

PADMA RAGHAVAN
CURRICULUM VITAE

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EDUCATION

- Ph.D., Computer Science, The Pennsylvania State University, December 1991.
- M.S., Computer Science, The Pennsylvania State University, August 1987.
- Bachelor of Technology (Honors), Computer Science and Engineering, Indian Institute of Technology, Kharagpur, India, July 1985.

EMPLOYMENT

- Director, Institute for Computational Science, The Pennsylvania State University, July 2007 - present.
- Professor, Department of Computer Science and Engineering, The Pennsylvania State University, July 2005 - present.
- Associate Professor, Department of Computer Science and Engineering, The Pennsylvania State University, August 2000 - July 2005.
- Associate Professor, Department of Computer Science, The University of Tennessee, August 2000 - March 2001 (on leave).
- Assistant Professor, Department of Computer Science, The University of Tennessee, August 1994 - July 2000.
- Post Doctoral Research Associate, National Center for Supercomputing Applications, University of Illinois, August 1991 - July 1994.
- Instructor, Department of Computer Science, The Pennsylvania State University, August 1987 - August 1991.
- Consultant: Sandia National Laboratory, March 1999 - July 2004; Oak Ridge National Laboratory, August 1995 - July 2000.

PRESTIGIOUS AWARDS (AFTER RECEIPT OF PH.D.)

- Best Paper, Software Track, 22nd IEEE/ACM International Parallel and Distributed Symposium (IPDPS'08), *A Helper Thread Based EDP Reduction Scheme for Adapting Application Execution in CMPs*, Y. Ding, M. Kandemir, P. Raghavan and M. J. Irwin. (1 Best Paper selected in each of 4 four tracks out of 410 papers).
- Faculty Teaching Award, Department of Computer Science and Engineering, The Pennsylvania State University, March 2006.
- The Maria Goeppert-Mayer Distinguished Scholar Award, Argonne National Laboratory (Department of Energy) and the University of Chicago, \$171,349, in recognition of Raghavan's contributions to scalable parallel techniques for sparse linear system solution, January 2002 - December 2002.
- The National Science Foundation, Computer and Information Science and Engineering (CISE) Directorate, CAREER Award (NSF ASC-9502594), \$131,651, June 1995 - July 1998.
- The University of Tennessee Science Alliance Award for Excellence in Research, \$5,000 per award, total of four awards, 1996, 1997, 1998, and 1999.

PADMA RAGHAVAN: RESEARCH CONTRIBUTIONS

Raghavan's research contributions concern the following three major areas: (i) parallel algorithms for high performance scientific computing (supercomputing), (ii) modeling and simulation of advanced computer systems including application and architecture interactions (iii) modeling, simulation and knowledge extraction algorithms and software for computational science. Specific contributions concern scalable sparse solvers, parallel and distributed graph and numeric algorithms for modeling, simulation and knowledge discovery, and energy-aware supercomputing.

EXTERNAL FUNDING

All grants and awards received are listed below. Awards for research indicate total amounts with notes in parentheses to indicate the status of the project, and Raghavan's role (as principal investigator–PI, Co-principal investigator–Co-PI, or senior personnel).

BASIC RESEARCH AND INSTRUMENTATION (PI/ Co-PI)

— At The Pennsylvania State University (2000 - present).

- National Science Foundation, CISE-Computer Systems Research, *Toward Model-Driven Multilevel Analysis and Optimization of Multicomponent Computer Systems*, P. Raghavan, M. J. Irwin, M. Kandemir, J. Li, S. Shontz, \$855,729, October 2007 – October 2010. (**in progress, PI**).
- Maryland Procurement Office (NSA), *CMP Optimizations*, P. Raghavan, \$86,259, July 2007 – February 2008. (**in progress, PI**).
- National Science Foundation, *Adaptive Software for Extreme-Scale Scientific Computing: Co-Managing Quality-Performance-Power Tradeoffs (CCF-0444345)*, P. Raghavan, M. J. Irwin (Co-PI), L. C. McInnes and B. Norris (collaborators) \$750,000, October 2004 - October 2008. (**in progress, PI**).
 - *Research Experience for Undergraduates Supplement*, \$6,000, May 2005 - December 2005, (**completed, PI**).
- National Science Foundation, *A Set of Multi-Tiered Interventions at Critical Pipeline Stages: Broadening Participation in Computing Supplement*, \$149,900, May 2006 – October 2007, (**in progress, PI**).
- National Science Foundation, *Center for Computational Materials Design (IIP-0541674)*, Z. K. Liu, L.Q. Chen, J. Kubucki, P. Raghavan and J. Sofo, approximately \$400,000, October 2005 - October 2010, (**in progress, Co-PI**).
- National Science Foundation, *Grant to Support Activities at the Eleventh SIAM Conference on Parallel Processing for Scientific Computing (CCF-0340869)*, San Francisco, CA, February 2004, P. Raghavan (conference Co-Chair), \$17,000, August 2003 - March 2004, (**completed, PI**).
- National Science Foundation, Information Technology Research 'medium' award, *ITR: Computational Tools For Multicomponent Materials Design (DMR-0205232)*, Z. K. Liu, L.Q. Chen, P. Raghavan and Q. Du, \$2,900,000, August 2002 - August 2007, (**in progress, Co-PI**).
- National Science Foundation, Information Technology Research 'small' award, *ITR: Large Scale Quantum Mechanical Simulations of Nanomechanics (EIA-0221916)*, M. Menon

- and P. Raghavan, \$394,843, September 2002 - September 2005, (**in progress, Co-PI**).
- National Science Foundation, (*I³C*): *An Infrastructure for Innovation in Information Computing* (CNS-0102007), C. Das, R. Acharya, L. Giles, M. J. Irwin, and P. Raghavan. \$1,795,729, July 2002 - July 2007. (**in progress, Co-PI**).
 - Department of Energy, *SciDac Terascale Optimal PDE Simulation: An Enabling Technology Center*, multi-site project lead by D. Keyes, subcontract from the Lawrence Berkeley National Laboratory, P. Raghavan, \$108,000, May 2002 - May 2005, (**completed, PI**).
 - Argonne National Laboratory (Department of Energy) and the University of Chicago, *The Maria Goeppert-Mayer Distinguished Scholar Award*, P. Raghavan, \$171,349, January 2002 - December 2002, (**completed, PI**).
 - National Science Foundation, *Robust Limited Memory Hybrid Sparse Solvers* (0102537), P. Raghavan, \$315,473, August 2001 - August 2005, (**completed, PI**).
 - National Science Foundation, *Fabrication of Fullerene Based Novel Molecular Electronic Devices Using Quantum Mechanical Simulations*, M. Menon and P. Raghavan, \$87,078, July 2001 - July 2002, (**completed, PI**).
 - National Aeronautics and Space Administration (NASA), *An Efficient Scheme for Updating Sparse Cholesky Factors*, P. Raghavan, \$20,000, April 2001 - April 2002, (**completed, PI**).
 - National Science Foundation, *A Study of an Automated Development Environment for Parallel Computing with Reconfigurable Processing Elements*, M. A. Langston, P. Raghavan and D. W. Bouldin, \$315,473, August 2000 - August 2003, (**completed, Co-PI**).

— At The University of Tennessee (1994 - 1999)

- The University of Tennessee (SARIF Equipment and Infrastructure Fund), *A Linux-Based Parallel Computing Cluster for Computational Chemistry Algorithm Design*, R. J. Hinde and P. Raghavan, *support only for instrumentation*, \$12,000, January 1999 - December 1999, (**completed, Co-PI**).
- National Science Foundation, *SInRG: A Scalable Intracampus Research Grid*, J. J. Dongarra, M. D. Beck, M. W. Berry, J. Gregor, and M. A. Langston, \$1,751,088, February 2000 - January 2005. (**completed, senior-personnel**).
- National Science Foundation, *Enabling Technology for High-Performance Heterogeneous Clusters*, J. J. Dongarra, P. Raghavan and J. S. Plank, *support only for instrumentation*, \$150,000, May 1999 - May 2002, (**completed, Co-PI**).
- National Science Foundation, *Scalable Sparse Solvers*, P. Raghavan, \$182,000, July 1998 - June 2002, (**completed, PI**).
- National Science Foundation, *High-Performance ATM Network*, M. W. Berry, J. Gregor, M. T. Jones, J. S. Plank and P. Raghavan, *support only for instrumentation*, \$100,000, March 1996 - February 1997, (**completed, PI**).
- Defense Advanced Research Projects Agency (DARPA), *Portable Parallel Preconditioning*, J. G. Gilbert, E. G. Ng, B.W. Peyton and P. Raghavan, \$600,000, January 1996 - April 1999, (**completed, Co-PI**).
- Defense Advanced Research Projects Agency (DARPA), *Scalable Libraries*, multi-site project lead by J. J. Dongarra, subcontract to P. Raghavan, from the *Sparse Direct Solvers*

component directed by M. T. Heath, \$130,000, January 1996 - January 1999, (**completed, PI**).

