DEPARTMENT OF MATHEMATICS AND COMPUTER SCIENCE UNIVERSITY OF SOUTHERN DENMARK, ODENSE

COMPUTER SCIENCE COLLOQUIUM

Superpolynomial Lower Bounds Against Low-Depth Algebraic Circuits

Nutan Limaye Computer Science Department IT University of Copenhagen, Denmark

Tuesday, 09 November, 2021 at 14:15

Auditorium U62

Abstract:

Every multivariate polynomial $P(x_1, ..., x_n)$ can be written as a sum of monomials, i.e. a sum of products of variables and field constants. In general, the size of such an expression is the number of monomials that have a non-zero coefficient in P.

What happens if we add another layer of complexity, and consider sums of products of sums (of variables and field constants) expressions? Now, it becomes unclear how to prove that a given polynomial $P(x_1, ..., x_n)$ does not have small expressions. In this result, we solve exactly this problem.

More precisely, we prove that certain explicit polynomials have no polynomial-sized "Sigma-Pi-Sigma" (sums of products of sums) representations. We can also show similar results for Sigma-Pi-Sigma-Pi-Sigma-Pi-Sigma-Pi-Sigma and so on for all "constant-depth" expressions.

In this talk we will present the background behind this result and sketch the details of some of the main ideas involved in the proof.