Numerical Analysis and Scientific Computing Seminar

Direct Solvers for Elliptic PDEs

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Abstract: That the linear systems arising upon the discretization of elliptic PDEs can be solved efficiently is well-known, and iterative solvers that often attain linear complexity (multigrid, Krylov methods, etc) have proven very successful. Interestingly, it has recently been demonstrated that it is often possible to directly compute an approximate inverse to the coefficient matrix in linear (or close to linear) time. The talk will describe some recent work in the field and will argue that direct solvers have several advantages, including improved stability and robustness, the ability to solve certain problems that have remained intractable to iterative methods, and dramatic improvements in speed in certain environments.¡br¿¡br¿The talk will in particular focus on methods for solving elliptic PDEs with oscillatory solutions. These are particularly compelling targets for direct solvers, as it is notoriously difficult to attain fast convergence for iterative solvers in this environment. But they also pose additional challenges, as the inherent ill-conditioning of the physics of the problem require very high precision in both discretizing the PDE, and in solving the resulting linear system.

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https://emory.zoom.us/j/95900585494

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