- National Science Foundation, *Parallel Sparse Matrix Computations*, P. Raghavan, **CA-REER award**, \$131,651, June 1995 - July 1999, (**completed, PI**).

RECENT SOFTWARE (2000 - PRESENT)

These are based new algorithms and computational schemes developed by Raghavan through NSF and DOE funded basic research programs. They represent tuned implementations of new algorithms for scalable high performance and problem solving environments for multiscale modeling and simulation.

1. **DSCPACK**: *A Domain-Separator Cholesky Package* for the multifrontal solution of sparse linear systems, P. Raghavan. The software is suitable for multiprocessors with message passing (MPI) and includes mechanisms for latency-tolerant, fast repeated solves. At <http://www.cse.psu.edu/~raghavan/Dscpack/>.
 - Supported in part through the grants (i) NSF, *Robust Limited Memory Hybrid Sparse Solvers*, P. Raghavan, August 2001 - August 2005, and (ii) Argonne National Laboratory (Department of Energy) and the University of Chicago, *The Maria Goeppert-Mayer Distinguished Scholar Award*, P. Raghavan, January 2002 - December 2002.
 - Distributed (upon request) to over 50 sites since 2000; interfaces are available through well-established problem solving environments including Trilinos from the Sandia National Laboratories, and the PETSc Toolkit for Scientific Computing from the Argonne National Laboratory.
 - User's guide *DSCPACK: Domain-Separator Codes for the parallel solution of sparse linear systems*, P. Raghavan, Technical Report CSE-02-004, Department of Computer Science and Engineering, The Pennsylvania State University, University Park, PA 16802-6106, 2002.
2. **DSCPACK-IC**: *A Parallel Direct-Iterative Hybrid Solver Through Flexible Incomplete Cholesky Preconditioning*, K. Teranishi and P. Raghavan.
 - Supported in part through the grants (i) NSF, *Robust Limited Memory Hybrid Sparse Solvers (ACI-0102537)*, P. Raghavan, August 2001 - August 2005, and (ii) Department of Energy, *SciDac Terascale Optimal PDE Simulation: An Enabling Technology Center*, subcontract through the Lawrence Berkeley National Laboratory, P. Raghavan, May 2002 - May 2005.
 - Limited-use version at <http://www.cse.psu.edu/~teranish/dscpack-ic.html/>. this software is based on research conducted as part of K. Teranishi's doctoral dissertation.
3. **MATCASE**: *A Web-Based Laboratory for Multicomponent Materials Design*, P. Raghavan and K. Teranishi, Raghavan is the principal developer of the services based software architecture to combine knowledge bases with on-demand multi-scale simulations on computational grids (wide-area high performance computing systems). The system enables scientists to interactively explore the design of the technologically important Al-Cu-Mg-Si alloys. It enables the prediction of macro-structural properties such as stress fields, by automating the generation of simulated micro-structures, their subsequent analyses using finite-element methods, and design-space exploration using reduced-order representations.
 - Supported primarily by the NSF Information Technology Research Grant, *ITR: Computational Tools For Multicomponent Materials Design (DMR-0205232)*, Z. K. Liu, L.Q. Chen, P. Raghavan and Q. Du, see project web-site <http://www.matcase.psu.edu/>.
 - Under development, limited-use release is planned for May 2008.

LIST OF PUBLICATIONS

In the following list, co-authors supervised by Raghavan are indicated by an ‘*’ beside their names. In Computer Science and Engineering refereed conference proceedings are often more valuable than journal publications. The following quote concerns established evaluation criteria in the discipline, from *Academic Careers for Experimental Computer Scientists and Engineers*, National Academy Press and Computing Research Association, *Evaluating Computer Scientists and Engineers*, 1999.

The computer science engineering field in academe is composed of faculty who apply one of two basic research paradigms: theory or experimentation. As a second generalization, experimentalists tend to conduct research that involves creating computational artifacts and assessing them. The ideas are embodied in the artifact, which could be a chip, circuit, computer, network, software, robot, etc.

For experimentalists conference publication is preferred to journal publication, and the premier conferences are generally more selective than the premier journals.

BOOKS/CHAPTERS IN BOOKS

1. *Parallel Processing for Scientific Computing*, M. H. Heroux, P. Raghavan and H. D. Simon, SIAM book series on Software, Tools, and Environments; also its introductory and concluding chapters, *Parallel Processing for Scientific Computing: An Overview, and Opportunities and Challenges for Parallel Computing in Science and Engineering*, November 2006.
2. *Symbolic Preprocessing Techniques for Information Retrieval Using Vector Space Models*, M. W. Berry, P. Raghavan, and X. Zhang*, Computational Information Retrieval, SIAM Proceedings in Applied Mathematics, Editor M.W. Berry, SIAM, Philadelphia, pp. 75–86, 2001.

REFEREED ARTICLES IN JOURNALS AND CONFERENCE PROCEEDINGS

Parallel Scientific Computing

3. *Effective Preconditioning through Ordering Interleaved with Incomplete Factorization*, I. Lee*, P. Raghavan and E. G. Ng, SIAM Journal on Matrix Analysis and Applications, Vol. 27, No. 4, pp. 1069–1088, 2006.
4. *Parallel Hybrid Sparse Solvers Through Flexible Incomplete Cholesky Preconditioning*, K. Teranishi* and P. Raghavan, Lecture Notes in Computer Science, No. 3732, Applied Parallel Computing, pp. 637–643, 2006.
5. *Advanced Algorithms and Software Components for Scientific Computing*, P. Raghavan, Lecture Notes in Computer Science, No. 3732, Applied Parallel Computing, pp. 590–592, 2006.
6. *A Hybrid Parallel Preconditioner Using Incomplete Cholesky Factorization and Sparse Approximate Inversion*, K. Teranishi and P. Raghavan, Lecture Notes in Computational Science and Engineering, Domain Decomposition Methods in Science and Engineering XVI, Vol. 55, pp. 757–764, 2007.

7. *Multi-Pass Mapping Schemes For Parallel Sparse Matrix Computations*, K. Malkowski and P. Raghavan, Lecture Notes in Computer Science, Computational Science-ICCS 2005, Number 3514, Springer Verlag, pp. 245–255, May 2005.
8. *Faster PDE-Based Simulations Using Robust Composite Linear Solvers*, S. Bhowmick*, P. Raghavan, L. C. McInnes and B. Norris, Future Generation Computer Systems, Vol. 20, pp. 373–387, 2004.
9. *Robust Algorithms and Software for Parallel PDE-Based Simulations*, S. Bhowmick*, L. McInnes, B. Norris and P. Raghavan, Proceedings of HPC 2004, The Twelfth Special Symposium on High Performance Computing at the 2004 Advanced Simulation Technologies Conference, Arlington, VA, pp. 37–42, April 2004.
10. *A Latency Tolerant Hybrid Sparse Solver Using Incomplete Cholesky Factorization*, P. Raghavan, K. Teranishi* and E. G. Ng, Numerical Linear Algebra, Volume 10, pp. 541–560, 2003.
11. *Time-Memory Trade-offs Using Sparse Matrix Methods For Large-Scale Eigenvalue Problems*, K. Teranishi*, P. Raghavan, and C. Yang, Lecture notes in Computer Science 2677, pp. 840–847, May 2003.
12. *The Role of Multi-Method Linear Solvers in PDE-Based Simulations*, S. Bhowmick*, L. McInnes, B. Norris, and P. Raghavan, Lecture notes in Computer Science 2677, pp. 828–839, May 2003.
13. *A New Data-Mapping Scheme For Latency-Tolerant Distributed Sparse Triangular Solution*, K. Teranishi*, P. Raghavan and E. Ng, Proceedings of the IEEE/ACM Supercomputing 2002, IEEE Computer Society, paper 27, November 2002.
14. *A Combinatorial Scheme for Developing Efficient Composite Solvers*, S. Bhowmick*, P. Raghavan, and K. Teranishi, Lecture Notes in Computer Science, Computational Science- ICCS 2002, Number 2330, Springer Verlag, pp. 325–334, May 2002.
15. *Towards Scalable Preconditioning Using Incomplete Factorization*, P. Raghavan, K. Teranishi*, and E. Ng, Proceedings of the 2001 International Conference on Preconditioning Techniques for Large Sparse Matrix Problems in Industrial Applications, pp. 63–65, November 2001.
16. *Towards A Scalable Hybrid Sparse Solver*, E. G. Ng and P. Raghavan, Concurrency: Practice and Experience, Vol. 12, pp. 1–16, 2000.
17. *A Blocked Incomplete Cholesky Preconditioner for Hierarchical-Memory Computers*, E. G. Ng, B. W. Peyton and P. Raghavan, IMACS Series in Computational and Applied Mathematics: Iterative Methods in Scientific Computation IV, pp. 211–222, October 1999.
18. *The Performance of Greedy Ordering Heuristics for Sparse Cholesky Factorization*, E. G. Ng and P. Raghavan, SIAM Journal of Matrix Analysis and Applications, Vol. 20, No. 4, pp. 902–914, 1999.
19. *Tools for Mapping Applications to CCMs*, M. T. Jones, M. A. Langston and P. Raghavan, Proceedings of SPIE, Configurable Computing: Technology and Applications, Editor John Schewel, pp. 72–81, November 1998.
20. *Efficient Parallel Triangular Solution Using Selective Inversion*, P. Raghavan, Parallel Processing Letters, Vol. 8, No. 1, pp. 29–40, 1998.
21. *The Performance of Parallel Sparse Triangular Solution*, M. T. Heath and P. Raghavan, IMA Volumes in Mathematics and its Applications: Algorithms for Parallel Processing, Vol. 105, pp. 289–306, 1998.
22. *Parallel Ordering Using Edge Contraction*, P. Raghavan, Parallel Computing, Vol. 23, No. 8, pp. 1045–1067, 1997.

