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 $\epsilon$-error probabilistic polynomial over the reals of degree at most $(\log(s/\epsilon))^{O(d)}$. We will have a re-look at this construction and show how to improve the bound to $(\log s)^{\Theta(d)} \cdot \log(1/\epsilon)$, which is much better for small values of $\epsilon$. As an application of this result, we show that $(\log s)^{\Theta(d)} \cdot \log(1/\epsilon)$-wise independence fools AC0, improving on Tal's strengthening of Braverman's theorem that $(\log(s/\epsilon))^{\Theta(d)}$-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.