

**PADMA RAGHAVAN**  
**CURRICULUM VITAE**

Director, Institute for CyberScience (Web-site: <http://www.ics.psu.edu>)  
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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 CyberScience, 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.
- Assistant Professor, Department of Computer Science, The University of Tennessee, August 1994–July 2000. Associate Professor, August 2000–March 2001 (on leave).
- 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.
- Other appointments: Sandia National Laboratory, March 1999–July 2004 (consultant); Oak Ridge National Laboratory, August 1995–July 2004 (research scientist); Lawrence Livermore National Laboratory, March 2009–present (consultant).

**PRESTIGIOUS AWARDS (AFTER RECEIPT OF PH.D.)**

- Best Poster, IEEE/ACM Supercomputing 2010, *Impact of Soft Errors on Sparse Linear Solvers*, S. Srinivasmurthy, M. Shantharam, P. Raghavan and M. Kandemir.
- The Pennsylvania State University Faculty Scholar Medal in Engineering for contributions to parallel scientific computing. 2010.
- The Pennsylvania State University CIC Academic Leadership Program Fellow, 2009–2010.
- 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.
- Faculty Teaching Award, Department of Computer Science and Engineering, The Pennsylvania State University, 2006.
- The Maria Goeppert-Mayer Distinguished Scholar Award, Argonne National Laboratory (Department of Energy) and the University of Chicago, for contributions to scalable parallel techniques for sparse linear system solution, 2002–2003.
- The National Science Foundation, Computer and Information Science and Engineering (CISE) Directorate, CAREER Award (NSF ASC-9502594) 1995–2000.

## **PADMA RAGHAVAN: RESEARCH CONTRIBUTIONS**

Raghavan's research contributions concern *sparsity* as a unifying abstraction from computational science to advanced computing systems toward increasing computational performance by constant factors to orders of magnitude. Her publications are in three major areas including: scalable parallel algorithms; performance modeling and optimizations (for resilience, performance and energy efficiency of advanced computer systems); and computational modeling, simulation and knowledge extraction.

### **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.
3. Problem Solving Environments and Software Tools for High Performance Computing, C.R. Johnson, S. G. Parker, H. M. Bucker, H. P. Langtangen, P. Raghavan, C. J. Douglas, and L. Persson, Proceedings of Dagstuhl 2003 Workshop on Challenges in High Performance Simulations for Science and Engineering, (<http://www10.informatik.uni-erlangen.de/~markus/Dagstuhl03/>).

### **REFEREED ARTICLES IN JOURNALS AND CONFERENCE**

#### **Scalable Parallel Algorithms**

4. Exploiting dense substructures for fast sparse matrix vector multiplication. M. Shantharam\*, A. Chatterjee\*, P. Raghavan, International Journal of High Performance Computing Applications, 25(3): 328-341, 2011.
5. A Multilevel Cholesky Conjugate Gradients Hybrid Solver for Linear Systems with Multiple Right-hand Sides. J. Booth\*, A. Chatterjee\*, P. Raghavan, M. Frasca\*, Procedia Computer Science, 4: 2307-2316, 2011.
6. Parallel Hybrid Preconditioning: Incomplete Factorization with Selective Sparse Approximate Inversion, P. Raghavan and K. Teranishi\*, SIAM J. Scientific Computing 32(3): 1323-1345,

2010.

7. PFFTC: An improved fast Fourier transform for the IBM cell broadband engine. A. Shaffer\*, B. Einfalt, P. Raghavan, *Procedia Computer Science*, 1(1): 1045-1054, 2010.
8. 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.
9. 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.
10. 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.
11. Advanced Algorithms and Software Components for Scientific Computing, P. Raghavan, *Lecture Notes in Computer Science*, No. 3732, *Applied Parallel Computing*, pp. 590–592, 2006.
12. 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, pp. 245–255, May 2005.
13. 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.
14. 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.
15. 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.
16. 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.
17. 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.
18. 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.
19. 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.
20. Towards Scalable Preconditioning Using Incomplete Factorization, P. Raghavan, K. Teranishi\* and E. Ng, *Proceedings of the International Conference on Preconditioning Techniques*, pp. 63–65, November 2001.
21. Towards A Scalable Hybrid Sparse Solver, E. G. Ng and P. Raghavan, *Concurrency: Practice and Experience*, Vol. 12, pp. 1–16, 2000.
22. 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.
23. 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.
24. 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.
25. Efficient Parallel Triangular Solution Using Selective Inversion, P. Raghavan, *Parallel Processing Letters*, Vol. 8, No. 1, pp. 29–40, 1998.

