

Curriculum Vitae

Mark Hoemmen

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Work address:

Parallel Computing Laboratory
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ACADEMIC INTERESTS

- Scalable parallel numerical linear algebra
- Performance optimization of mathematical kernels
- Parallel programming libraries and languages

EDUCATION

- Fall 2003-present: Ph.D. candidate in Computer Science, University of California Berkeley (advisor: Prof. James Demmel)
- 2002-2003: Fulbright grant at the Technical University of Berlin, Germany
- August 2002: B.S. *summa cum laude* in Mathematics and Computer Science (Minor: German), University of Illinois Urbana-Champaign

EMPLOYMENT

- **Research assistant:** August 2003 – present
 - *Employer:* University of California Berkeley
 - Investigated communication-optimal iterative methods for solving linear systems and eigenvalue problems

- Helped develop sparse matrix-vector multiply benchmarks and utility libraries for manipulating sparse matrices
- Mentored others students in my research group
- **Teaching assistant:** August – December 2007
 - *Employer:* University of California Berkeley
 - Class: Parallel Programming (CS 194-2) for undergraduates
 - Pilot course; helped develop curriculum
 - Wrote or revised all programming assignments
- **Summer internship:** May – August 2006
 - *Employer:* Lawrence Livermore National Laboratory (Livermore, CA)
 - Experimented with multilevel preconditioners that can be adapted to work with multistep Krylov subspace methods
- **Summer internship:** June – August 2004
 - *Employer:* Barcelona Design (Sunnyvale, CA)
 - Developed a code for the detection and removal of dependencies among linear constraints for sparse linear and geometric programs
- **Research programmer:** January 2000 – August 2002
 - *Employer:* Beckman Institute, University of Illinois, Urbana, IL
 - Simulation of shipboard fires, floods, and firemain events
 - Real-time sensor data filtering

STIPENDIA AND HONORS

Date received	Award
Spring 2008	<i>ACM/IEEE</i> High Performance Computing fellowship
Spring 2003	<i>National Science Foundation</i> graduate studies award
Spring 2002	<i>J. William Fulbright</i> grant for study in Germany
Fall 2001	Interviewed for the <i>British Marshall</i> and <i>Rhodes</i> scholarships (regional level)

RESEARCH

Publications

- “Minimizing Communication in Sparse Matrix Solvers.” James Demmel, Mark Hoemmen, Marghoob Mohiyuddin, and Katherine Yelick. Accepted by Supercomputing 2009.

- “Implementing communication-optimal parallel and sequential QR factorizations.” James Demmel, Laura Grigori, Mark Hoemmen, and Julien Langou. Submitted to SIAM Journal on Scientific Computing.
- “Communication-optimal parallel and sequential QR and LU factorizations.” James Demmel, Laura Grigori, Mark Hoemmen, and Julien Langou. UC Berkeley technical report (UCB/EECS-2008-89) and LAPACK Working Note #204, May 2008. Submitted to SIAM Journal on Scientific Computing.
- “Non-negative diagonals and high performance on low-profile matrices from Householder QR.” James Demmel, Mark Hoemmen, Yozo Hida, and E. Jason Riedy. SIAM Journal on Scientific Computing, Volume 31, Issue 4, pp. 2832-2841, July 2009. (See also UC Berkeley technical report (UCB/EECS-2008-76) and LAPACK Working Note #203, May 2008.)
- “Avoiding Communication in Sparse Matrix Computations.” James Demmel, Mark Hoemmen, Marghoob Mohiyuddin, and Katherine Yelick. IEEE International Parallel and Distributed Processing Symposium, April 2008.
- “Avoiding communication in computing Krylov subspaces.” James Demmel, Mark Hoemmen, Marghoob Mohiyuddin, and Katherine Yelick. UC Berkeley technical report (UCB/EECS-2007-123), October 2007.
- “Benchmarking sparse matrix-vector multiply in five minutes.” With Hormozd Gahvari. SPEC 2007 (Austin, TX).

Conference and seminar talks

- “Communication-avoiding Krylov subspace methods.” Presented at the Copper Mountain 2008 Iterative Methods conference (April) and at SIAM Parallel Processing 2008 (March).
- *Idem titulus*. Presented at the University of California Berkeley Matrix Computations Seminar on 15. Mar. 2006 and 15. Nov. 2006.
- “A self-tuning benchmark for sparse matrix-vector multiplication.” With Hormozd Gahvari. SIAM CSE Conference (Orlando, Florida), 12. Feb. 2005).
- “Adaptable benchmarks for register blocked sparse matrix-vector multiplication.” Presented at the University of California Berkeley Matrix Computations Seminar, 5. May 2004.

PROFESSIONAL ACTIVITIES

- Head developer of the BeBOP Sparse Matrix Converter (bebop.cs.berkeley.edu/smc/), an open-source software library which is featured on the National Institute of Standards and Technology website (<http://math.nist.gov/MatrixMarket/>)

- Developed a library for pseudorandom number generation in Clojure (a functional parallel language built on the Java Virtual Machine), and advised Clojure users on parallel pseudorandom number generation
- Managed LAPACK and research group e-mail lists
- Reviewed 2007 UC Berkeley computer science graduate school applications
- Secretary for the UC Berkeley Matrix Computations Seminar since summer 2006
- Reviewer for PARA 2006 workshop (State-of-the-Art in Parallel and Scientific Computing)

COURSES AND PRACTICAL SKILLS

Languages

Native language: English. Extensive German experience (spoken and written), including scientific and mathematical texts. Two semesters of study abroad at the Technical University of Berlin.

Graduate-level courses

- Iterative methods for linear systems
- Numerical methods for ordinary and partial differential equations
- Applications of parallel computing
- Computer architecture
- Convex optimization
- Statistical learning theory
- Combinatorial algorithms and data structures
- Symbolic computing / computer algebra

Computing skills

- *Programming languages and libraries*
 - ANSI Common Lisp, C, C++, Python, Perl, Java
 - MPI, Unified Parallel C, Cilk, OpenMP, POSIX Threads, Clojure
 - Matlab, Octave, Gnuplot, Mathematica
- *Documentation*
 - \LaTeX and \BibTeX , HTML (with CSS), Microsoft Word

REFERENCES

Contact information available upon request.