Matrix Computations & Scientific Computing Seminar

Organizer(s): James Demmel, Ming Gu & Beresford Parlett

Wednesday, 11:00am–12:00pm, 380 Soda

Sept. 16   **Prof. Ming Gu**, UC Berkeley
A Numerically Stable and Superfast Algorithm for Toeplitz Systems of Equations

A Toeplitz matrix is an $n \times n$ matrix whose entries are identical along each diagonal. Since the publication of Levinson's Algorithm in 1947, a lot of research has been done to develop both fast (those requiring roughly $O(n^2)$ operations) and superfast (those requiring roughly $O(n)$ operations) algorithms for solving the Toeplitz systems of equations. While some of these fast algorithms have been shown to be numerically stable, none of the superfast ones is known to be.

In this talk, we present a superfast algorithm for solving Toeplitz systems of equations and show that it is numerically stable. The key behind this novel algorithm is a judicious combination of recently developed techniques in semi-separable matrix computations and rank-revealing factorizations. We will discuss numerical experiments to demonstrate that this new algorithm is indeed very fast and very reliable in practice.