

# Matrix Computations & Scientific Computing Seminar

Organizer: James Demmel & Ming Gu

Wednesday, 12:10–1:00pm, 380 Soda

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Feb. 15     **Jim Demmel**, UCB

*New Lower and Upper bounds on Communication and Arithmetic*

We present two new approaches to lower and upper bounds in arithmetic and communication. First, we consider dense and sparse linear algebra algorithms: Under reasonable assumptions intended to describe any algorithms that are 3-nested-loop-like, we use geometric arguments to prove lower bounds on the arithmetic required. These bounds are attained for some but not all sparsity patterns, offering the hope of faster algorithms yet to be discovered.

Second, in joint work with Katherine Yelick and Michael Christ, we describe a generalization of our communication lower bounds for 3-nested-loop-like algorithms to any number of nested loops, with any array references that are general affine functions of the loop indices. This lower bound is attained by a new algorithm of Yelick and Edgar Solomonik for the N-Body problem.