23. *Performance of a Fully Parallel Sparse Solver*, M. T. Heath and P. Raghavan, International Journal of Supercomputing Applications, Vol. 11, No. 1, pp. 49–64, 1997.
24. *Distributed Sparse Gaussian Elimination and Orthogonal Factorization*, P. Raghavan, SIAM Journal of Scientific Computing, Vol. 16, pp. 1462–1477, 1995.
25. *A Cartesian Parallel Nested Dissection Algorithm*, M. T. Heath and P. Raghavan, SIAM Journal of Matrix Analysis and Applications, Vol. 16, pp. 235–253, 1995.
26. *Performance of a Fully Parallel Sparse Solver*, M. T. Heath and P. Raghavan, Proceedings of the 1994 Scalable High Performance Computing Conference, IEEE Computer Society Press, pp. 334–341, May 1994.
27. *Distributed Sparse Gaussian Elimination and Orthogonal Factorization*, P. Raghavan, Proceedings of the 1994 Scalable High Performance Computing Conference, IEEE Computer Society Press, pp. 607–614, May 1994.
28. *Distributed Solution of Sparse Symmetric Positive Definite Systems*, M. T. Heath and P. Raghavan, Proceedings of the 1993 Scalable Parallel Libraries Conference, IEEE Computer Society Press, October 1993.
29. *Distributed Orthogonal Factorization: Givens and Householder Algorithms*, A. Pothen and P. Raghavan, SIAM Journal of Scientific Computing, Vol. 10, No. 6, pp. 1113–1134, 1989.
30. *Distributed Orthogonal Factorization*, A. Pothen and P. Raghavan, Proceedings of the Third ACM Conference on Hypercube Concurrent Computers and Applications, pp. 1610–1620, June 1988.

Modeling and Simulation of Advanced Computer Systems

31. *A Helper Thread Based EDP Reduction Scheme for Adapting Application Execution in CMPs*, Y. Ding, M. Kandemir, P. Raghavan, and M. J. Irwin. 22nd IEEE/ACM International Parallel and Distributed Symposium, IPDPS-2008, 14 pages, accepted, to appear. **Best Paper, Software Track; 4 Best Papers, one per track out of 410 papers received..**
32. *Evaluating the Role of Scratchpad Memories in Chip Multiprocessors for Sparse Matrix Computations*, A. Yanamandra, B. Cover, P. Raghavan. M. J. Irwin, and M. Kandemir, 22nd IEEE/ACM International Parallel and Distributed Symposium, IPDPS-2008, 12 pages, accepted, to appear.
33. *Adapting Application Execution to Reduced CPU Availability*, Y. Ding, M. Kandemir, P. Raghavan and M.J. Irwin, INTERACT at IEEE 13th International Symposium on High Performance Computer Architecture, HPCA-INTERACT'07, 11 pages, accepted, to appear.
34. *Analysis of the IPv4 Address Space Delegation Structure*, A. Sriraman*, K. Butler, P. McDaniel and P. Raghavan, IEEE Symposium on Computers and Communications (ISCC'07), 8 pages, accepted, to appear.
35. *Load Miss Prediction for Energy-Aware High Performance Computing*, K. Malkowski*, G. Link, P. Raghavan and M. J. Irwin, 21st IEEE/ACM International Parallel and Distributed Symposium, IPDPS-2007, High-Performance, Power-Aware Computing Workshop. 8 pages, DOI: 10.1109/IPDPS.2007.370536.
36. *Memory Optimizations For Fast Power-Aware Sparse Computations*, K. Malkowski*, P. Raghavan and M.J. Irwin, Proceedings of the 21st IEEE/ACM International Parallel and Distributed Symposium, IPDPS-2007, Next Generation Software Workshop. 8 pages, DOI: 10.1109/IPDPS.2007.370501.

37. *Reducing energy consumption of parallel sparse matrix applications through integrated link/CPU voltage scaling*, S. W. Son, K. Malkowski*, G. Chen, M. T. Kandemir, P. Raghavan, *The Journal of Supercomputing*, DOI: 10.1007/s11227-007-0113-9.
38. *Phase-Aware Adaptive Hardware Selection for Power-Efficient Scientific Computing*, K. Malkowski*, P. Raghavan, M. Kandemir and M.J. Irwin, *ISLPED 2007*. DOI: 10.1145/1283780.1283869.
39. *Modeling of Link Shutdown Opportunities During Collective Communication Primitives in 3-D Torus Nets*, S. Conner, S. Akioka*, G. M. Link, M. J. Irwin and P. Raghavan, 21st IEEE International Parallel and Distributed Symposium, IPDPS-2007, IPDPS-2007, High-Performance, Power-Aware Computing Workshop. 8-pages, accepted, to appear.
40. *On Improving Performance and Energy Profiles of Sparse Scientific Applications*, K. Malkowski*, I. Lee*, P. Raghavan and M. Irwin, *Proceedings of the 20th IEEE/ACM International Parallel and Distributed Symposium, IPDPS'06, Next Generation Software Workshop*, 8 pages, DOI: 10.1109/IPDPS.2006.1639589.
41. *Conjugate Gradient Sparse Iterative Solvers: Performance-Power Characteristics*, K. Malkowski*, I. Lee*, P. Raghavan and M. Irwin, *Proceedings of the 20th IEEE/ACM International Parallel and Distributed Symposium, IPDPS'06, Second High-Performance, Power-Aware Computing Workshop*, accepted, to appear, 8 pages, DOI: 10.1109/IPDPS.2006.1639595.
42. *Integrated Link/CPU Voltage Scaling for Reducing Energy Consumption of Parallel Sparse Matrix Applications*, S. W. Son, K. Malkowski*, G. Chen, M. T. Kandemir, and P. Raghavan, *Proceedings of the 20th IEEE/ACM International Parallel and Distributed Symposium, IPDPS'06, Second High-Performance, Power-Aware Computing Workshop*, 8 pages. 10.1109/IPDPS.2006.1639596.
43. *Characterizing the Performance and Energy Attributes of Scientific Simulations*, S. Akioka*, K. Malkowski*, P. Raghavan, M. J. Irwin, L. C. McInnes, and B. Norris, *Lecture Notes in Computer Science*, Volume 399/2006, pp. 242–249, January 2006.
44. *Adaptive Software for Scientific Computing: Co-Managing Quality-Performance-Power Tradeoffs*, P. Raghavan, M. J. Irwin L. C. McInnes and B. Norris *Proceedings of the Next Generation Software Workshop at the 19th IEEE/ACM International Parallel and Distributed Symposium, IPDPS-05 Vol. 11, no. 11, p. 220b, 19th, 2005*. Also at: <http://doi.ieeecomputersociety.org/10.1109/IPDPS.2005.83>.
45. *Reducing Power with Performance Constraints for Parallel Sparse Applications*, G. Chen, K. Malkowski*, M. Kandemir, and P. Raghavan, *Proceedings of the High-Performance, Power-Aware Computing Workshop at the 19th IEEE/ACM International Parallel and Distributed Symposium, IPDPS-05 Vol. 12, no. 12, p. 231a, 19th, 2005*. Also at: <http://doi.ieeecomputersociety.org/10.1109/IPDPS.2005.378>.

