Ananth Grama

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Education

- Ph.D., Computer Sciences, University of Minnesota, Minneapolis, MN, May 1996.
- M.S., Wayne State University, Detroit, MI, July 1990.
- B. Engg., Indian Institute of Technology (IIT), Roorkee, India, July 1989.

Research Interests

- Scientific Computing: Computational Biology and Bioinformatics, Particle Dynamics Methods, Sparse Linear System Solvers, and Large-Scale Simulations.
- Parallel and Distributed Computing: Algorithms, Software, and Infrastructure.
- Large Scale Data Handling and Analysis: Data Mining and Compression Techniques.

Employment History

- Professor and University Scholar, Department of Computer Science, Purdue University, W. Lafayette, IN, Aug. 2006 - .
- Associate Professor, Department of Computer Science, Purdue University, W. Lafayette, IN, Aug. 2001 - July 2006.
- Assistant Professor, Department of Computer Science, Purdue University, W. Lafayette, IN, Aug. 1996 - July 2001.
- Assistant Professor, Department of Computer Science, University of Minnesota, Minneapolis, MN, June 1996 - Aug. 1996.
- Visiting Research Scientist, Hewlett Packard Labs, Palo Alto, CA, June 1994 to Nov 1994.

Awards and Honors

- Purdue University Scholar (2002).
- Purdue University School of Science Outstanding Teacher Award (2002).
- National Science Foundation CAREER Award, 1998–2002.
- Purdue University School of Science Outstanding Assistant Professor, 1999.
- Nominated for the Best Student Paper Award at the Supercomputing Conference, 1996.
- Doctoral Dissertation Fellowship, Graduate School of the University of Minnesota, 1995-96.

- Doctoral Dissertation Award, Department of Computer Science, University of Minnesota, in recognition of the research work published in the paper "Scalable Load Balancing Techniques for Parallel Computers", Journal of Parallel and Distributed Computing, 22(1):60–79, 1994.
- Vice-Chancellors Gold Medal for best overall grades among all engineering majors at the Indian Institute of Technology, Roorkee, India, June 1989.
- Vice-Chancellors Gold Medal for best engineering design project titled "Load Balancing in LANs", Indian Institute of Technology, Roorkee, India, June 1989.

Professional/ Scholarly Associations and Service

- Editorial Boards: Parallel Computing, PLoS (Public Library of Science) ONE
- Member, American Association for Advancement of Sciences, Sigma Xi.
- Large number of Program Committees of Premier Conferences in High Performance Computing, Computational Biology and Bioinformatics, Scientific Computing, and Data Mining.
- Study groups and review panels for NSF, NIH, NASA, DoD.

Postdoctoral Scholars and Students

- Current Ph.D. Students: Metin Aktulga, Jayesh Pandey, Karthik Khambatla.
- Graduated Ph.D. Students: Asad Awan (Rinera Networks), Ramanathan Muralikrishna (Coverity), Ronaldo Ferreira (Federal University of Mato Grosso do Sul, Brasil), Mehmet Koyuturk (Case Western Reserve University), Ioannis Ioannidis, Bogdan Carbunar (Motorola Labs).
- Past Post-Doctoral Researcher(s): Dr. Sagar Pandit (University of South Florida), Dr. Mehmet Koyuturk (Case Western Reserve University), Dr. Eric Polizzi (University of Massachussetts), Dr. Pucha Raghuram (now at Georgia Tech.).

Publications

Books (Published)

1. Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, *Introduction to Parallel Computing*, Addison Wesley, 2003 (ISBN: 0-201-64865-2) `http://www.aw.com/catalog/academic/product/1,4096,0201648652,00.html`. (Note: Chinese translation available through the China Machine Press. Hungarian translation under way. Southeast Asian Edition available through Pearson Education Asia, Chinese (english) Edition available through China Machine Press. Please see a recent review of the book in *IEEE Distributed Systems Online* at `http://doi.ieeecomputersociety.org/10.1109/MDSO.2004.12`)
2. Vipin Kumar, Ananth Grama, Anshul Gupta, and George Karypis, *Introduction to Parallel Computing: Design and Analysis of Algorithms*. Benjamin Cummings/ Addison Wesley (ISBN 0-8053-3170-0), 600 pp, Redwod City, 1994.

Journal Articles

1. Bogdan Carbunar, Muralikrishna Ramanathan, Mehmet Koyuturk, Suresh Jagannathan, and Ananth Grama, Efficient Tag Detection in RFID Systems, *Journal of Parallel and Distributed Computing*, 2008 (to appear).

2. Jayesh Pandey, Mehmet Koyuturk, Shankar Subramaniam, and Ananth Grama, Functional Coherence in Domain Interaction Networks, *Bioinformatics* Suppl. to ECCB, 2008 (to appear).

3. Sagar Pandit, See-Wing Chiu, Eric Jakobsson, Ananth Grama, and H. L. Scott, Cholesterol Packing Around Lipids with Saturated and Unsaturated Chains: A Simulation Study, *Langmuir*, 24, 6858-6865, 2008.