26. 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.
27. Parallel Ordering Using Edge Contraction, P. Raghavan, Parallel Computing, Vol. 23, No. 8, pp. 1045–1067, 1997.
28. 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.
29. Distributed Sparse Gaussian Elimination and Orthogonal Factorization, P. Raghavan, SIAM Journal of Scientific Computing, Vol. 16, pp. 1462–1477, 1995.
30. 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.
31. 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.
32. 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.
33. 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.
34. 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.
35. 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.

**Performance Modeling and Optimization ( for measures such as energy, resilience and speed)**

36. Characterizing the Impact of Soft Errors on Iterative Methods in Scientific Computing. M. Shantharam\*, S. Srinivasmurthy\*, P. Raghavan, International Conference on Supercomputing 2011, 152-161, 2011.
37. Virtual I/O Caching: Dynamic Storage Cache Management for Concurrent Workloads. M. Frasca\*, R. Prabhakar, P. Raghavan, M. T. Kandemir, Supercomputing 2011: 38.
38. Can models of scientific software-hardware interactions be predictive? M. Frasca\*, A. Chatterjee\*, P. Raghavan, Procedia Computer Science, 4: 322-331, 2011.
39. Intra-Application Cache Partitioning, S. P. Muralidhara, M. Kandemir and P. Raghavan, Proceedings of the 24nd IEEE/ACM International Parallel and Distributed Symposium, IPDPS-2010, 1-12.
40. Analyzing the Soft-Error Resilience of Linear Solvers on Multicore Multiprocessors, K. Malkowski\*, P. Raghavan and M. Kandemir, Proceedings of the 24nd IEEE/ACM International Parallel and Distributed Symposium, IPDPS-2010, 1-12.
41. T-NUCA -A Novel Approach to Non-Uniform Access Latency Cache Architectures for 3D CMPs, K. Malkowski\*, P. Raghavan, M. Kandemir and M. J. Irwin, Proceedings of the 6th Workshop on High-Performance, Power-Aware Computing (HPPAC), in conjunction with 24nd IEEE/ACM International Parallel and Distributed Symposium, IPDPS Workshops-2010, 1-8.
42. Intra-Application Shared Cache Partitioning For Multithreaded Applications, S. P. Muralidhara, M. Kandemir and P. Raghavan, Proceedings of 15th ACM SIGPLAN Annual Symposium on Principles and Practices of Parallel Programming (PPoPP 2010), January 2010.
43. Dynamic Core Partitioning for Energy Efficiency. Y. Ding, M. Kandemir, M. J. Irwin and P. Raghavan, Proceedings of the 6th Workshop on High-Performance, Power-Aware Computing (HPPAC), in conjunction with 24nd IEEE/ACM International Parallel and Distributed Symposium, IPDPS-2010, IPDPS Workshops 2010: 1-8.
44. Markov Model Based Disk Power Management for Data Intensive Workloads . R. Garg, S. Woo Son, M. T. Kandemir, P. Raghavan, R. Prabhakar, 9th IEEE/ACM International