Computational Modeling, Simulation and Knowledge Extraction

46. *An Evaluation of Limited Memory Sparse Linear Solvers for Thermo-Mechanical Applications*, K. Teranishi*, P. Raghavan, J. Sun* and P. Michaleris, *International Journal of Numerical Methods for Engineering*, accepted, to appear, 34 pages.
47. *Readily Regenerable Reduced Microstructure Representations*, K. Teranishi*, J. Zhang, T. Wang, L.Q. Chen, Z.K. Liu, and P. Raghavan, *Computational Materials Science*, accepted, to appear, 18 pages.
48. *Si Nanotrees: Structure and Electronic Properties*, M. Menon, E. Richter, I. Lee*, and

- P. Raghavan *Journal of Computational and Theoretical Nanoscience*, Vol.4, pp.250-256, 2007.
49. *A Fast Implementation of the FETI-DP Method: FETI-DP-RBS-LNA and Applications on Large Scale Problems with Localized Nonlinearities*, J. Sun*, P. Michaleris, A. Gupta, and P. Raghavan *International Journal for Numerical Methods in Engineering*, Vol. 60, No. 4, pp. 833–858, 2005.
 50. *Large Scale Simulations of Branched Si-nanowires*, M. Menon, E. Richter, I. Lee*, K. Teranishi*, and P. Raghavan, *Proceedings of The IEEE/ACM International Workshop on High Performance Computing for Nano-science and Technology (HPCNano05)*, 2005.
 51. *Parallel Adaptive Solvers in Compressible PETSc-FUN3D Simulations*, S. Bhowmick*, D. Kaushik, L. McInnes, B. Norris, and P. Raghavan. Argonne National Laboratory preprint ANL/MCS-P1279-0805, *Proceedings of the 17th International Conference on Parallel Computational Fluid Dynamics*, Aug. 2005.
 52. *Applications of the FETI-DP-RBS-LNA algorithm on Coupled Linear-Nonlinear Large Scale Problems with Localized Nonlinearities*, J. Sun*, P. Michaleris, A. Gupta and P. Raghavan, *Lecture Notes in Computational Science and Engineering, Domain Decomposition Methods in Science and Engineering XVI*, Vol. 55, pp. 431–438, 2007.
 53. *An Integrated Framework for Multi-Scale Materials Simulation and Design*, Z. K. Liu, L. Q. Chen, P. Raghavan, Q. Du, J. O. Sofo, S. Langer and C. Wolverton, *Journal of Computer-Aided Materials Design*, Volume 11, No. 2-3, pp. 183–199, 2004.
 54. *Towards A Grid Enabled System for Multicomponent Materials Design*, K. Teranishi*, P. Raghavan and Z. K. Liu, *Proceedings of CCGrid04: IEEE International Symposium on Cluster Computing and the Grid*, Chicago, Illinois, IEEE Computer Society Press, April 2004, 6 pages.
 55. *A Quality of Service Approach for High-Performance Numerical Components*, P. Hovland, K. Keahey, L. C. McInnes, B. Norris, L. F. Diachin and P. Raghavan. *Proceedings of the Workshop on Quality-of-Service in Component-Based Software Engineering, Software Technologies Conference*, Toulouse, France, Editor J. M. Bruel, pp. 89–98, June 2003.
 56. *Dimension Reduction in Spectral Element Methods*, I. Lee*, P. Raghavan, S. Schofield and P. Fischer, *Computational Fluid and Solid Mechanics 2003*, *Proceedings of the Second MIT Conference on Computational Fluid and Solid Mechanics*, Editor K. J. Bathe, Volume 2, pp. 2039–2042, June 2003.
 57. *Adaptive Sparse Linear Solvers for Implicit CFD Using Newton-Krylov Algorithms*, B. Norris, L. McInnes, S. Bhowmick* and P. Raghavan, *Proceedings of the Second MIT Conference on Computational Fluid and Solid Mechanics*, Editor K. J. Bathe, Volume 2, pp. 1024–1028, June 2003.
 58. *Scalable Sparse Matrix Techniques for Modeling Crack Growth*, P. Raghavan, M. A. James, J. C. Newman and B. R. Seshadri, *Lecture Notes in Computer Science, Applied Parallel Computing*, pp. 588–602, June 2002.
 59. *Experiences with FETI-DP in a Production Level Finite Element Code*, K. Pierson, G. Reese, and P. Raghavan, *Proceedings of the 14th International Conference on Domain Decomposition Methods*, also available in the electronic archive at <http://www.ddm.org/DD14/>, pp. 233–240, January 2002.
 60. *Large-scale Normal Coordinate Analysis on Distributed Memory Parallel Systems*, C. Yang, P. Raghavan, L. Arrowood*, D. W. Noid, B. G. Sumpter, and R. E. Tuzun, *International Journal of High Performance Computing Applications*, Volume 1, Issue 4, pp. 409–424, 2002.

61. *Level Search Techniques for Scalable Information Filtering and Retrieval*, M. W. Berry, P. Raghavan and X. Zhang*, Information Processing and Management, Vol. 37, pp. 313–334, 2001.
62. *A Grid Computing Environment for Enabling Large Scale Quantum Mechanical Simulations*, J. J. Dongarra and P. Raghavan, Proceedings of GRID'2000: IEEE/ACM International Workshop on Grid Computing, Lecture Notes in Computer Science, No. 1971, Editors R. Buyya and M. Baker, pp. 102–110, December 2000 (**acceptance rate 25%**).
63. *A Comparison of Computational Complexities of HFEM and ABC Finite Element Methods*, M. A. Nasir, P. Raghavan, W. C. Chew and M. T. Heath, Journal of Electromagnetic Waves and Applications, Vol. 11, pp. 1601–1617, 1997.
64. *Sparse Matrix Reordering Schemes for Browsing Hypertext*, M. W. Berry, B. Hendrickson and P. Raghavan, Lectures in Applied Mathematics, Vol. 32: The Mathematics of Numerical Analysis, pp. 99–123, 1996.
65. *A Comparison of Computational Complexities of HFEM and ABC Based Finite Element Methods*, M. A. Nasir, P. Raghavan, W. C. Chew and M. T. Heath, Proceedings of IEEE APS International Symposium, pp. 447–450, June 1994.

TECHNICAL REPORTS AND ARTICLES REFEREED BY ABSTRACT

This list does not duplicate articles listed in other sections.

66. *Evaluating the role of scratchpad memories in multi-cores for sparse matrix computations*, A. Yanamandra, B. Cover, P. Raghavan, M.J. Irwin, M. Kandemir and K. Malkowski, Poster Session, IEEE/ACM Supercomputing (SC'07), 2007. Reno, NV, November 8-16 2007.
67. *Phase-Aware Hardware Adaptivity for Energy-Aware High Performance Computing*, K. Malkowski*, P. Raghavan, M. Kandemir and M.J. Irwin, poster session, 2007 SIAM Conference on Computational Science and Engineering (CSE07), Costa Mesa, CA, February 20 - 24, 2007.
68. *Towards a Power-Efficient Computer Architecture for Barnes-Hut N-Body Simulations*, K. Malkowski*, P. Raghavan and M. J. Irwin, poster session, IEEE/ACM Supercomputing (SC06), 2006. Tampa, FL. November 14-15, 2006.
69. *Co-Managing Performance and Power for High-Performance Scientific Computing*, S. Akioka*, M. J. Irwin, S. Kennedy, K. Malkowski*, L. C. McInnes, B. Norris, and P. Raghavan, poster session, IEEE/ACM Supercomputing (SC05), 2005. Seattle, WA. November 15, 2005.
70. *Tree-Based Parallel Drop Threshold Incomplete Cholesky Preconditioning Using Matrix Inversion Heuristics*, K. Teranishi*, P. Raghavan, B. F. Smith, Proceedings of the 2005 International Conference on Preconditioning Techniques for Large Sparse Matrix Problems in Industrial Applications, October 2003.
71. *Ordering Schemes for Preconditioning with Sparse Incomplete Factors*, I. Lee*, P. Raghavan, and E. Ng, Proceedings of the 2003 International Conference on Preconditioning Techniques for Large Sparse Matrix Problems in Industrial Applications, October 2003.
72. *Automating the Development of Thermodynamic Database*, D. W. Shin, W. Stevenson, P. Raghavan and Z. K. Liu, In Proceedings of Calphad XXXII, La Malbaie, Quebec, Canada May 2003.
73. *Scalable Preconditioning Using Incomplete Factors*, P. Raghavan, K. Teranishi*, and E.

- Ng, Proceedings of the Tenth SIAM Conference on Parallel Processing for Scientific Computing, Portsmouth VA, pp. 231–239, March 2001.
74. *A New Recursive Implementation of Sparse Cholesky Factorization*, J. J. Dongarra and P. Raghavan, Proceedings of the 16th IMACS World Congress on Scientific Computation, Applied Mathematics and Simulation. Lausanne, Switzerland, August 2000.
 75. *Performance of ICCG*, J. R. Gilbert, E. G. Ng and B. W. Peyton and P. Raghavan, Technical Report UT-CS-1997-381, Department of Computer Science, University of Tennessee, 1997.
 76. *Performance of Greedy Ordering Heuristics for Sparse Cholesky Factorization*, E. G. Ng and P. Raghavan, Proceedings of the 15th IMACS World Congress on Scientific Computation, Modelling and Applied Mathematics, Vol. 2, Editor A. Sydow, Wissenschaft Technik Verlag pp. 325–330, August 1997.
 77. *Efficient Parallel Triangular Solution with Selective Inversion*, P. Raghavan, Proceedings, Householder Symposium XIII, pp. 169–171, June 1996.
 78. *Line and Plane Separators*, P. Raghavan, Technical Report UIUCDCS-R-93-1794, Department of Computer Science, University of Illinois, February 1993.
 79. *Parallel Sparse Matrix Factorization: QR and Cholesky Decompositions*, P. Raghavan, Ph.D. Thesis, Technical Report, Department of Computer Science, The Pennsylvania State University, December 1991.