4. Ronaldo Ferreira, Mehmet Koyuturk, Suresh Jagannathan, and Ananth Grama, Semantic indexing in structured peer-to-peer networks, *Journal of Parallel and Distributed Computing*, 68(1):64-77, 2008.

5. Jayesh Pandey, Mehmet Koyuturk, Yojan Kim, Wojciech Szpankowski, Shankar Subramaniam, and Ananth Grama. Functional annotation of regulatory pathways. *Bioinformatics* Suppl. on ISMB/ECCB'07, 23(13), i377-i386, 2007.

6. Hassan Aktulga, Ioannis Kontoyiannis, Leszek Lyznik, Lukasz Szpankowski, Wojciech Szpankowski, Ananth Grama, Identifying Statistical Dependence in Genomic Sequences via Mutual Information, *Journal on Bioinformatics and Systems Biology*, 14741, 2007.

7. Priya Vashishta, Rajiv Kalia, Aiichiro Nakano, Eftimios Kaxiras, Ananth Grama, Gang Lu, Steve Eidenbenz, Arthur Voter, Randy Hood, John Moriarty and Lin Yang, Hierarchical petascale simulation framework for stress corrosion cracking, *Journal of Physics*, Volume 78, 2007 (SciDAC 2007 papers).

8. Ronaldo Ferreira, Murali Krishna Ramanathan, Suresh Jagannathan, and Ananth Grama, Randomized Protocols for Duplicate Elimination in Peer-to-Peer Storage Systems, *IEEE Trans. Parallel and Distributed Systems*, Volume 18, Number 5, pages 686-696, May 2007.

9. Muralikrishna Ramanathan, Ronaldo Ferreira, Suresh Jagannathan, Ananth Grama, and Wojciech Szpankowski, Randomized Leader Election, *Distributed Computing* Volume 19, Number 5-6, pages 403-418, April 2007.

10. Mehmet Koyutürk, Wojciech Szpankowski, and Ananth Grama, Assessing Significance of Connectivity and Conservation in Protein Interaction Networks, *Journal of Computational Biology* 14(6), 747-764, 2007.

11. Sagar Pandit, George Khelashvili, Eric Jakobsson, Ananth Grama, and H. L. Scott Lateral Organization in Lipid-Cholesterol Mixed Bilayers, *Biophysical Journal* 27 October 2006, 10.1529/biophysj.106.093864.

12. Sagar Pandit, See-Wing Chiu, Eric Jakobsson, Ananth Grama, and H. L. Scott, Cholesterol Surrogates: A Comparison of Cholesterol and 16:0 Ceramide in POPC Bilayers, *Biophysical Journal* 27 October 2006, 10.1529/biophysj.106.093864.

13. Mehmet Koyuturk, Yohan Kim, Shankar Subramaniam, Wojciech Szpankowski, and Ananth Grama, "Detecting conserved interaction patterns in biological networks", *Journal of Computational Biology*, 13(7), 1299-1322, 2006.

14. Jie Chi, Mehmet Koyuturk, and Ananth Grama, Conquest: A Coarse-Grained Algorithm for Constructing Summaries of Distributed Discrete Datasets, *Algorithmica*, 45(3), 377-401, 2006.

15. Mehmet Koyuturk, Yohan Kim, Umut Topkara, Shankar Subramaniam, Wojciech Szpankowski, and Ananth Grama, Pairwise Alignment of Protein Interaction Networks, *Journal of Computational Biology*, 13(2), 182-199, 2006.

16. Yohan Kim, Mehmet Koyuturk, Umut Topkara, Ananth Grama, and Shankar Subramaniam, Inferring Functional Information from Domain Co-evolution, *Bioinformatics*, 22(1), pp. 40-49, 2006.

17. Ronaldo Ferreira, Suresh Jagannathan, and Ananth Grama. Locality in Structured Peer-to-Peer Networks, *Journal of Parallel and Distributed Computing*, Volume 66, Number 2, pages 257-273, February 2006.

18. Mehmet Koyuturk, Ananth Grama, and Naren Ramakrishnan, Non-orthogonal Decomposition of Binary Matrices for Bounded-Error Data Compression and Analysis, *ACM Transactions on Mathematical Software*, 32(1), 2006.

19. Asad Awan, Ronaldo A. Ferreira, Suresh Jagannathan, Ananth Grama. Unstructured Peer-to-Peer Networks for Sharing Processor Cycles. *Parallel Computing*, Volume 32, Issue 2 , February 2006, Pages 115-135

20. Bogdan Carbunar, Ananth Grama, Jan Vitek, Octavian Carbunar "Redundancy and Coverage Detection in Sensor Networks", *ACM Transactions on Sensor Networks*, Volume 2, Issue 1, February 2006

21. Ioannis Ioannidis, Ananth Grama, and Mikhail Atallah, Adaptive Data Structures for IP Lookups, *ACM Journal of Experimental Algorithmics*, Volume 10, 2005.

22. Ioannis Ioannidis and Ananth Grama, Level Compressed DAGs for Lookup Tables, *Computer Networks*, Volume 49, Issue 2, 5 October 2005, Pages 147-160.