- Symposium on Cluster Computing and the Grid, CCGRID 2009: 76-83.
45. Adapting Application Execution in CMPs Using Helper Threads, Y. Ding, M. Kandemir, P. Raghavan and M. J. Irwin. *Journal of Parallel and Distributed Computing*, **Invited Paper**, Vol. 69, No. 9, pp. 790–806, 2009.
  46. Adapting Application Mapping to Systematic Within-die Process Variations on Chip Multiprocessors. Y. Ding, M. Kandemir, M.J. Irwin and P. Raghavan, *Proceedings of International Conference on High Performance Embedded Architectures & Compilers*, pp. 231 – 247, 2009.
  47. Ring Data Location Prediction Scheme for Non-Uniform Cache Architectures, S. Akioa, F. Li, K. Malkowski\*, P. Raghavan, M. Kandemir and M. J. Irwin, *Proceedings of XXVI IEEE International Conference on Computer Design, ICCD'08*, pp. 693–698, 2009.
  48. Performance and Power Impacts of Memory Latency Hiding for Sparse Matrix Vector Multiplication on Multi-Core Architectures, M. Shantharam\*, K. Malkowski\* and P. Raghavan, *Post conference Proceedings of the 9th International Workshop on State-of-the-Art in Scientific and Parallel Computing (PARA 2008)*, May 2008.
  49. 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*, pp. 1–14, DOI: 10.1109/IPDPS.2008.4536297. **Best Paper, Software Track; 4 Best Papers, one per track out of 410 submitted papers.**
  50. 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*, pp. 1– 10, DOI:0.1109/IPDPS.2008.453631, April 2008.
  51. Managing Power, Performance and Reliability Trade-offs, P. Raghavan, M. Kandemir, M. J. Irwin and K. Malkowski, *Next Generation Software Workshop, Proceedings of 22nd IEEE/ACM International Parallel and Distributed Symposium, IPDPS-2008*, pp. 1– 6, April 2008.
  52. Towards Energy Efficient Scaling of Scientific Codes Y. Ding, K. Malkowski\*, P. Raghavan and M. Kandemir, *High-Performance, Power-Aware Computing Workshop. Proceedings of 22nd IEEE/ACM International Parallel and Distributed Symposium, IPDPS-2008*, pp. 1–8, April 2008.
  53. 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*, pp. 24–31, February 2007.
  54. Analysis of the IPv4 Address Space Delegation Structure, A. Sriraman\*, K. Butler, P. McDaniel and P. Raghavan, pp. 501–508, *IEEE Symposium on Computers and Communications (ISCC'07)*, DOI: 10.1109/ISCC.2007.4381538, July 2007.
  55. Scientific Algorithms: Performance, Power, Thermal Properties on Modern Computing Architectures, I. Lee\*, P. Raghavan, *Workshop on Unique Chips and Systems (UCAS-3)*, pp. 1–8, April 2007.
  56. 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*, pp. 1–8, DOI:10.1109/IPDPS.2007.370536, March 2007.
  57. 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*, pp. 1–8, DOI:10.1109/IPDPS.2007.370501, March 2007.
  58. 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, Vol. 41, No. 3, pp. 179–213, September 2007.
  59. Phase-Aware Adaptive Hardware Selection for Power-Efficient Scientific Computing, K. Malkowski\*, P. Raghavan, M. Kandemir and M. J. Irwin, *ISLPED*, pp. 403–406, DOI:10.1145/1283780.1283869, August 2007.
  60. 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, High-Performance, Power-Aware Computing*

Workshop, pp. 1–8, March 2007.

61. 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, pp. 1–8, DOI:10.1109/IPDPS.2006.1639589, April 2006.
62. 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, Second High-Performance, Power-Aware Computing Workshop, pp. 1–8, DOI: 10.1109/IPDPS.2006.1639595, April 2006.
63. 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, pp. 1–8, DOI:10.1109/IPDPS.2006.1639596, April 2006.
64. 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.
65. 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.
66. Reducing Power with Performance Constraints for Parallel Sparse Applications, G. Chen, 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.

### **Computational Modeling, Simulation and Knowledge Extraction**

60. Feature Subspace Transformations for Enhanced Unsupervised Classification, A. Chatterjee\*, S. Bhowmick and P. Raghavan, under review, Transactions on Knowledge and Data Engineering.
61. Characterizing sparse preconditioner performance for the support vector machine kernel. A. Chatterjee\*, K. Fermoye\*, P. Raghavan, Procedia Computer Science 1(1): 367-375, 2010.
62. Hybrid Techniques for Fast Multicore Simulation, M. Shantharam\*, P. Raghavan and M. Kandemir, Euro-Par 09: Proceedings of the 15th International Euro-Par Conference on Parallel Processing, pp. 122–134, Springer Verlag, 2009.
63. Towards Low-Cost, High-Accuracy Classifiers for Linear Solver Selection, S. Bhowmick, B. Toth\* and P. Raghavan, Proceedings of International Conference on Computational Science 2009, pp. 463–472. Lecture Notes in Computer Science, Vol, 5544, Springer, 2009.
64. FAST: Force-directed Approximate Subspace Transformation to Improve Unsupervised Document Classification, A. Chatterjee\*, S. Bhowmick and P. Raghavan, Proceedings of SIAM Text Mining in conjunction with the Eighth SIAM International Conference on Data Mining (SDM), 8 pages, April 2008.
65. 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, Wiley InterScience, DOI: [www.interscience.wiley.com](http://www.interscience.wiley.com),10.10002/nme.2239, 34 pages, November 2007.
66. Readily Regenerable Reduced Microstructure Representations, K. Teranishi\*, P. Raghavan, J. Zhang, T. Wang, L. Q. Chen and Z. K. Liu, Computational Materials Science, DOI: [//dx.doi.org/10.1016/j.commatsci.2007.07.015](http://dx.doi.org/10.1016/j.commatsci.2007.07.015), 18 pages, March 2008.
67. Si Nanotrees: Structure and Electronic Properties, M. Menon, E. Richter, I. Lee\* and P. Raghavan, J. of Computational and Theoretical Nanoscience, Vol. 4, pp. 250–256, 2007.

