrag laden wir alle Interessierten herzlich ein.

Prof. Dr. Benjamin Nill

Abstract: In this talk we study the even Vandermonde map, (even) symmetric sums of squares, nonnegative forms and the relation between these topics. The Vandermonde map is the map $\mathbb{R}^n \to \mathbb{R}^d$ consisting of the first d power sums, while the even Vandermonde map is its restriction to the nonnegative orthant. We show that the boundary of the image of the even Vandermonde map has the combinatorial structure of a cyclic polytope and we present an H-representation of the tropicalization of the image at infinity.

The power sum and elementary symmetric polynomials are related by Newton's identities. We show that the convex hull of the image of elementary symmetrics satisfies useful properties which are not shared by the convex hull of the image of the Vandermonde map. This allows us to present test sets for the nonnegativity of certain symmetric functions and the construction of explicit examples of uniform polynomials that are nonnegative but not sums of squares in any non-trivial number of variables. We close with a classification of the limit nonnegativity versus sums of squares question and an undecidability result of verifying nonnegativity in the limit.

The talk is based on joint work with Jose Acevedo, Greg Blekherman and Cordian Riener.