Rigidity of Random Toeplitz Matrices with an Application to Depth Three Circuits

Avishay Tal
IAS

12/2/2015 at 11:00 am
Core A (Room 301)

Abstract

Joint work with Oded Goldreich.

We prove that random n-by-n Toeplitz matrices over GF(2) have rigidity $\Omega(n^{3/(r^2 \log n)})$ for rank $r > \sqrt{n}$, with high probability. This improves, for $r = o(n / \log n \log \log n)$, over the $\Omega(n^2 / r) \log(n/r)$ bound that is known for many explicit matrices.

Our result implies that an explicit trilinear function $f$ on $n$ variables has complexity $\Omega(n^{3/5})$ in the multilinear circuit model suggested by Goldreich and Wigderson (ECCC, 2013), which yields an $\exp(n^{3/5})$ lower bound on the size of the so-called canonical depth-three circuits for $f$. 

Organizer(s): Eric Allender, Michael Saks and Mario Szegedy