Efficient depth reduction for composites is possible

Periklis Papakonstantinou
Rutgers Business School
1/27/2016 at 11:00 am
Core A (Room 301)

Abstract

In 1989 it was shown by Allender and Hertrampf that every circuit of depth \( d \) and gates \( \text{AND,OR,NOT, and MOD}_p \) can be reduced to a depth \( 3 \) circuit of size \( 2^{(\log n)^{O(d)}} \). The question about \( \text{MOD}_m \) gates was handled a year later by Yao, and subsequently by Beigel and Tarui, with a triple-exponentially size bound, i.e. \( 2^{((\log n)^{2^O(d)})} \).

We resolve the question for composites obtaining the same asymptotic result as Allender-Hertrampf.

Depth reduction is a fundamental question on its own. It also has significant implications. For example, one of its immediate consequences is an exponential depth-improvement in Williams’ program for separations of \( \text{NEXP} \).

This is joint work with Shiteng Chen.

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