23. Mehmet Koyutürk, Ananth Grama, and Naren Ramakrishnan, Proximus: A Framework for Compression, Clustering and Pattern Discovery in Very High Dimensional Discrete-Attributed Datasets, *IEEE Transactions on Knowledge and Data Engineering*, Vol. 17, No. 4, 447–462, Apr. 2005.

24. Mehmet Koyutürk, Ananth Grama, and Wojciech Szpankowski, An Efficient Algorithm for Detecting Frequent Subgraphs in Biological Networks, *Bioinformatics*, Vol. 20, Suppl. 1, pp i200-i207, 2004.

25. Sreekanth Sambavaram, Vivek Sarin, Ahmed Sameh and Ananth Grama, Multipole-Based Preconditioners for Large Sparse Linear Systems, *Parallel Computing*, 29(9): 1261-1273, 2003.

26. Marc Alzina, Wojciech Szpankowski, and Ananth Grama, 2D Pattern Matching Image and Video Compression: Theory, Algorithms, and Experiments, *IEEE Transactions on Image Processing*, 11(3), 318-332, Mar 2002.

27. Naren Ramakrishnan, Benjamin Keller, Batul Mirza, Ananth Grama, and George Karypis, Privacy Risks in Recommender Systems, *IEEE Internet Computing*, Vol. 5, No. 6, pages 54-62, Nov-Dec 2001.

28. Dow-Yung Yang, Ananth Grama, Vivek Sarin, and Naren Ramakrishnan, Compression of Particle Data for Hierarchical Approximation Techniques, *ACM Transactions on Mathematical Software*, Vol. 27, No. 3, September 2001.

29. Naren Ramakrishnan and Ananth Grama, Mining Large Scale Scientific Datasets, *Advances in Computers*, 55, pp 119-169, 2001.

30. Ananth Grama, Vivek Sarin, and Ahmed Sameh, Improving Error Bounds for Multipole-Based Treecodes, *SIAM Journal on Scientific Computing*, 21(5):1790–1803, May 21, 2000.

31. Naren Ramakrishnan and Ananth Grama, Data Mining: From Serendipity to Science, *IEEE Computer*, 32(8):34–37, 1999.

32. Ananth Grama and Vipin Kumar, State-of-the-Art in Parallel Search Techniques for Discrete Optimization Problems, *IEEE Transactions on Knowledge and Data Engineering*, 11(1):28–35, Jan/Feb 1999.

33. Ananth Grama, Vipin Kumar, and Ahmed Sameh, Parallel Hierarchical Solvers and Preconditioners for Boundary Element Methods, *SIAM Journal on Scientific Computing*, 20(1):337–358, 1998.

34. Ananth Grama, Vipin Kumar, and Ahmed Sameh, Scalable Parallel Formulations of the Barnes-Hut Method for n-Body Simulations, *Parallel Computing*, 24(5-6):797–822, 1998.

35. Ananth Grama and Vipin Kumar, Parallel Search Algorithms for Discrete Optimization Problems, *ORSA Journal of Computing*, 7(4):365–385, Fall 1995.

36. Vipin Kumar, Ananth Grama, and V. Nageshwara Rao, Scalable Load Balancing Techniques for Parallel Computers, *Journal of Parallel and Distributed Computing*, 22(1):60–79, July 1994.

37. Ananth Grama, Anshul Gupta, and Vipin Kumar, Isoefficiency Function: A Scalability Metric for Parallel Algorithms and Architectures, *IEEE Parallel and Distributed Technology, Special Issue on Parallel and Distributed Systems: From Theory to Practice*, 1 (3):12–21, 1993.

38. Ananth Grama and Vipin Kumar, Parallel Algorithms for Discrete Optimization Problems, *Bulletin of the Mathematical Programming Society*, 21:8–12, Nov., 1992.

Conference Proceedings (Refereed)

1. Jayesh Pandey, Mehmet Koyuturk, Shankar Subramaniam, and Ananth Grama, Functional Coherence in Domain Interaction Networks, *European Conference on Computational Biology* (ECCB), 2008 (to appear), Cagliari, Italy, Sept. 2008.

2. Murali Krishna Ramanathan, Koushik Sen, Ananth Grama, Suresh Jagannathan, Protocol Inference Using Static Path Profiles (to Appear), *15th International Static Analysis Symposium* (SAS), Valencia, Spain, 2008.

3. Murali Krishna Ramanathan, Mehmet Koyuturk, Ananth Grama, Suresh Jagannathan, Phalanx: A Graph-Theoretic Framework for Test-Case Prioritization, *23rd Annual ACM Symposium on Applied Computing* (SAC), Fortaleza, Brazil, March 2008.

4. Jayesh Pandey, Mehmet Koyuturk, Wojciech Szpankowski, and Ananth Grama, Annotating Pathways in Interaction Networks, *Pacific Symposium on Biocomputing*, 2008.

5. Hasan Aktulga, Ioannis Kontoyiannis, L. Alex Lyznik, Lukasz Szpankowski, Ananth Grama and Wojciech Szpankowski, Identifying Statistical Dependence in Genomic Sequences via Mutual Information Estimates, *International Symposium on Information Theory*, 2676-2680, Nice, 2007.