REPORTS TO GOVERNMENT AGENCIES

80. The Department of Energy, MICS and OBER, Workshop on Mathematics of the Genomes to Life Program; participant, report submitted to DOE, March 2002.
81. The National Science Foundation, CISE Advanced Computational Research (ACR) Program, Review, Committee of Visitors Report, M. McRobbie, B. Hamann, C. Johnson, P. Papadopoulos, P. Raghavan, September 2001.

INVITED PRESENTATIONS

The following is a list of invited presentations by Raghavan; this list does not include presentations by co-authors.

- *When Sparse Applications Meet Architectures*, P. Raghavan, Thirteenth SIAM Conference on Parallel Processing for Scientific Computing, SIAM-PP08, Atlanta, March 12-14, 2008. **Invited Plenary.**
- *Scalable Parallel Preconditioning through Selective Sparse Approximate Inversion*, P. Raghavan, Third Asian-Pacific Congress on Computational Mechanics, with the Eleventh International Conference on Enhancement and Promotion of Computational Methods in Engineering and Science, Kyoto International Conference Center, Kyoto, Japan, Dec 3-6, 2007. **Invited Plenary.**
- *Parallel Hybrid Preconditioners*, P. Raghavan, 2007 International Conference on Preconditioning Techniques for Large Sparse Matrix Problems, Toulouse, France, July 9-12, 2007. **Invited Plenary.**
- *Readily Regenerable Reduced Microstructure Representations*, P. Raghavan, 1007 ASM/TMS Annual Symposium, Computational Materials Design, GE Global Research, Niskayuna,

NY, August 20-21, 2007.

- *Sparse Computations and Computer Architecture: Improving Performance and Energy Profiles*, P. Raghavan, Computer Science and Engineering, The Ohio State University, Dec 7, 2006.
- *Power-Aware High Performance Scientific Computing*, P. Raghavan, International Symposium for Integrated Predictive Simulation System for Earthquake and Tsunami Disaster, University of Tokyo. Japan, October 23, 2006. **Invited Plenary.**
- *SuperSolvers: Hybrid, Adaptive and Composite Solvers*, P. Raghavan, International Workshop on Numerical Methods and Large-Scale Scientific Computation, University of Tokyo. Japan, October 25, 2006.
- *Cyberinfrastructure Challenges for Materials Design Optimization*, P. Raghavan, Workshop on Cyberinfrastructure for Materials Science, National Science Foundation, Division of Materials Research, Washington DC, Aug. 2006.
- *Parallel Hybrid Solvers*, P. Raghavan, K. Teranishi, B. F. Smith, SIAM Annual Meeting, Boston, July 12 - 15, 2006.
- *Energy Aware Optimizations for Sparse Scientific Computing*, K. Malkowski, P. Raghavan, and M. J. Irwin, Architectures and Algorithms for Petascale Computing, Dagstuhl Seminar, Schloss Dagstuhl, International Conference and Research Center For Computer Science Universitdt des Saarlandes, Germany, February 12 - 17, 2006. **Invited Plenary.**
- *Parallel Scientific Computing and Its Applications*, P. Raghavan, Information Technology Division, Air Force Rome Laboratory, Rome, NY, September 7, 2005.
- *Multi-Method Solvers For Improving the Performance of PDE-Based Simulation*, P. Raghavan, S. Bhowmick, L. C. McInnes and B. Norris, Eighth SIAM Conference on Applied Linear Algebra, Williamsburg, VA, July 15 - 19, 2003.
- *Composite and Adaptive Solvers*, P. Raghavan, S. Bhowmick, L. McInnes, and B. Norris, Challenges in High Performance Simulations for Science and Engineering, Dagstuhl Seminar 03111, Schloss Dagstuhl, International Conference and Research Center For Computer Science Universitdt des Saarlandes, Germany, March 9 - 14, 2003. **Invited Plenary.**
- *Application of Graph-Theoretic Methods for Information Filtering and Retrieval*, P. Raghavan and M. W. Berry, SIAM 50th Anniversary and Annual Meeting, Philadelphia, PA, July 6 - 14, 2002.
- *Sparse Matrix Methods For Improving the Performance of Two Applications*, P. Raghavan, The Lawrence Berkeley Laboratory, University of California, Berkeley, CA, June 21, 2001.
- *Robust Limited-Memory Sparse Solvers*, P. Raghavan, The Maria-Goeppert Mayer Award Presentation, Argonne National Laboratory and the University of Chicago, Argonne, IL, May 14, 2001.
- *Parallel Sparse Solvers*, P. Raghavan, The Theory Center, Cornell University, Ithaca, NY, November 17, 2000.
- *Preprocessing using Level Search*, P. Raghavan and M. W. Berry, SIAM Conference on Linear Algebra, Raleigh, NC, October 23 - 25, 2000.
- *Symbolic Techniques for Information Filtering*, P. Raghavan, M. W. Berry and X. Zhang, Workshop on Computational Information Retrieval, Raleigh, NC, October 22, 2000.
- *Sparse Matrix Methods*, P. Raghavan, University of Kentucky, October 12, 1998.
- *A Tutorial on Sparse Matrix Computations*, P. Raghavan, IMA Workshop for Algorithms for Institute for Mathematics and its Applications, Program in *Mathematics in High Performance Computing*. University of Minnesota, Minneapolis, MN, September 16 - 20, 1996.

- *Parallel Sparse Triangular Solution with Selective Inversion*, P. Raghavan, Thirteenth Householder Meeting, Pontresina, Switzerland, June 17 - 21, 1996.
- *Parallel Sparse Direct Solution*, P. Raghavan, Department of Computer Science, University of Houston, Houston, TX, December 6, 1995.
- *Parallel Nested Dissection*, P. Raghavan, SIAM-SEAS Conference, Charleston, NC, March 24, 1995.
- *A Fully Parallel Solution of Sparse Linear Systems*, P. Raghavan, University of Florida, Gainesville, FL, February 1994.
- *The Parallel Solution of Sparse Symmetric Positive Definite Systems*, P. Raghavan, University of Maryland, College Park, MD, November 1993.
- *Distributed Solution of Sparse Symmetric Positive Definite Systems*, M. T. Heath and P. Raghavan, 1993 Scalable Parallel Libraries Conference, Starkville, MI, October 1993.
- *Parallel Solution of Sparse Linear Systems*, P. Raghavan, Argonne National Laboratory, Argonne, IL, February 1992.
- *Parallel Sparse Matrix Factorization*, P. Raghavan, Center for Supercomputing Research and Development, Urbana, IL, April 1991.
- *Sparse Matrix Factorization*, P. Raghavan, ICASE, NASA Langley Center, Norfolk, VA, March 1991.
- *Distributed Cholesky and Orthogonal Factorization*, P. Raghavan, Advanced Computing Research Institute, Cornell University, Ithaca, NY, March 1991.

CONTRIBUTED PRESENTATIONS IN CONFERENCES AND WORKSHOPS

In the following list, the presenter is listed first; presentations by collaborators are not listed prior to 2001.

- *Phase-Aware Hardware Adaptivity for Energy-Aware High Performance Computing*, K. Malkowski, P. Raghavan, M. Kandemir and M.J. Irwin, International Symposium on Low Power Electronics and Design 2007 (ISLPED 2007), Portland, OR, August 27 - 29, 2007.
- *Analysis of the IPv4 Address Space Delegation Structure*, A. Sriraman, K. Butler, P. McDaniel and P. Raghavan, IEEE Symposium on Computers and Communications (ISCC'07), Aveiro, Portugal, July 1-4.
- *On-Line Microstructure Repository for Predictive Analyses*, K. Teranishi, P. Raghavan, Z. K. Liu, and L. Q. Chen, Costa Mesa, CA, February 20 - 24, 2007.
- *Adapting Application Execution to Reduced CPU Availability*, Y. Ding, M. Kandemir, P. Raghavan and M.J. Irwin, INTERACT at IEEE 13th International Symposium on High Performance Computer Architecture, HPCA-INTERACT'07, Phoenix, Arizona February 11, 2007.
- *Improving Performance and Power for Sparse Scientific Computing*, P. Raghavan, K. Malkowski, and M. J. Irwin, 2006 SIAM Conference on Parallel Processing for Scientific Computing. San Francisco, Feb. 22 - 24, 2006.
- *Parallel Incomplete Cholesky Preconditioner with Selective Sparse Approximate Inversion*, K. Teranishi and P. Raghavan, 2006 SIAM Conference on Parallel Processing for Scientific Computing. San Francisco, Feb. 22 - 24, 2006.
- *Large scale simulations of branched Si-nanowires*, Madhu Menon, Ernst Richter, Ingyu Lee, Keita Teranishi, Padma Raghavan, The IEEE/ACM International Workshop on High Performance Computing for Nano-science and Technology (HPCNano05) November 16, 2005, Seattle, Washington, USA.

