Matrix Computations & Scientific Computing Seminar

Organizer: James Demmel & Ming Gu

Wednesday, 12:10–1:00pm, 380 Soda

Nov. 2 **Oded Schwartz**, UC Berkeley

Minimizing communication costs: new upper and lower bounds using graph expansion considerations

The communication costs of algorithms are shown to be closely related to the expansion properties of the corresponding computation graphs.

We demonstrate this on Strassens fast matrix multiplication algorithm, and obtain the first lower bounds on its communication costs, both for sequential and for parallel models. This bound is optimal for the sequential case, as it is attainable by a natural implementation. The technique extends to other classes of algorithms.

Motivated by the graph-expansion approach, we then suggest parallel implementations for Strassen's and Strassen-like algorithms, that attain the communication costs lower bounds, and perform better in theory and in practice.

Based on joint work with Grey Ballard, James Demmel, Olga Holtz, Ben Lipshitz, and Eran Rom.