68. 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.
69. 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), November 2005.
70. 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, August 2005.
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72. 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.
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75. 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.
76. 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.
77. 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.
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81. 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
82. 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.
83. 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.
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M. A. Nasir, P. Raghavan, W. C. Chew and M. T. Heath, Proceedings of IEEE APS International Symposium, pp. 447–450, June 1994.

## REPORTS TO GOVERNMENT AGENCIES

85. The Department of Energy, MICS and OBER, Workshop on Mathematics of the Genomes to Life Program; participant, report submitted to DOE, March 2002.
86. 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.

## 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/key personnel).

## BASIC RESEARCH AND INSTRUMENTATION

- National Science Foundation, CNS Data-Intensive Computing, DC: Small: Adaptive Sparse Data Mining on Multicores, P. Raghavan and M. Kandemir, \$449,998. **In Progress, PI.**
- National Science Foundation, CISE Computer Systems Research, SHF: Medium: Automatic Control Driven Resource Management in Chip Multiprocessors, M. Kandemir, P. Raghavan and Q. Wang, \$1,200,000. **In Progress, Co-PI.**
- National Science Foundation, CISE HECURA program, Collaborative Research: Achieving End-to-End QoS in the I/O Stack on Petascale Multiprocessors, M. Kandemir, P. Raghavan, J. Dennis and Q. Wang, \$708,551, 2009–2012. **In progress, Co-PI.**
- National Science Foundation, Major Research Instrumentation Program, MRI Acquisition of A Scalable Instrument for Discovery through Computing, P. Raghavan, L. Q. Chen, P. J. Hudson, M. T. Kandemir and B. K. Smith, \$1,855,501, 2008–2012. **In progress, PI.**
- National Science Foundation, CISE-Computer Systems Research, Model-Driven Multilevel Analysis and Optimization of Multicomponent Computer Systems, P. Raghavan, M. J. Irwin, M. Kandemir, J. Li and S. Shontz, \$855,729, 2007–2010. **In progress, PI.**
- U.S. Army Corps of Engineers, Engineer Research and Development Center, A Smart Solver Selection Toolkit for Faster PDE-Based Simulations, P. Raghavan, \$105,849, 2009– 2011. **Completed, PI.**
- National Science Foundation, CISE CCF Theoretical Foundations, Toward a Linear Time Sparse Solver with Locality-Enhanced Scalable Parallelism, P. Raghavan, \$200,000, 2008–2011. **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.**
- Maryland Procurement Office (DoD), CMP Optimizations-Parts I & II, P. Raghavan, \$184,571, 2007–2009. **Completed, PI.**
- IBM, SUR grant (hardware, Cell Blade) Toward a Parallel Preconditioned Conjugate Gradients Sparse Solver for the Cell Processor, P. Raghavan, V. Agarwala and J. Nucciarone. \$100,000, October 2007–October 2008, **Completed, 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) \$950,000, 2004–2009. **Completed, 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, 2006–2007. **Completed, 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, 2002–2008. **Completed, 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, 2002–2006. **Completed, Co-PI.**
- National Science Foundation, (I<sup>3</sup>C): An Infrastructure for Innovation in Information Computing (CNS-0102007), C. Das, R. Acharya, L. Giles, M. J. Irwin and P. Raghavan. \$1,795,729, 2002–2008. **Completed, 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, 2002–2005. **Completed, PI.**
- Argonne National Laboratory (Department of Energy) and the University of Chicago, The Maria Goeppert-Mayer Distinguished Scholar Award, P. Raghavan, \$171,349, 2002–2003. **Completed, PI.**
- National Science Foundation, Robust Limited Memory Hybrid Sparse Solvers (0102537), P. Raghavan, \$315,473, 2001–2005. **Completed, PI.**
- National Science Foundation, Fabrication of Fullerene Based Novel Molecular Electronic Devices Using Quantum Mechanical Simulations, M. Menon and P. Raghavan, \$87,078, 2001–2002. **Completed, PI.**
- National Aeronautics and Space Administration (NASA), An Efficient Scheme for Updating Sparse Cholesky Factors, P. Raghavan, \$20,000, 2001–2002. **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, 2000–2003. **Completed, Co-PI.**
- 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, instrumentation, \$12,000, 1999–2000. **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, 2000–2005. **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, 1999–2002. **Completed, Co-PI.**
- National Science Foundation, Scalable Sparse Solvers, P. Raghavan, \$182,000, 1998–2002. **Completed, PI.**
- National Science Foundation, High-Performance ATM Network, M. W. Berry, J. Gregor, M. T. Jones, J. S. Plank and P. Raghavan, \$100,000, 1996–1997. **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, 1996–1999. **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, 1996–1999. **Completed, PI.**
- National Science Foundation, Parallel Sparse Matrix Computations, P. Raghavan, **CAREER award**, \$131,651, 1995–2000. **Completed, PI.**

## TECHNICAL REPORTS AND ARTICLES REFEREED BY ABSTRACT

This list does not duplicate articles listed in other sections.