- *Co-Managing Performance and Power for High-Performance Scientific Computing*, S. Akioka*, M. J. Irwin, S. Kennedy, K. Malkowski*, L. C. McInnes, B. Norris, and P. Raghavan, Poster session, IEEE/ACM Supercomputing (SC05), 2005. Seattle, WA. November 15, 2005.
- *A Grid Enabled Multicomponent Materials Design System*, K. Teranishi, P. Raghavan and Z. K. Liu, SIAM Conference on Computational Science and Engineering (CSE05), Orlando, FL, Feb. 12– 15, 2005.
- *A Hybrid Parallel Preconditioner Using Incomplete Cholesky Factorization and Sparse Approximate Inversion*, K. Teranishi, and P. Raghavan, The 16th International Conference on Domain Decomposition Methods, New York City, NY, Jan. 12-15, 2005.
- *An Integrated Framework for Multi-Scale Materials Simulation and Design*, Z. K. Liu, L. Q. Chen, P. Raghavan, Q. Du, J. O. Sofo, S. Langer and C. Wolverton, Symposium on Integration of Materials Microstructure in Design Optimization in The 2004 ASME International Design Engineering Technical Conferences and Computers and Information in Engineering Conference, Salt Lake City, UT, September 28 - October 2, 2004.
- *SuperSolvers: Multimethod Adaptive and Composite Solvers*, P. Raghavan, S. Bhowmick, L.C. McInnes, and B. Norris, PARA'04, Workshop On State-Of-The-Art In Scientific Computing, Lyngby, Denmark, June 20 - 23, 2004.
- *On the Performance of Parallel Preconditioners Based on Factors and Inverses*, P. Raghavan and K. Teranishi, PARA'04, Workshop On State-Of-The-Art In Scientific Computing, Lyngby, Denmark, June 20 - 23, 2004.
- *Towards A Grid Enabled System for Multicomponent Materials Design*, K. Teranishi, P. Raghavan and Z.K. Liu, IEEE International Symposium on Cluster Computing and the Grid, Chicago, Illinois, April 19 - 22, 2004.
- *ITR: Computational Tools for Multicomponent Materials Design*, Z. K. Liu, L. Q. Chen, Q. Du, P. Raghavan, J. Sofo, S. A. Langer and C. C. Wolverton, TMS Annual Meeting, Charlotte, NC, March 14 - 18, 2004.
- *Automating Multicomponent Materials Design*, K. Teranishi, P. Raghavan and Z. K. Liu, Symposium on *Computational Thermodynamics and Phase Transformations*, 2004 Annual TMS Meeting, Charlotte, NC, March 14 - 18, 2004.
- *An Empirical Study of Parallel Preconditioning Schemes for Sparse Linear System Solution*, K. Teranishi, P. Raghavan, and B. F. Smith, The Eleventh SIAM Conference on Parallel Processing, San Francisco, CA, February 25 - 27, 2004.
- *Data Mapping Techniques for Parallel Sparse Factorization*, K. Malkowski, and P. Raghavan, The Eleventh SIAM Conference on Parallel Processing, San Francisco, CA, February 25 - 27, 2004.
- *Combinatorial Schemes for Developing Composite and Adaptive Solvers*, S. Bhowmick, L.C. McInnes, B. Norris and P. Raghavan, The Eleventh SIAM Conference on Parallel Processing, San Francisco, CA, February 25 - 27, 2004.
- *Ordering Schemes for Preconditioning with Sparse Incomplete Factors*, P. Raghavan, I. Lee and E. Ng, 2003 International Conference On Preconditioning Techniques For Large Sparse Matrix Problems In Scientific And Industrial Applications Napa, October 27 - 29, 2003.
- *Adaptive Sparse Linear Solvers for Implicit CFD Using Newton-Krylov Algorithms*, B. Norris, L. McInnes, S. Bhowmick, P. Raghavan, Second MIT Conference on Computational Fluid and Solid Mechanics, Massachusetts Institute of Technology, Boston, MA, June 17 - 20, 2003.

- *Dimension Reduction in Spectral Element Methods*, P. Fischer, I. Lee, P. Raghavan, and S. Schofield, Second MIT Conference on Computational Fluid and Solid Mechanics, Massachusetts Institute of Technology, Boston, MA, June 17 - 20, 2003.
- *Automation of thermodynamic database development*, D. Shin, W. Stevenson, P. Raghavan and Z. K. Liu. CALPHAD XXXII, La Malbaie, Quebec, Canada, May 25 - 30, 2003.
- *The Role of Multi-Method Linear Solvers in PDE-Based Simulations*, S. Bhowmick, L. McInnes, B. Norris and P. Raghavan, 2003 International Conference on Computational Science and its Applications, ICCSA 2003, Montreal, Canada May 18 - 21, 2003.
- *Time-Memory Trade-offs Using Sparse Matrix Methods For Large-Scale Eigenvalue Problems*, K. Teranishi, P. Raghavan and C. Yang, 2003 International Conference on Computational Science and its Applications, ICCSA 2003, Montreal, Canada May 18 - 21, 2003.
- *Parallel Preconditioning Using Blocked Incomplete Cholesky Factorization and Selective Inversion*, K. Teranishi, P. Raghavan and E. Ng, SIAM Conference on Computational Science and Engineering, San Diego, CA, Feb. 10 - 13, 2003.
- *Improving the Run-Time of PDE Based Simulations Using Multimethod Solvers*, S. Bhowmick, L. McInnes, B. Norris and P. Raghavan, SIAM Conference on Computational Science and Engineering, San Diego, CA, Feb. 10 - 13, 2003.
- *A New Data-Mapping Scheme For Latency-Tolerant Distributed Sparse Triangular Solution*, K. Teranishi, P. Raghavan and E. Ng, Supercomputing 2002, Baltimore, MD, November 22 - 26, 2002.
- *A New Scheme for Developing Composite Solvers*, S. Bhowmick, P. Raghavan and K. Teranishi, SIAM 50th Anniversary and Annual Meeting, Philadelphia, PA, July 6 - 14, 2002.
- *A Combinatorial Scheme for Developing Efficient Composite Solvers*, P. Raghavan, S. Bhowmick, and K. Teranishi, International Conference on Computational Science, Workshop on Modern Numerical Algorithms, Amsterdam, Netherlands, April 24 - 28, 2002.
- *Experiences with FETI-DP in a Production Level Finite Element Code*, K. Pierson, G. Reese, and P. Raghavan, 14th International Conference on Domain Decomposition methods, Cocoyoc, Morelos, Mexico, January 6 - 11, 2002.
- *Scalable Incomplete Factorizations*, E. Ng, P. Raghavan, and K. Teranishi, Workshop on Scalable Solver Software 2001 - Multiscale Coupling and Computational Earth Science, The University of Tokyo, Japan, December 2001.
- *Performance of Incomplete Factorization Preconditioners*, E. Ng, B. Peyton, P. Raghavan and K. Teranishi, SIAM Annual Meeting, San Diego CA, July 2001.
- *Towards Scalable Preconditioning Using Incomplete Factorization*, P. Raghavan, K. Teranishi and E. Ng, International Conference on Preconditioning Techniques in Industrial Applications, Tahoe City CA, April 2001.
- *Scalable Preconditioning Using Incomplete Factors*, K. Teranishi, P. Raghavan and E. Ng, The Tenth SIAM Conference on Parallel Processing for Scientific Computing, Portsmouth VA, March 2001.
- *A Grid Computing Environment for Enabling Large Scale Quantum Mechanical Simulations*, P. Raghavan and J. Dongarra, GRID'2000: IEEE/ACM International Workshop, Bangalore, India, December 15 - 20, 2000.
- *Large-scale Normal Coordinate Analysis on Distributed Memory Multiprocessors and NOWs*, P. Raghavan and C. Yang, First SIAM Conference on Computational Science and Engineering, Washington, DC, September 21 - 24, 2000.

- *Hybrid Sparse Solvers with Efficient Triangular Solves*, P. Raghavan and E. Ng, Ninth SIAM Conference on Parallel Processing, San Antonio, TX, March 1999.
- *Tools for Mapping Applications to CCMs*, P. Raghavan, M. Jones, and M. A. Langston, SPIE International Symposium on Voice, Video, and Data Communications, Configurable Computing: Technology and Applications, Boston, MA, November 1 - 5 1998.
- *A Cache-Efficient Blocked Incomplete Cholesky Preconditioner*, Fourth IMACS International Symposium on Iterative Methods in Scientific Computation, University of Texas, Austin, TX, October 18 - 20, 1998.
- *Performance of Greedy Ordering Heuristics*, P. Raghavan and E. Ng, Sixth SIAM Conference on Applied Linear Algebra, Snowbird, UT, November 1, 1997.
- *The Performance of Parallel Sparse Triangular Solution*, P. Raghavan, Eighth SIAM Conference on Parallel Processing, Minneapolis, MN, March 1997.
- *Minimum Deficiency Orderings*, P. Raghavan and E. Ng, Second SIAM Conference on Sparse Matrices, Coeur d'Alene, ID, October 9 - 11, 1996.
- *Parallel Contracted Ordering*, P. Raghavan, Seventh SIAM Conference on Parallel Processing, San Francisco, CA, February 1995.
- *Distributed Sparse Gaussian Elimination and Orthogonal Factorization*, P. Raghavan, Scalable High Performance Computing, Knoxville, TN, May 1994.
- *Parallel Solution of Linear Systems*, P. Raghavan and M. T. Heath, Sixth SIAM Conference on Parallel Processing, Norfolk, VA, March 1993.
- *Parallel Sparse Matrix Methods*, P. Raghavan and A. Pothen, Thirty-Ninth SIAM Annual Meeting, Washington, DC, July 1991.
- *Distributed Sparse Matrix Factorization*, Fifth SIAM Conference on P. Raghavan and A. Pothen, Parallel Processing, Houston, TX, March 1991.
- *Orthogonal Factorization on a Distributed Memory Multiprocessor*, P. Raghavan and A. Pothen, SIAM Conference on Sparse Matrices, Salishan, OR, May 1989.

