ODTU-Bilkent Algebraic Geometry

Nonnegativity of the polynomials supported on circuits

By

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Abstract: A real multivariate polynomial is called nonnegative if its evaluation at any given point in R^n is nonnegative. Checking the nonnegativity of a real polynomial is a not only a mathematically challenging task, but also is an effective tool both for mathematics and for sciences. Often one uses nonnegativity certificates in order to tackle this problem, i.e., easily verifiable conditions that imply the nonnegativity for a large class of polynomials. The typical nonnegativity certificates usually make use of the fact that a polynomial is nonnegative if it is a sum of squares of polynomials (SOS polynomial), however not every nonnegative polynomial is of this form. In the first part this talk, we focus on a relatively new nonnegativity certificate based on the arithmetic and geometric means (AM-GM) inequality, and we elaborate on the fact that this class of polynomials neither contains nor is contained in the class of SOS polynomials. Unlike the SOS certificates, one is only interested in the exponents that show up in the support while working with AM-GM certificates. In particular, this gives us a framework to write sufficient symbolic conditions for the nonnegativity of a given sparse polynomial in terms of its coefficients. We utilize the aforementioned AM-GM framework in the second part of the talk, and present an application to a particular problem from the chemical reaction networks theory.

Date: 15 October 2021, Friday
Time: 16:00 (GMT+3)
Place: Zoom

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