1. Evaluating the role of scratchpad memories in multi-cores for sparse matrix computations, 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 (**Nominated for Best Poster Award**).
2. 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, 2007.
3. 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, 2006.
4. 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, 2005.
5. 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.
6. Ordering Schemes for Preconditioning with Sparse Incomplete Factors, I. Lee\*, P. Raghavan and E. Ng, 2003 International Conference on Preconditioning Techniques for Large Sparse Matrix Problems in Industrial Applications, October 2003.
7. 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.
8. 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.
9. 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.
10. 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.
11. 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, Wissenschaft Technik Verlag pp. 325–330, August 1997.
12. Efficient Parallel Triangular Solution with Selective Inversion, P. Raghavan, Proceedings, Householder Symposium XIII, pp. 169–171, June 1996.
13. Line and Plane Separators, P. Raghavan, Technical Report UIUCDCS-R-93-1794, Department of Computer Science, University of Illinois, February 1993.
14. 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.

## RECENT SOFTWARE

These are based on 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, (<http://www.cse.psu.edu/~raghavan/Dscpack/>).

- 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, Computer Science and Engineering, The Pennsylvania State University, University Park, PA 16802, 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/>).
  - Limited-use release to industry partners at the Center for Computational Materials Design (CCMD), see center web-site (<http://www.ccmd.psu.edu>).

## INVITED PRESENTATIONS (MOST RECENT 5 YEARS)

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

- Professional Development Workshop, P. Raghavan, CRA-W Distinguished Professor for NSF-sponsored Cohort of Associate Professors Project, Providence, RI, June 25-26, 2010.
- Energy-Aware Scheduling for Scalable Matrix Computations, P. Raghavan, Scheduling for large-scale systems, Knxoville, May 13-115, 2009.
- Energy Aware Algorithms at the Exascale, P. Raghavan, Power Efficiency and the Path to Exascale Computing Workshop at SC08, Supercomputing 2008, Miami, November 16, 2008. **Invited Plenary.**
- 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, December 3-6, 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. **Invited Plenary.**
- Workshop on Computational Education for Scientists, Microsoft Research, Redmond, WA, September 27-28, 2007.
- Parallel Hybrid Preconditioners, P. Raghavan, 2007 International Conference on Preconditioning Techniques for Large Sparse Matrix Problems, Toulouse, France, July 9-12, 2007. **Invited Plenary.**
- Graduate Cohort Workshop, P. Raghavan, Fourth CRA-W Graduate Cohort Workshop, San Francisco, March 23, 2007.
- Sparse Computations and Computer Architecture: Improving Performance and Energy Profiles, P. Raghavan, Computer Science and Engineering, The Ohio State University, Dec 7, 2006.
- Professional Development Workshop, P. Raghavan, CRA-W Distinguished Professor for NSF-sponsored Cohort of Associate Professors Project, Sannibal, FL, October 20, 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, August 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 Universitat des Saarlandes, Germany, February 12-17, 2006.
- 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 Universitat des Saarlandes, Germany, March 9-14, 2003.

### **CONTRIBUTED CONFERENCE PRESENTATIONS (MOST RECENT 5 YEARS)**

The presenter is listed first; students supervised by Raghavan are indicated by an ‘\*’.

- FAST: Force-directed Approximate Subspace Transformation to Improve Unsupervised Document Classification, A. Chatterjee\*, S. Bhowmick and P. Raghavan, SIAM Text Mining in conjunction with the Eighth SIAM International Conference on Data Mining (SDM), Atlanta, GA, April 26, 2008.
- Preconditioning with Selective Sparse Approximate Inversion, P. Raghavan and K. Teranishi\*, Gene Golub Symposium, University of Illinois, Urbana-Champaign, IL, February 29-March 1, 2008.
- Software Engineering of Phase-field Codes, A. Chatterjee\*, J. Zhang, P. Raghavan and L. Q. Chen, Center for Computational Materials Design Annual Meeting 2008, Atlanta, GA, February 20 -22, 2008.

