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IT Eminent Lecture Series

The Future of High Performance Linear Algebra

James Demmel, University of California at Berkeley

Richard Carl Dehmel Distinguished Professor of Computer Science and Mathematics

Coates Hall 152
June 01, 2007 - 01:30 pm

Abstract:
Linear algebra is at the core of much scientific and engineering computing problem, so faster and more accurate algorithms and software are always welcome. We survey three areas of recent progress. (1) We are planning new releases of the widely used LAPACK and ScaLAPACK numerical linear algebra libraries. Based on a user survey and research by many people, we are proposing a variety of faster and more accurate algorithms, expanded functionality, and improved ease of use. (2) The best implementations of operations like sparse-matrix-vector multiplication depend in complicated and surprising ways on both the computer architecture and matrix sparsity structure, and are difficult and tedious to write by hand. We describe OSKI, our system for automatically performance tuning such codes. (3) We survey a variety of new dense and sparse linear algebra algorithms whose computational complexity is much lower than previous algorithms, and provably optimal in many cases.

Speaker's Bio:
James Demmel is the Dr. Richard Carl Dehmel Distinguished Professor of Computer Science and Mathematics at the University of California at Berkeley. His personal research interests are in numerical linear algebra, high performance computing, computer aided design for microelectromechanical systems, and applications of information technology to solve societal scale problems. He is best known for his work on the LAPACK and ScaLAPACK linear algebra libraries. He is an IEEE Fellow, ACM Fellow, winner of the SIAM J. H. Wilkinson Prize in Numerical Analysis and Scientific Computing, and Member of the National Academy of Engineering. He was an invited speaker at the 2002 International Congress of Mathematicians and the 2003 International Congress on Industrial and Applied Mathematics.

This lecture has a reception.