6. Jayesh Pandey, Mehmet Koyuturk, Yohan Kim, Wojciech Szpankowski, Shankar Subramaniam, and Ananth Grama, "Functional annotation of regulatory pathways", *15th Intl. Conf. Intelligent Systems for Molecular Biology / 6th European Conf. Computational Biology* (ISMB/ECCB'07).

7. Murali Krishna Ramanathan, Ananth Grama, Suresh Jagannathan, Static Specification Inference Using Predicate Mining, *ACM SIGPLAN Conference on Programming Language Design and Implementation*, (PLDI) June 2007.

8. Murali Krishna Ramanathan, Ananth Grama, Suresh Jagannathan, Path-Sensitive Inference of Function Precedence Protocols, *International Conference on Software Engineering* (ICSE), Minneapolis, 2007.

9. Asad Awan, Ahmed Sameh, Suresh Jagannathan, and Ananth Grama, Building Verifiable Sensing Applications Through Temporal Logic Specifications, *International Conference on Computational Science* (ICCS), Beijing, China, May 2007.

10. Jayesh Pandey, Mehmet Koyuturk, Wojciech Szpankowski, and Ananth Grama, A statistical model for functional characterization of regulatory pathways, *Data Mining for Biomedical Informatics, SIAM Data Mining*, 2007.

11. Asad Awan, Suresh Jagannathan, and Ananth Grama, Macroprogramming Heterogeneous Sensor Networks Using COSMOS, *EuroSys*, Lisbon, Portugal 2007.

12. Murali Krishna Ramanathan, Ananth Grama, Suresh Jagannathan, Sieve: A Tool for Automatically Detecting Variations Across Program Versions, *21st IEEE/ACM International Conference on Automated Software Engineering*, (ASE 2006) September 2006.

13. Murali Krishna Ramanathan, Suresh Jagannathan, Ananth Grama, Trace-Based Memory Aliasing Across Program Versions, *Fundamental Approaches to Software Engineering (FASE)*, March 2006, Vienna, Austria.

14. Asad Awan, Ahmed Sameh, and Ananth Grama, The Omni Macroprogramming Environment for Sensor Networks, *Proceedings of 5th International Conference on Computational Science (ICCS)*, Reading, England, 2006

15. Mehmet Koyuturk, Ananth Grama, and Wojciech Szpankowski, Assessing Significance of Connectivity and Conservation in Protein Interaction Networks, *10th International Conference on Research in Computational Molecular Biology (RECOMB)*, LNBI 3909, pp. 45-59, 2006.

16. Bogdan Carbunar, Murali Ramanathan, Mehmet Koyuturk, Christoph Hoffmann, and Ananth Grama, Redundant-Reader Elimination in RFID Systems, *IEEE Sensor and Ad Hoc Communications and Networks (SECON)*, 26-29 Sept., 2005.

17. Ronaldo Ferreira, Muralikrishna Ramanathan, Suresh Jagannathan, and Ananth Grama, Randomized Protocols for Duplicate Elimination in Peer-to-Peer Storage Systems, *The Fifth IEEE International Conference on Peer-to-Peer Computing*, Konstanz, Germany, 31 Aug. - 2 Sept., 2005.

18. Ronaldo Ferreira, Muralikrishna Ramanathan, Asad Awan, Suresh Jagannathan, and Ananth Grama, Search with Probabilistic Guarantees in Unstructured Peer-to-Peer Networks, *The Fifth IEEE International Conference on Peer-to-Peer Computing*, Konstanz, Germany, 31 Aug. - 2 Sept., 2005.

19. Mehmet Koyutürk, Ananth Grama and Wojciech Szpankowski, Pairwise Local Alignment of Protein Interaction Networks Guided by Models of Evolution, RECOMB 2005.

20. Christoph Hoffmann, Ahmed Sameh, and Ananth Grama High-Fidelity Simulation of Large Scale Structures *Proceedings 4th International Conference on Computational Science - ICCS* 2005, Atlanta.

21. Bogdan Carbunar, Ananth Grama, Jan Vitek, and Octavian Carbunar, Coverage Preserving Redundancy Elimination in Sensor Networks *IEEE Sensor and Ad Hoc Communications and Networks (SECON)*, 10 pp, 2004.

22. Hemant Mahawar, Vivek Sarin, and Ananth Grama, Parallel Performance of Hierarchical Multipole Algorithms for Inductance Extraction, *High Performance Computing (HiPC)*, 10 pp, 2004.

23. Ronaldo A. Ferreira, Ananth Grama, and Suresh Jagannathan, Plethora: An Efficient Wide-Area Storage System, *High Performance Computing (HiPC)*, 10 pp, 2004.

24. Bogdan Carbunar, Ananth Grama, and Jan Vitek, Distributed and Dynamic Voronoi Overlays for Coverage Detection and Distributed Hash Tables in Ad-Hoc Networks, *International Conference on Parallel and Distributed Systems*, pp 549 - 556, 2004.