- Challenges in Parallelizing Irregular Computations, K. Malkowski\* and P. Raghavan, Center for Advanced Studies Conference 2007 (CASCON 2007), Toronto, Canada, October 23 -24, 2007.
- 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, 2007.
- Scientific Algorithms: Performance, Power, Thermal Properties on Modern Computing Architectures, I. Lee\*, P. Raghavan, Workshop on Unique Chips and Systems (UCAS-3), San Jose, CA. April 25, 2007.
- On-Line Microstructure Repository for Predictive Analyses, K. Teranishi\*, P. Raghavan, Z. K. Liu and L. Q. Chen, SIAM Computational Science, 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, AZ, 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, CA, 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, CA, February 22–24, 2006.
- Large scale simulations of branched Si-nanowires, I. Lee\*, E. Richter, M. Menon and P. Raghavan, The IEEE/ACM International Workshop on High Performance Computing for Nano-science and Technology (HPCNano05), Seattle, WA, November 16, 2005.
- 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, February 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, January 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, IL, 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.

## PADMA RAGHAVAN: STUDENT SUPERVISION

- Post-doctoral Research Supervision
  - K. Malkowski, Project: Department of Defense and NSF, CMP Optimization, July 2007– present.
  - S. Akioka, Project: NSF Software Tools for High-End Computing, Adaptive Software for Extreme-Scale Scientific Computing: Co-Managing Quality-Performance-Power Tradeoffs, October 2004–October 2007.
  - K. Teranishi, Project: NSF Information Technology Research, ITR: Computational Tools For Multicomponent Materials Design (DMR-0205232), August 2004–August 2007.
- Doctoral Dissertations
  - S. Kirmani, Can Parallel Partitioning Scale? Anticipated graduation, 2013.
  - J. Brooks, Parallel Hybrid Solvers, anticipated graduation 2013.
  - M. Frasca, Predictive Models of Multicore Performance, anticipated graduation 2012.
  - M. Shantharam, Model-Driven Performance Optimization of Concurrent Scientific Workloads, anticipated graduation 2012.
  - A. Chatterjee, Exploiting Sparsity, Structure and Geometry for Knowledge Discovery, 2011.
  - K. Malkowski, Power-Aware High-Performance Computing, 2008.
  - I. Lee, Sparse Scientific Applications: Improving Performance and Energy Characteristics on Advanced Architectures, 2007.
  - S. Bhowmick, Ph.D., Multimethod Adaptive and Composite Solvers: Algorithms, Software and Applications, 2004.
  - K. Teranishi, Ph.D., Scalable Hybrid Sparse Linear Solvers, 2004.
- M.S. Theses
  - B. Suchoski, Models of GPU Acceleration for Sparse Solvers, anticipated graduation 2012.
  - S. Srinivasamurthy, Impact of Soft Errors on Sparse Linear Solvers, 2011.
  - K. Fermoye, Adaptive Algorithms for Sparse Scientific Computing, 2010.
  - A. Shaffer, PFFTC: An Improved Fast Fourier Transform for the Cell Broadband Engine, May 2009.
  - J. Johnson, Power-Efficiency and Scaling of the Cell Broadband Engine, May 2009.
  - B. Toth, Machine Learning Techniques for Sparse Solver Selection, July 2009.
  - A. Chatterjee, Graph Embedding Enhanced Unsupervised Learning, July 2009.
  - A. Viswanath, Graph Embedding Algorithms, July 2008.
  - A. Sriraman, An Analysis of IPV4 Delegation Structure, co-advisor, May, 2007.
  - C. Walker, Defending Against Computer Worms: A Survey of Defense Mechanisms, co-advisor, July 2007.
  - B. Cover, Evaluating the Role of Scratchpad Memories in Chip Multiprocessors for Sparse Matrix Computations, Co-advisor, April 2007.
  - 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.
  - The following students were supervised 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.
  - 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.
- B. S. Honors Theses
    - 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.
    - 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.

