Matrix Computations and Scientific Computing Seminar

Organizer: Jim Demmel and Ming Gu

Wednesday, 12:10–1:00 pm, 380 Soda Hall

Oct 15 **Grey Ballard**, Sandia National Lab

How practical is fast matrix multiplication?

Determining the exponent of matrix multiplication has been an exciting theoretical pursuit for many years, and there continue to be improvements on the best lower and upper bounds. While "fast" algorithms for matrix multiplication perform $O(n^w)$ floating point operations in multiplying n-by-n matrices with w<3, they are seldom used in practice. The original fast algorithm, discovered by Strassen, is known to be practical (i.e., outperforming the best implementation of the classical $O(n^3)$ algorithm on reasonably sized matrices), but most of the other advances in the field of fast matrix multiplication have focused more on theoretical questions rather than practical ones. I'll talk about how advances in communication-avoiding algorithms have created some optimism for the practicality of fast algorithms, show some promising practical results in parallelizing Strassen's algorithm, and discuss the prospects of other fast and practical matrix multiplication algorithms. In particular, I'll discuss recent results in using computer-aided search to find many different fast algorithms and then benchmarking their performance on both sequential and shared-memory parallel architectures.