Drexel Analysis Seminar

November 3, 2023

12-1 PM, Korman 245

Speaker: Jurij Volčič (Drexel)

Title: A perturbative Positivstellensatz for nonnegative polynomials

Abstract: At the core of real algebraic geometry is the relationship between polynomial inequalities (geometry) and sums of squares of polynomials (algebra). The formal certificates establishing this relationship are called Positivstellensätze (in analogy with Nullstellensätze in classical algebraic geometry). They emerged with the affirmative solution of Hilbert's 17th problem, and nowadays they are ubiquitous and diverse (with real-world applications in optimization, and high-reaching generalizations in control theory and physics). This talk presents yet another such statement, which asserts that every nonnegative polynomial is a sum of squares of polynomials up to an arbitrary small perturbation of its coefficients. This Positivstellensatz was first established by Lasserre in the unconstrained case, and the talk discusses its version in an arbitrary constrained case, based on joint work with Igor Klep and Victor Magron. To properly appreciate this result, a big chunk of the talk will serve as an introduction to Positivstellensätze in real algebraic geometry. Time permitting, an extension of the perturbative Positivstellensatz to moment inequalities will be presented (where such positivity certificates are scarce).