

Matrix Computations and Scientific Computing Seminar

Organizer: J. Demmel and M. Gu

Wednesday, 12:10–1:00 pm, 380 Soda Hall

Sep 14 **Pieter Ghysels**, LBNL

Preconditioning using Hierarchically Semi-Separable matrices and randomized projection

We present a preconditioner for general linear systems, with a focus on problems arising from PDE discretizations. The preconditioner is constructed from an incomplete factorization, based on a multifrontal version of classical Gaussian elimination. The fill-in introduced during the factorization is compressed using Hierarchically Semi-Separable (HSS) matrices, a matrix format with low-rank off-diagonal blocks. For construction of the HSS representation we use a random projection technique and column-pivoted QR to reveal the rank. Factorization of an HSS matrix is done with a ULV-like decomposition. The incomplete LU factorization is used as a preconditioner for GMRES or BiCGStab and we compare with a number of other common preconditioners such as ILU and AMG. Our code is released as the package STRUMPACK and exploits hybrid parallelism through OpenMP and MPI.