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Special Guest Lectures

Superfast solvers for some large structured matrix problems

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Abstract:
This talk discusses superfast solvers for some large matrix problems which are rank structured. Examples of these structured problems include some large discretized PDEs, Toeplitz systems, certain low-rank updated eigenproblems (e.g. companion matrices), and others. Our superfast solvers use certain semiseparable rank structured matrices. I will first briefly show an example of a quadratic cost companion matrix eigensolver and condition estimator. Then I will focus on a fast multifrontal type direct solver for large sparse discretized PDEs. Mesh ordering and node elimination schemes are discussed. Semiseparable matrices are used to approximate dense intermediate matrices in the factorization. A new linear time factorization algorithm for semiseparable matrices is presented. The overall sparse solver has nearly linear complexity and linear storage, and has good potential for parallelization. It can also work as an effective preconditioner. Numerical results will be shown. This is joint work with Shiv Chandrasekaran, Ming Gu, Alan Laub, and Xiaoye Li.

Speaker's Bio:
Jianlin Xia is currently a postdoc in the Department of Mathematics, UCLA. He received his Ph.D. from University of California, Berkeley in 2006. His research interests include: numerical linear algebra, numerical analysis, scientific computing, and numerical methods for differential equations.