25. Ronaldo Ferreira, Suresh Jagannathan, and Ananth Grama, Enhancing Locality in Peer-to-Peer Networks, *International Conference on Parallel and Distributed Systems*, pp 25 - 34, 2004.

26. M. Koyuturk, W. Szpankowski and A Grama, Biclustering Gene-Feature Matrices for Statistically Significant Dense Patterns, *IEEE Computational Systems Bioinformatics Conf. (CSB)*, pp 480 - 484, 2004.

27. A. Grama and V. Sarin, Impact of Far-Field Interactions on Performance of Multipole-Based Preconditioners for Sparse Linear Systems, *ACM International Conference on Supercomputing*, St. Malo, France, pp 41 - 47, 2004.

28. A. Antoulas, D. Sorensen, K. Gallivan, P. Van Dooren, A. Grama, C. Hoffmann, and A. Sameh, Model Reduction of Large-Scale Dynamical Systems, *Proceedings 4th International Conference on Computational Science - ICCS* 2004, Krakow, Poland, June 6-9, 2004, Part III, Lecture Notes in Computer Science, Vol. 3038, Bubak, M.; Albada, G.D.v.; Sloot, P.M.A.; Dongarra, J. (Eds.), pp. 740-747.

29. Mehmet Koyutürk, Ananth Grama, and Wojciech Szpankowski, An Efficient Algorithm for Detecting Frequent Subgraphs in Biological Networks, *Intelligent Systems for Molecular Biology (ISMB) / European Conference on Computational Biology (ECCB)*, 2004.

30. Jie Chi, Mehmet Koyutürk and Ananth Grama, Conquest: A Distributed Tool for Constructing Summaries of High-Dimensional Discrete Attributed Datasets, *SIAM Data Mining Conference (SDM)*, 12 pp (IEEE Digital Library) 2004.

31. Shan Lei and Ananth Grama, Extended Consistent Hashing: An Efficient Framework for Object Location, *International Conference on Distributed Computing Systems (ICDCS)*, pp 254 - 263, 2004.

32. Mehmet Koyutürk and Ananth Grama, Proximus: A Framework for Analyzing Very High Dimensional Discrete-Attributed Datasets, *ACM SIGKDD*, 147 - 156, 2003.

33. Ronaldo A. Ferreira, Ananth Grama and Suresh Jagannathan, An IP Address Based Caching Scheme for Peer-to-Peer Networks, *GLOBECOM*, 5 pp, 2003.

34. Changrui Cheng, Ihtesham Choudhury, Xianfan Xu, Jayathi Murthy, Ananth Grama, and Xinwei Wang, Numerical Simulation of Femtosecond Laser Ablation of Copper – Comparison Between Molecular Dynamics and Finite Difference Calculations, *Heat Transfer*, 2003.

35. Mehmet Koyutürk, Ananth Grama, and Wojciech Szpankowski, Algorithms for Bounded-Error Correlation of High Dimensional Data in Microarray Experiments, *The Computational Systems Bioinformatics Conference (CSB)*, pp 575-580, 2003 (poster presentation).

36. Mohamed Mokbel, Walid Aref, and Ananth Grama, Spectral LPM: An Optimal Locality-Preserving Mapping using the Spectral (not Fractal) Order, *Proceedings of the 19 International Conference of Data Engineering ICDE*, pp 699 - 701, 2003 (Poster Presentation).

37. Ioannis Ioannidis, Ananth Grama, Mikhail Atallah, Adaptive Trie Data Structures for IP Lookups, *INFOCOM* 10 pp (IEEE Digital Library), 2003.

38. Ioannis Ioannidis and Ananth Grama, An Efficient Protocol for Yao's Millionaires' Problem, *Hawaii International Conference on Computer Systems*, 6 pp (IEEE Digital Library), 2003.

39. Mehmet Koyuturk, Ananth Grama, and Naren Ramakrishnan, Algebraic Techniques for Analysis of Large Discrete-Valued Datasets, *Sixth European Conference on Principles and Practice of Knowledge Discovery in Databases (PKDD)*, 311 - 324, 2002.

40. Tzvetan Horozov, Ananth Grama, Sean Landis, and Venu Vasudevan, MOBY – A Mobile Peer-to-Peer Service and Data Networks, *International Conference on Parallel Processing (ICPP)*, 437 - 444, 2002.

41. Ioannis Ioannidis, Ananth Grama, and Mikhail Atallah, A Secure Protocol for Computing Dot Products in Clustered and Distributed Environments, *International Conference on Parallel Processing (ICPP)*, 379 - 384, 2002.

42. Jie Chi, Alok R. Chaturvedi, Ananth Grama, Shailendra Raj Mehta, Oceanus: A Distributed Web-Based Framework for Execution of Genetic Algorithms, *Genetic and Evolutionary Computation Conference (GECCO),* 55-61, 2002.

43. Sacha Zyto, Ananth Grama, and Wojciech Szpankowski, Semi-Discrete Matrix Transforms (SDD) for Image and Video Compression, *Data Compression Conference* (poster presentation), Snowbird, Utah, Mar. 31 - Apr. 4, 2002.

