



THE UNIVERSITY OF
CHICAGO

Computational and Applied Mathematics
&
Statistics Student Seminar

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Minimizing the Arithmetic and Communication Complexity of Jacobi's Method

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12:30 PM

DSI, 5460 S University Ave,
Room 105, Chicago, IL 60615

ABSTRACT

Jacobi's method is a classical iterative algorithm for computing eigenvalues and eigenvectors of symmetric matrices, notable for its simplicity, high accuracy, and natural suitability for parallelism. This talk will cover rigorous complexity bounds for several Jacobi variants—scalar, blocked, recursive, and parallel. We introduce a (serial) recursive scheme with LU-based fast pivoting that guarantees convergence while approaching the optimal complexity of fast matrix multiplication. The results are further extended to singular value decomposition, yielding various bounds via applying the Jacobi methods we introduced. We also provide insights for 2D parallel Jacobi and beyond, with complexity bounds analyzed under the alpha-beta-gamma model. Numerical experiments confirm convergence and robustness, and open questions point toward achieving scalar Jacobi's high accuracy under the blocked or recursive framework and convergence guarantee under the parallel setting.