## **PADMA RAGHAVAN: PROFESSIONAL SERVICE**

### **EDITORSHIP(S) AND CONFERENCE COMMITTEE SERVICE (MOST RECENT 5 YEARS)**

- Associate Editor, Journal of Computational Science 2011– present.
- Associate Editor, Journal of Parallel and Distributed Computing, 2010 – present.
- Associate Editor, SIAM Journal of Scientific Computing, 2005–present.
- Editorial Board, SIAM series on Computational Science and Engineering, 2009–present.
- SIAM book series on Software, Tools and Environments, Parallel Processing for Scientific Computing, Editors M. H. Heroux, P. Raghavan and H. D. Simon, 2005–2006.
- Co-Chair Technical Papers, Supercomputing 2012, November 2010 – present.
- Co-Chair, SIAM Conference on Computational Science and Engineering, January 2010 – March 2011.
- Member, SIAM Program Committee, 2010–2013.
- Member, Program Committee, International Conference on Supercomputing (ICS 2011), Tucson, AZ, June 2011.
- Member, Program Committee, International Conference on Preconditioning Techniques for Large Sparse Matrix Problems, Hong Kong, August 24-26, 2009.
- Co-Chair, Invited Technical Speaker, The 2010 Grace Hopper Celebration of Women in Computing, Atlanta, GA, September 28–October 2, 2010.
- Member, Program Committee, The 38th International Conference on Parallel Processing (ICPP-2009), Vienna, Austria, September 22-25, 2009.
- Member, Program Committee, SIAM Text Mining 2009, in conjunction with the Sixth SIAM International Conference on Data Mining (SDM 2009), April 30, Sparks, NV, 2009.
- Member, Program Committee, Algorithms Track, 17th International Conference on High Performance Computing, HiPC 2010, Goa, India, December 19–22, 2010.
- Member, Program Committee, Applications Track, IEEE/ACM International Parallel & Distributed Processing Symposium, April 19-23, Atlanta, GA, 2010.
- Member, Program Committee, Parallel Algorithms and Applications track. ICPADS'09, 15th IEEE International Conference on Parallel and Distributed Systems, Shenzhen, China, December 9–11, 2009.
- Member, Program Committee, PACT'09, International Conference on Parallel Architectures and Compilation Techniques, Raleigh, NC, September 2009.
- Chair, Doctoral Research Showcase and Member, Program Committee, IEEE/ACM Supercomputing, Portland, OR, November 13-20, 2009.
- Member, Program Committee, SIAM Annual Meeting, Denver, CO, July 6–10 2009.
- Member, Program Committee, SIAM Workshop on Combinatorial Scientific Computing, in conjunction with SIAM Linear Algebra Conference, Monterey, CA, October 2009.
- Member, Program Committee, 15th International Conference on High Performance Computing, HiPC 2008, Bangalore, India, December 17–20, 2008.
- Member, Program Committee, 2008 IEEE International Conference on Cluster Computing. Tsukuba, Japan, September 29–October 1, 2008.
- Member, Program Committee, Applications Track, IEEE/ACM International Parallel & Distributed Processing Symposium, May 25-28, Rome, 2009.
- Co-Chair, New Investigators Committee, The 2008 Grace Hopper Celebration of Women in Computing, Keystone Resort, CO, October 1–4, 2008.
- Member, Program Committee, WAGE06, 2nd International Workshop on Workflow Management and Application in Grid Environments, in conjunction with the The 6th International Conference on Grid and Cooperative Computing (GCC 2007). Urumchi, Xinjiang, China, August 16-18, 2007.
- Member, Program Committee, The International Multi-Symposiums on Computer and Computational Sciences (IMSCC'07), Iowa City, IA, August 13–15, 2007.

- Member, Program Committee, Technical Papers-Applications, IEEE/ACM Supercomputing'08, Austin, TX, November 15–20, 2008.
- Member, Program Committee, Software Track, IEEE/ACM International Parallel & Distributed Processing Symposium, Long Beach, CA, March 26–30, 2007.
- Co-Chair, The IEEE Workshop on High Performance Power Aware Computing (HPPAC), 2007, in conjunction with IEEE/ACM International Parallel & Distributed Processing Symposium, Long Beach, CA, March 26–30, 2007.
- Member, Program Committee, SIAM Text Mining 2007, in conjunction with the Sixth SIAM International Conference on Data Mining (SDM 2007), April 26, Minneapolis, MN, 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, Lyngby, Denmark, June 20–23, 2004.
- Member, Program Committee, Tutorials and Workshops, IEEE/ACM Supercomputing 2006, Tampa FL, November 11-17 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 17, 2006.
- Member, Program Committee, The IEEE/ACM International Workshop on High Performance Computing for Nano-science and Technology (HPCNano05), Seattle, WA, in conjunction with IEEE/ACM Supercomputing, November 16, 2005.
- Member, Program Committee, The International Multi-Symposiums on Computer and Computational Sciences (IMSCC'06), Hangzhou, China, June 20–24, 2006.
- Co-Chair, Workshops and Panels Committee, The 2006 Grace Hopper Celebration of Women in Computing, San Diego, CA, October 4-6, 2006.
- Member, Program Committee, SIAM Text Mining 2006, in conjunction with the Sixth SIAM International Conference on Data Mining (SDM 2006), Bethesda, MD, April 22, 2006.
- 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 25-27, 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.

