ABSTRACT

Amir Shpilka, Hebrew University

Quadratic lower bounds for Depth-3 Arithmetic Formulae over Fields of Characteristic Zero.

I will prove near quadratic lower bounds for depth-3 arithmetic formulas over fields of characteristic zero. Such bounds are obtained for the elementary symmetric functions, the (trace of) iterated matrix multiplication, and the determinant. As corollaries we get the first nontrivial lower bounds for computing polynomials of constant degree, and a gap between the power of depth-3 arithmetic formulae and depth-4 arithmetic formulae. The main technical contribution relates the complexity of computing a polynomial in this model to the wealth of partial derivatives it has on every affine subspace of small co-dimension. Lower bounds for related models utilize an algebraic analog of Nečhiporuk lower bound on Boolean formulae.