44. Ananth Grama, Vipin Kumar, Sanjay Ranka, and Vineet Singh, Architecture Independent Analysis of Parallel Programs, In *International Conference on Computational Science*, pages 599-608, San Francisco, CA, May 28-30, 2001.

45. Dow-Yung Yang, Akshay Johar, Wojciech Szpankowski, and Ananth Grama, Summary Structures for Frequency Queries on Large Transaction Sets, In *Data Compression Conference*, pages 238–247, Snowbird, UT, March 2000.

46. Dow-Yung Yang, Ananth Grama, and Vivek Sarin, Bounded-Error Compression of Particle Data from Hierarchical Approximate Methods, In *Proceedings of the 12th Supercomputing Conference*, page 10 pp, Portland, OR, 1999. Proceedings on CD or online at `http://www.sc99.org/proceedings/toc.htm`, sponsored by ACM and IEEE Computer Society.

47. Marc Alzina, Wojciech Szpankowski, and Ananth Grama, 2D-Pattern Matching Image and Video Compression, In *Proceedings of the Data Compression Conference*, pages 424–433, Snowbird, UT, 1999, IEEE Computer Society Press.

48. Ananth Grama, Vivek Sarin, and Ahmed Sameh, Analyzing the Error Bounds of Multipole-Based Treecodes, In *Proceedings of the 11th Supercomputing Conference*, page 10 pp, Orlando, FL, 1998. Proceedings on CD or online at `http://www.supercomp.org/sc98/papers/index.html`, sponsored by ACM and IEEE Computer Society.

49. Ananth Grama, Vivek Sarin, and Ahmed Sameh, Improving Error Bounds for Multipole-Based Treecodes, In *Proceedings of 5th International Conference on High Performance Computing*, page 8 pp, Chennai, India, 1998. Proceedings on CD and online at `http://www.hipc.org/hipc98/adpgm98.html`.

50. Chen Wang and Ananth Grama, Fast Parallel Techniques for Discrete Walsh Transforms, In *Proceedings of the 11th Annual International Symposium on High Performance Computing Systems*, page 8 pp, Winnipeg, Canada, 1997.

51. Chen Wang and Ananth Grama, Fast Parallel Techniques for Discrete Hadamard Transformations, In *Proceedings of the 10th International Conference on Parallel and Distributed Computing Systems*, page 10 pp, New Orleans, LA, 1997.

52. Ananth Grama, Vipin Kumar, and Ahmed Sameh, Parallel Hierarchical Solvers and Preconditioners for Boundary Element Methods, In *Proceedings of the 9th Supercomputing Conference*, page 8 pp, Pittsburgh, PA, 1996. Proceedings on CD and online at `http://www.supercomp.org/sc96/proceedings/`. Sponsored by ACM and IEEE Computer Society.

53. Ananth Grama, Vipin Kumar, Sanjay Ranka, and Vineet Singh, A^3: A Simple and Asymptotically Accurate Model for Parallel Computation, In *Proceedings of the Sixth Conference on Frontiers of Massively Parallel Computing*, page 8 pp, Annapolis, MD, 1996.

54. Vipin Kumar, Ahmed Sameh, Ananth Grama, and George Karypis, Architectures, Algorithms and Applications for Future Generation Supercomputers, In *Proceedings of the Sixth Conference on Frontiers of Massively Parallel Computing*, page 8 pp, Annapolis, MD, 1996.

55. Ananth Grama, Vipin Kumar, and Ahmed Sameh, Parallel Matrix-Vector Product Using Approximate Hierarchical Methods, In *Proceedings of the 8th Supercomputing Conference*, page 8 pp, San Diego, CA, 1995. Sponsored by ACM and IEEE Computer Society.

56. Minesh Amin, Ananth Grama, and Vineet Singh, Fast Volume Rendering Using an Efficient, Scalable Parallel Formulation of the Shear-Warp Algorithm, In *Proceedings of the Parallel Rendering Symposium (PRS) at Visualization Conference*, Atlanta, GA, 1995, IEEE Computer Society.

57. Ananth Grama, Vipin Kumar, and Ahmed Sameh, Scalable Parallel Formulations of the Barnes-Hut Algorithm for n-Body Simulations, In *Proceedings of the 7th Supercomputing Conference*, page 8 pp, Washington, DC, 1994.

58. Ananth Grama and Vipin Kumar, Scalability Analysis of Partitioning Strategies for Finite Element Graphs, In *Proceedings of the 5th Supercomputing Conference*, page 8 pp, Minneapolis, MN, 1992.

59. Ananth Grama, Vipin Kumar, and V.N. Rao. Experimental Evaluation of Load Balancing Techniques for the Hypercube, In *Proceedings of the Parallel Computing Conference*, United Kingdom, 1991.

Book Chapters

1. Ananth Grama and Vipin Kumar, Scalability of Parallel Programs, in Handbook of Parallel Computing, Chapman Hall/CRC Press, Sanguthevar Rajasekaran, John Reif, eds., 2007.