PADMA RAGHAVAN: RESEARCH SUPERVISION AND EDUCATION

POST-DOCTORAL RESEARCH SUPERVISION

- K. Teranishi, Project: NSF Information Technology Research, *ITR: Computational Tools For Multicomponent Materials Design (DMR-0205232)*, August 2002 - August 2007.
- S. Akioka, Project: NSF Software Tools for High-End Computing, *Adaptive Software for Extreme-Scale Scientific Computing: Co-Managing Quality-Performance-Power Trade-offs*, October 2004 - October 2007.

STUDENT THESIS SUPERVISION

In the list below, Raghavan is the advisor except when noted as a co-advisor.

— At The Pennsylvania State University.

- Doctoral Dissertations
 - S. Bhowmick, Ph.D., *Multimethod Adaptive and Composite Solvers: Algorithms, Software and Applications*, December 2004.
 - K. Teranishi, Ph.D., *Scalable Hybrid Sparse Linear Solvers*, December 2004.
 - I. Lee, *Preconditioning and its Applications to Computational Nanomechanics Modeling*, May 2007.
 - K. Malkowski, *Power-Aware High-Performance Computing for PDE-Based Modeling Applications*, anticipated graduation 2008.
 - A. Chatterjee, *Multiresolution Schemes for N-Body Problems*, anticipated graduation 2009.
 - Manu Shantharam, *Predictive Models of Chip Multiprocessors*, anticipated graduation 2009.
- M. S. Theses
 - S. Poku, M. Eng., *An Evaluation of Parallel Sorting Schemes*, Advisor, May 2006.
 - J. Sun, M. S., *Effective Computational Modeling of Localized Nonlinearities in Large Scale Material Processing Problems*, Advisor, July 2005.
 - X. Ding, M.S., *Data Mining in Bioinformatics*, Co-Advisor, May 2004.
 - W. Stevenson, M. Eng., *Automating Gibbs-Energy Modeling of Pure Elements*, May 2004.
 - A. Sriraman, *An Analysis of IPV4 Delegation Structure*, May, 2007.
 - C. Walker, *Defending Against Computer Worms: A Survey of Defense Mechanisms*, July 2007.
 - A. Viswanath, *Graph Embedding Algorithms*, July 2008 (anticipated).

- B. S. Honors Theses
 - B. S. Honors thesis, Computer Engineering, M. A. Carter, *A Study of Complex Networks*, Thesis supervisor, May 2005.
 - B. S. Honors thesis, Computer Engineering, Tian Liang, *ODEs: Solution Methods and Applications*, Thesis supervisor, May 2006.
 - B. S. Honors thesis, Computer Science, Andrew Ruslander, *Computer Flashcards for Learning Japanese*, Thesis supervisor, May 2007.
 - B. S. Honors thesis, Computer Science, Ryan Kaulakis, *Parallel Algorithms for Branch and Bound Optimization*, Thesis supervisor, May 2007.

— At The University of Tennessee.

- J. Koehler, *Symbolic Preprocessing Techniques for Information Retrieval*, M.S., July 2000.
- K. Teranishi, *An Evaluation of Sparse Eigenvalue Methods*, M.S., July 2000.
- M. Iturriaga, *A web-based system for Resource Allocation, Scheduling and Reservation*, M.S., July 2000.
- X. Zhang, *Level Search Techniques for Scalable Information Filtering*, Co-Advisor, M. S., July 1999.
- Y. Li, *Incorporating Sparse Solvers into NetSolve*, M. S., July 1999.
- A. Dongara, *Software Tools for Reconfigurable Computing*, M. S., April 1999.
- T. Harrold, *A Portable Scalable Implementation of a Multifrontal Sparse Cholesky Solver on Distributed Memory Multiprocessors*, M. S., May 1997.
- K. Hart, *The Performance of PRAM Graph Connectivity Algorithms on Message Passing Multiprocessors*, M. S., May 1996.

ADVANCED SCIENTIFIC COMPUTING COURSES

The following graduate and senior undergraduate courses were developed or revamped by Raghavan. Some of these courses also meet the requirements for the Graduate Minor in Computational Science and Engineering.

- *Advanced Topics in Scientific Computing*. Introduces new computational techniques developed in recent decades to enable large-scale modeling and simulation. Topics include Jacobian-free Newton-Krylov (JFNK) methods, Monte-Carlo methods and their applications, parallel random number generation, scale-free networks and their application to interaction networks and disease modeling, and Barnes-Hut and Fast Multipole methods for the N-body problem.
- *Sparse Matrix Computations*. Provides an in-depth study of the design and analysis of serial and parallel sparse linear solvers including direct, iterative, multigrid and domain-decomposition solution schemes and preconditioners.
- *Software Design for Scientific Computing*. Concerns software design aspects specific to scientific computing including the use of libraries (Scalapack) for basic kernels, language interoperability (SIDL), portability, extensibility, performance monitoring and visualiza-

tion tools (ParaGraph, Jumpshot), emerging standards on scientific software components, and the Open Grid Services Architecture.

- *Concurrent Scientific Computing*. An introduction to parallel scientific computing including data and task parallelism, analysis and measurement of speedups and scalability, multi-processor architecture and programming models, and parallel programming with message-passing and Open-MP.
- *Introduction to Numerical Analysis I and II*. Two courses comprising the traditional undergraduate elective sequence in numerical analysis and scientific computing including linear algebra, nonlinear equations, numerical differentiation and integration, and ordinary and partial differential equations and their numerical solution.

PADMA RAGHAVAN: PROFESSIONAL SERVICE

EDITORSHIPS AND SERVICE ON CONFERENCE COMMITTEES

- Associate Editor, SIAM Journal of Scientific Computing, 2005 –present.
- *Parallel Processing for Scientific Computing*, Editors M. H. Heroux, P. Raghavan and H. D. Simon, an edited volume with 23 contributed chapters on the state-of-the art in scientific computing, SIAM book series on Software, Tools, and Environments, November 2006.
- Member, Program Committee, SIAM Workshop on Combinatorial Scientific Computing, in conjunction with SIAM Linear Algebra Conference, October, Monterey, CA, 2009.
- Member, Program Committee, 15th International Conference on High Performance Computing, HiPC 2008, Goa, India.
- Member, Program Committee, 2008 IEEE International Conference on Cluster Computing, Tsukuba, Japan, Sept 29-Oct 1, 2008.
- Member, Program Committee, Applications Track, IEEE/ACM International Parallel & Distributed Processing Symposium 2008, .
- Member, Program Committee, The International Multi-Symposiums on Computer and Computational Sciences (IMSCC'07), Aug. 13-15, Iowa City, Iowa USA, 2007.
- Member, Program Committee, Technical Papers-Applications, and Tutorials, IEEE/ACM Supercomputing 2008.
- Member, Program Committee, Software Track, IEEE/ACM International Parallel & Distributed Processing Symposium 2007.
- Co-Chair, The IEEE Workshop on High Performance Power Aware Computing (HPPAC), 2007, in conjunction with IEEE/ACM International Parallel & Distributed Processing Symposium 2007.
- Member, Program Committee, SIAM Text Mining 2007, in conjunction with the Sixth SIAM International Conference on Data Mining (SDM 2007).
- Associate Editor for papers in the minisymposium *Advanced Algorithms and Software Components for Scientific Computing*, at PARA04: Workshop on State-of-the-art in Scientific Computing, June 20 - 23, 2004, Lyngby, Denmark.
- Member, Program Committee, Tutorials and Workshops, IEEE/ACM Supercomputing 2006, Tampa Fl, November 2006.
- Member, Program Committee, The IEEE/ACM International Workshop on High Performance Computing for Nano-science and Technology (HPCNano06), at IEEE/ACM Supercomputing 2006, Tampa Fl, November 2006.
- Member, Program Committee, The IEEE/ACM International Workshop on High Performance Computing for Nano-science and Technology (HPCNano05), November 16, 2005, Seattle, Washington, USA in conjunction with IEEE/ACM Supercomputing 2005.
- Member, Program Committee, The International Multi-Symposiums on Computer and Computational Sciences (IMSCC'06), June 20-24, Hangzhou, China, 2006.
- Co-Chair, Workshops and Panels Committee, The 2006 Grace Hopper Celebration of Women in Computing, San Diego, CA, October 2006.
- Member, Program Committee, SIAM Text Mining 2006, April 22, 2006, in conjunction with the Sixth SIAM International Conference on Data Mining (SDM 2006).

