On polynomial approximations to AC0

Abstract:

In this talk, we will discuss some questions related to polynomial approximations of AC0. A classic result due to Tarui (1991) and Beigel, Reingold, and Spielman (1991), states that any AC0 circuit of size s and depth d has an ε-error probabilistic polynomial over the reals of degree at most \((\log(s/\varepsilon))^{O(d)}\). We will have a re-look at this construction and show how to improve the bound to \((\log s)^{O(d)} \cdot \log(1/\varepsilon)^{O(d)}\), which is much better for small values of \(\varepsilon\). As an application of this result, we show that \((\log s)^{O(d)} \cdot \log(1/\varepsilon)^{O(d)}\)-wise independence fools AC0, improving on Tal's strengthening of Braverman's theorem that \((\log(s/\varepsilon))^{O(d)}\)-wise independence fools AC0. Time permitting, we will also discuss some lower bounds on the best polynomial approximations to AC0.

Joint work with Srikanth Srinivasan.