#### **ADVISORY/REVIEW BOARDS AND COMMITTEES (MOST RECENT 5 YEARS)**

- Member, Network for Earthquake Engineering Simulation Governance Board 2011 – present.
- Member, Lawrence Livermore National Laboratory (LLNL), Computation Directorate External Review Committee, 2009–present.
- Member, Blue Waters Petascale Applications Advisory Committee, NCSA and The University of Illinois at Urbana-Champaign, 2009–present.
- Member, National Academies Panel on Digitization and Communications Science, 2009– present.
- Member, National Science Foundation, Office of CyberInfrastructure, Taskforce on Software Infrastructure, 2009.
- Member, Committee on Vision for Simulation Based Engineering and Science Research in the Next Decade, National Science Foundation and WTEC Co., Software section, 2009.
- Member, Board of Trustees, Great Lakes Consortium for Petascale Computing, 2008– present.
- Member, Leveraging University Research for Industrial Competitiveness and Growth, A National Science Foundation Partnerships for Innovation Project, Arlington, Virginia, May 4-5, 2009.
- Founding Director, Institute for CyberScience, a university-wide institute to promote interdisciplinary computational science research organized through the Office of the Vice-President for Research, The

- Pennsylvania State University, 2007–present. Website <http://www.ics.psu.edu/>.
- Member, SIAM Supercomputing Activity Group, Nominating Committee, 2009.
- Member, SIAM Committee on Conference Publications, 2006–2007.
- Member, Computing Research Association (CRA), Surveys Committee, 2006–2007.
- Member, SIAM Committee on Committees and Appointments, 2002–2007 (two terms). 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, 2005–2007.
- Director, Scalable Scientific Computing Laboratory, Department of Computer Science and Engineering, The Pennsylvania State University, 2004–present.

#### **MINISYMPOSIA ORGANIZATION AT CONFERENCES (MOST RECENT 5 YEARS)**

- Algorithms for Data-Mining, S. Bhowmick and P. Raghavan, SIAM Computational Science and Engineering Conference (CSE'09). Miami, FL. March 2-6, 2009.
- Architecture-Aware Scientific Computing, L. Mullin and P. Raghavan, SIAM Annual Meeting (AN08), San Diego, CA, July 7–11, 2008.
- Parallel Scientific Computing: Performance Evaluation, Optimization and Scaling, P. Raghavan, PARA08: Workshop on State-of-the-art in Scientific Computing, Trondheim, Norway, May 13–16, 2008.
- Co-Managing Performance and Power For Scientific Workloads, E.G. Ng and P. Raghavan, SIAM Conference on Parallel Processing, 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, CA, 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, Lyngby, Denmark, June 20–23, 2004.

#### **SERVICE ON PEER-REVIEW PANELS (MOST RECENT 5 YEARS)**

- NSF OCI Sustainable Software, 2011.
- NSF Major Research Instrumentation Panel, 2009, 2010.
- NSF CDI Panel, 2009.
- NSF IGERT Panel, 2008.
- NSF Office of Cyberinfrastructure, 2008.
- NSF IGERT Preproposal Review, 2008.
- NSF CISE BPC Alliance Site Review, 2008.
- NSF Office of Cyberinfrastructure, 2008.
- NSF Office of Cyberinfrastructure, 2007.
- NSF Office of Cyberinfrastructure, 2006.
- NSF Industry University Centers Program, 2006.
- NSF Computer Systems Research, 2006.
- NSF Computer Infrastructure, 2005.
- NSF CISE Broadening Participation in Computing, 2005.
- NSF Computer Networks Research, 2005.
- NSF Computing Systems Research, 2005.

- NSF Computing Systems Research, 2004.
- NSF Computing and Communication Foundations, 2004.
- NSF Information Technology Research review and PI meeting, 2004.
- DOE CAREER award review, 2004.

#### **UNIVERSITY, COLLEGE AND DEPARTMENT COMMITTEES (MOST RECENT 5 YEARS)**

- Network Science Initiative (University), Committee chair. 2009–present.
- College of Engineering, Associate Dean Search Committee, member, 2008.
- College of Engineering Distinguished Professor and Chair Review Committee, member 2006–2007, chair 2007–2008.
- College of Engineering Promotion and Tenure Committee, member, 2006–2008.
- Mechanical and Nuclear Engineering Department, Nuclear Engineering Faculty Hiring Committee, member, 2007–2009.
- College of Engineering, Strategic Planning Taskforce, 2007.
- College of Engineering Diversity Committee, member, 2006–2007.
- Schreyer Honors Advisor, (University), advisor, 2003–2007.
- Faculty Advisory Committee on Academic Computing (University), member, 2002–2005.
- Commission for Women (University), Co-Chair Faculty Issues and Development Committee and member of Executive Committee, 2004–2006.
- Strategic Committee (Department), member, 2003–present.
- Hiring Committee (Department), member, 2003–2009.
- 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, Chair 2007-2008, member 2009, 2011.