Matrix Computations and Scientific Computing Seminar

Organizer: Jim Demmel and Ming Gu

Wednesday, 11:00 am–12:00 pm, 380 Soda Hall

Jan 28 **Erin Carson**, UC Berkeley

Toward Practical Application of Communication-Avoiding Krylov Subspace Methods

Communication, that is, the movement of data between levels of memory hierarchy or between processors over a network, is the most expensive operation in terms of both time and energy on modern computers. Achieving scalable performance in these metrics thus requires a dramatic shift in the field of algorithmic design, with a focus on new communication-avoiding algorithms and implementations capable of fully exploiting available computing power.

Solvers for sparse linear algebra problems, ubiquitous throughout scientific applications, are often the most time-consuming kernels in large-scale simulations. This talk presents ongoing work in the development of communication-avoiding Krylov subspace methods, which can offer asymptotic performance improvements for many applications. We address two major challenges to the use of communication-avoiding Krylov subspace methods in practice, namely, understanding and improving stability and convergence properties in finite precision and the development of efficient preconditioners. We discuss future work towards improving the stability, resiliency, and usability of large-scale iterative methods, with the overarching goal of designing and implementing high-performance algorithms for next-generation scientific applications.