- Member, Program Committee, Software Track, IEEE/ACM International Parallel & Distributed Processing Symposium 2007.
- Member, International Conference on Computational and Information Sciences (CIS'04), Shanghai, China, December 2004.
- General Co-Chair, The Eleventh SIAM Conference on Parallel Processing for Scientific Computing, San Francisco, CA, February 2004 (with 9 plenary speakers, 50 minisymposia, 1 workshop, 5 short courses, and 388 attendees).
- Member, Workshops and Panels Committee, The 2004 Grace Hopper Celebration of Women in Computing, Chicago, IL, October 2004.
- Member, Program Committee, Eighth Asian Computing Science Conference, Tata Institute of Fundamental Research, Mumbai, India, December 2003.
- Member, Technical Papers Committee, Supercomputing 2003, Phoenix, AZ, November 2003.
- Member, Program Committee, Workshop on Text Mining, SIAM Conference on Data Mining, San Francisco, CA, May 2003.
- Member, Technical Papers Committee, Supercomputing 2002, Baltimore, MD, November 2002.
- Member, Workshops and Panels Committee, The 2002 Grace Hopper Celebration of Women in Computing, Vancouver, BC, Canada, October 2002.
- Member, Program Committee, Workshop on Text Mining, SIAM Conference on Data Mining, Arlington, VA, April 2002.
- Member, Program Committee, The Eighth International Workshop on Solving Irregularly Structured Problems in Parallel, San Francisco, CA, April 2001.
- Member, Program Committee, Workshop on Text Mining, SIAM Conference on Data Mining, Chicago, IL, April 2001.
- Member, Program Committee, The 7th International Workshop on Solving Irregularly Structured Problems in Parallel, Cancun, Mexico, May 2000.
- Member, Technical Papers Committee, Supercomputing 2000, Dallas, Texas, November 2000.

RECENT MINISYMPOSIA ORGANIZATION AT CONFERENCES

- *Co-Managing Performance and Power For Scientific Workloads* E.G. Ng and P. Raghavan, SIAM Conference on Parallel Processing for Scientific Computing, Atlanta, March 12 - 14, 2008.
- *Toward Materials By Design*, K. Teranishi and P. Raghavan, SIAM Conference on Computational Science and Engineering, Costa Mesa, CA, February 20 - 24, 2007.
- *Architecture-Aware Scientific Computing: Improving Performance and Power Characteristics*, M. J. Irwin and P. Raghavan, SIAM Conference on Parallel Processing for Scientific Computing, San Francisco, February 22 - 24, 2006.
- *Challenges in Large-Scale, Nonlinear PDE-based Applications*, L. C. McInnes and P. Raghavan, SIAM Conference on Computational Science and Engineering, Orlando, FL, February 12 - 15, 2005.
- *Advanced Algorithms and Software Components for Scientific Computing*, P. Raghavan, PARA04: Workshop on State-of-the-art in Scientific Computing, June 20 - 23, 2004, Lyngby, Denmark.

- *Multimethod Sparse Solvers for Large Scale Simulations*, L. C. McInnes and P. Raghavan, The Eleventh SIAM Conference on Parallel Processing, San Francisco, CA, February 25 - 27, 2004.
- *New Approaches for Scalable Sparse Linear System Solution*, P. Raghavan, SIAM 50th Anniversary Annual Meeting, Philadelphia, PA, July 6 - 14, 2002.
- *Sparse Matrix Methods*, P. Raghavan, Forty-Seventh SIAM Annual Meeting, Atlanta, GA, May 12 - 14, 1999.
- *Recent Progress in Sparse Direct Methods*, P. Raghavan, Eighth SIAM Conference on Parallel Processing for Scientific Computing, Minneapolis, MN, March 14 - 17, 1997.

COMMITTEES OF CENTERS, INSTITUTES, AND PROFESSIONAL SOCIETIES

- Member, SIAM Committee on Conference Publications, 2006-2007.
- Member coordinator for Penn State in the Great Lakes Consortium, for supercomputing, headed by NCSA at the University of Illinois, 2007-2008.
- Member, Computing Research Association (CRA), Surveys Committee, 2006-2007.
- Member, SIAM Committee on Committees and Appointments, Completed first term 2002 - 2004; elected to serve second term 2004 - 2006. This committee is responsible for appointments to other committees in SIAM.
- Member, SIAM Supercomputing Activities Group, Nominations Committee, 2005.
- The IEEE Technical Committee on Scalable Computing (TCSC) member Executive Committee, coordinator for scientific computing, 2005 -present.
- Director, Scalable Scientific Computing Laboratory, Department of Computer Science and Engineering, The Pennsylvania State University, web-site <http://www.cse.psu.edu/~teranish/SCL>, 2004 - present.
- Member, Committee in-charge of the Graduate Minor in Computational Science and Engineering, offered by the Institute for Computational Science, The Pennsylvania State University, 2004 - 2005.
- Associate Director, The Institute for High Performance Computing, The Pennsylvania State University, 2001 - 2004.
- Member, Technical Steering Committee, Center for Research in Parallel Computation, Rice University, Houston, Texas, 1997 - 1999.

SERVICE AS REFEREE/REVIEWER (PARTIAL LIST OF ACTIVITIES IN MOST RECENT 5 YEARS)

- NSF Office of Cyberinfrastructure, July 2007.
- NSF Office of Cyberinfrastructure, February 2007.
- NSF Industry University Centers Program, June 2006.
- NSF Computer Systems Research, April 2006.
- NSF Computer Infrastructure, November 2005.
- NSF CISE BPC panel, October 2005.
- NSF Computer Networks Research, August 2005.
- NSF Computing Systems Research, June 2005.
- NSF Computing Systems Research, February 2005.
- NSF Computing and Communication Foundations, reviewer, August 2004.

- NSF Information Technology Research review and PI meeting, July 7 - 9, 2004.
- DOE CAREER award review, May 10, 2004.
- NSF Next Generation Software panel, Dec. 3 - 4, 2003.
- DOE Faculty Early CAREER award panel, June 20, 2002.
- NSF Information Technology Research panel, June 5, 2002.
- DOE Workshop on the Genomes to Life Program, March 18 - 19, 2002.
- Member, NSF CISE Advanced Computational Research Program Review, Committee of Visitors September 27, 2001.
- Member, NSF Small Business Innovative Research Panel, July 2000.
- ACM Transactions in Math Software, since 1996.
- SIAM Journal on Matrix Analysis and Applications, since 1996.
- SIAM Journal of Scientific Computing, since 1991.
- The International Journal of Supercomputing Applications, since 1994.
- Numerical Linear Algebra, since 1996.
- Concurrency: Practice and Experience, since 1999.
- BIT, since 1998.

UNIVERSITY, COLLEGE AND DEPARTMENT COMMITTEES (2000 - PRESENT)

This list is a record of recent service at university, college, and department committees at the Pennsylvania State University.

- College of Engineering Promotion and Tenure Committee, member, 2006 - 2008.
- College of Engineering Distinguished Professor and Chair Review Committee, member, 2006 - 2007, chair 2007 - 2008.
- College of Engineering, Strategic Planning Taskforce, 2007.
- College of Engineering Diversity Committee, member, 2006 - 2007.
- Schreyer Honors Advisor, (University), advisor, 2003 - 2007.
- FACAC: Faculty Advisory Committee on Academic Computing (University), member, 2002 - 2005.
- Commission for Women (University), Co-Chair Faculty Issues and Development Committee, and member Executive Committee, 2004 - 2006. Organized Professional Development Workshop for Faculty at Penn State, March 21, 2005.
- Task Force on Scientific Computing (University), member, 2002 - 2003.
- FACIT: Faculty Advisory Committee on Information Technology, (University), member, 2000 - 2001.
- Nominations committee (College of Engineering), member, 2001 - 2002.
- The Engineering Advising committee (College of Engineering), Computer Science advisor at the Engineering Advising Center, 2000 - 2001.
- Strategic committee (Department), member, 2003 - present.
- Hiring committee (Department), member, 2003 - present.
- Teaching Issues committee (Department), 2005- 2006.
- Evan Pugh Nomination (Department), 2005.
- PSU-ACM faculty advisor (Department), 2002 - 2006.
- Graduate committee (Department), member, 2001 - 2006.
- Promotion and Tenure committee (Department), member, 2002 - 2005.
- Publications committee (Department), chair, 2002 - 2005.

- Web-development committee (Department), chair, 2001 - 2002.
- Laboratory committee (Department), member, 2000 - 2001.
- ABET accreditation committee (Department), member, 2000 - 2001.