2. Anastasios Antoulas, Dan Sorensen, Kyle Gallivan, Paul Van Dooren, Ananth Grama, Christoph Hoffmann, and Ahmed Sameh, Model Reduction and Real-time Control of Dynamic Data Driven Systems, *Dynamic Data Driven Application Systems*, Kluwer Academic Publishers, Amsterdam, F. Darema, Ed., 2005.

3. Sacha Zyto, Ananth Grama, and Wojciech Szpankowski, Semi-Discrete Matrix Transforms for Image and Video Compression, *Process Coordination and Ubiquitous Computing*, pp 249 - 260, CRC Press, 2003.

4. Ananth Grama and Naren Ramakrishnan, Data Mining Applications in Bioinformatics, In *Data Mining for Scientific and Engineering Applications*, Kluwer Academic Press, 21 pp, 2001.

5. Ananth Grama and Vipin Kumar, Load Balancing of Parallel Search Techniques, In *Encyclopedia of Optimization*, Kluwer Academic Press, pp 203-209, 2000.

6. Ananth Grama, Vipin Kumar, George Karypis, and Anshul Gupta, Scalability Analysis for Petaflop Scale Parallel Algorithms, In *Ultrascale Computing*, 2000.

7. Ananth Grama, Vipin Kumar, and Ahmed Sameh, Parallel Hierarchical Solvers and Preconditioners for Boundary Element Methods, In Thomas Campbell, Roy Nicolaides, and Manuel Salas, editors, *Computational Electromagnetics and Its Applications*, volume 5, pages 212–229, Kluwer Academic Publishers, 1997. ICASE/LaRC Interdisciplinary Series in Science and Engineering.

8. Ananth Grama, Vipin Kumar, and Panos Pardalos, Parallel Processing of Discrete Optimization Problems, In *Encyclopedia of Microcomputers*, pages 129–149, Marcel Dekker Publishers, NY, 1992.

Invited Lectures

1. Parallel Banded Preconditioners for Non-Symmetric Linear System Solvers, 5th International Workshop on Parallel Matrix Algorithms and Applications (PMAA), June 20, 2008, Neuchatel, Switzerland.

2. Computational Analysis of Biological Networks, 6th Pathways, Networks and Systems Medicine Conference, June 16, 2008, Chania, Greece.

3. Weighted bandwidth reduction and preconditioning sparse systems, International Conference on Preconditioning Techniques for Large Sparse Matrix Problems in Scientific and Industrial Applications, July 9-12, 2007, Meteopole, Toulouse, France.

4. Comparative Analysis of Molecular Interaction Networks, Deans Distinguished Lecture, Clemson University, Feb 16, 2007.

5. Algorithms and Infrastructure for Molecular Dynamics Simulations, Distinguished Lecture, College of Computing, Georgia Tech., Nov 6, 2006.

6. Molecular Dynamics Simulations of Reactive Systems, 4th International Workshop on Parallel Matrix Algorithms and Applications (PMAA), Rennes, France, Sept 8, 2006.

7. Software Support for Advanced Computing Platforms, Army Research Labs., Adelphi, MD, June 9, 2006.

8. Algorithms and Numerical Techniques for Scalable Molecular Dynamics Simulations, ICCES, Chennai, India, Dec 1-4, 2005.

9. Multipole-Based Preconditioners for Sparse Linear Systems, International Workshops on Advances in Computational Mechanics, Tokyo, Japan, 2004.

10. On Unstructured Peer-to-Peer Networks, their Eigenvalues, and Distributed Estimation, Parallel Matrix Algorithms and Applications, Marseilles, France, 2004.

11. Impact of Far-Field Interactions on Performance of Multipole-Based Preconditioners for Sparse Linear Systems, ACM International Conference on Supercomputing, St. Malo, France, 2004.

12. Multipole-Based Preconditioners for Large Sparse Linear Systems, Parallel Matrix Algorithms and Applications, Neuchatel, Switzerland, 2003.

13. Computational Aspects of Multipole Methods, Center for Computational Electromagnetics, University of Illinois at Urbana-Champaign, Nov. 27, 2001.

14. Mining Scientific Datasets, First SIAM Conference on Computational Science and Engineering, Sept. 21-23, 2000, Washington D.C.

15. Proximus: A Methodology for Error Bounded Compression and Categorization of Discrete Attribute Vector Sets, Workshop on Scientific Data Mining, Army High Performance Computing Research Center at the University of Minnesota, July 21, 2000.

16. Data Mining Applications in Battlefield Visualization, Army Research Labs, Adelphi, MD, April 6, 2000.

17. Approximation Techniques for Large-Scale Data Handling, Army High Performance Computing Center, Minneapolis, MN, Sept. 10,1999.

18. Fast Algorithms for n-Body Simulations and their Applications, National Center for Supercomputing Applications, University of Illinois, Urbana-Champaign, March 12, 1998.

19. Parallel Solution Methods using Hierarchical Dense Approximation, International Conference on Computational Engineering Science, Atlanta, GA, 1998.

20. Fast Parallel Algorithms for Surface and Volumetric Scattering, PetaFLOPS Algorithms Workshop, Williamsburg, VA, Apr. 15, 1997.

21. Hierarchical Architectures for 100 TeraFLOPS Class Computers in a Ten Year Timeframe, Sixth Symposium on the Frontiers of Massively Parallel Computing, Annapolis, MD, Oct. 30, 1996.

22. Parallel Hierarchical Solvers and Preconditioners for Boundary Element Methods, NASA ICASE/LaRC Workshop on Computational Electromagnetics and Applications, Newport News, VA, May 30, 1996.

23. Architecture, Algorithms and Applications for Future Generation Supercomputers, PetaFLOPS Architectures Workshop, Oxnard, CA, April 16, 1996.

24. Efficient Parallel Formulations of Hierarchical Methods and their Applications, The PetaFLOPS Forum, Bodega Bay, CA, Aug. 20, 1995.

Other Presented Papers (Invited Papers)

1. Ananth Grama and Naren Ramakrishnan, Mining Scientific Datasets, In *First SIAM Conference on Computational Science and Engineering*, Workshop on Scientific Data Mining, Washington D.C., Sept 2000.

2. Ananth Grama and Vipin Kumar, Data Mining Applications in Battlefield Visualization, In *Workshop on Battlefield Visualization and Real-time Geographic Information Systems*, Army Research Laboratory, Adelphi, Maryland, April, 2000.

3. Ananth Grama, Vivek Sarin, and Ahmed Sameh, Parallel Solution Methods Using Hierarchical Dense Approximation, In *International Conference on Computational Engineering and Science*, Atlanta, GA, 1998.

4. Ananth Grama, Vivek Sarin, and Ahmed Sameh, Piece-Wise Multipoles for Dense Iterative Solvers, In *Copper Mountain Conference on Iterative Methods*, Copper Mountain, CO, 1998.

5. Ananth Grama, Vivek Sarin, and Ahmed Sameh, Parallel Solution of Dense Linear Systems in Computational Electromagnetics, In *SIAM Workshop on Computational Electromagnetics*, Toronto, Canada, July 1998.

6. Ananth Grama and Vipin Kumar, Fast Parallel Algorithms for Surface and Volumetric Scattering, In *PetaFLOPS Algorithms Workshop*, Williamsburg, VA, April 15, 1997.

7. Vipin Kumar, George Karypis, and Ananth Grama, Role of Message-Passing in Performance Oriented Parallel Programming, In *Proceedings of the Eighth SIAM Conference on Parallel Processing for Scientific Computing*, San Antonio, TX, 1997.

8. Ananth Grama and Vipin Kumar, Parallel Algorithms for Discrete Optimization Problems, In *Symposium on Parallel Computing for Solving Large Scale and Irregular Applications*, Sophia-Antipolis, France, July, 1996.

9. Ananth Grama, Vipin Kumar, and Ahmed Sameh, On n-body Simulations Using Message Passing Parallel Computers, In *Proceedings of the SIAM Conference on Parallel Processing*, San Francisco, CA, Feb, 1995.

Grants and Contracts

Current Grants

1. Wojciech Szpankowski, Ananth Grama, and Daisuke Kihara, Information Transfer in Biological Systems, 2008 award, National Science Foundation, $480K.

2. Ananth Grama and Shankar Subramaniam, Biochemical Pathways Workbench, National Science Foundation, 1/08 - 12/09, $297K.

3. Jayathi Murthi (PI), Ananth Grama (coPI), and others, PRISM: NNSA Center for Prediction of Reliability, Integrity and Survivability of Microsystems, Department of Energy, 4/08 - 4/13, $21M.

4. Anthony Hosking, Suresh Jagannathan, Jan Vitek, and Ananth Grama, Language and Runtime Support for Safe and Scalable Programs, Microsoft, 2008.

5. Ananth Grama, Cracking Under Stress: Developing a petascale simulation framework for stress corrosion cracking, Department of Energy, 9/2006 - 8/2011, $400,000. (the total budget for the project is $1.1M/year, with PI Priya Vashishtha at USC, and other participants being Gang Lu, Efthimios Kaxiras, Stephan Eidenbenz, Arthur F. Voter, Randy Q. Hood, John A. Moriarty, Lin H. Yang, Rajiv K. Kalia, and Aiichiro Nakano.)

6. Ahmed Sameh, Ananth Grama, and Eric Polizzi, Developing a Robust Parallel Hybrid Solver, National Science Foundation, 09/15/06 - 08/31/09, $463,330.

7. Ananth Grama and Suresh Jagannathan, Profile Guided Speculation for Multicore Architectures, Intel Corp., 9/2006 – , $80,000.

8. Wojciech Szpankowski and Ananth Grama, Algebraic, Combinatorial and Probabilistic Methods for Biological Sequences, National Institute of Health, 5/15/2003-4/30/2008, $924,865.

9. Ananth Grama, ITR-ASE-SIM:Collaborative Research: DeNovo Hierarchical Simulations of Stress Corrosion Cracking in Materials, National Science Foundation, 9/1/2004-8/31/2009, $361,140 (Purdue's Budget). This is a collaborative proposal with University of Southern California and CalTech.

10. Zhiyuan Li, Ananth Grama, and Ahmed Sameh, AAD: Software Tools for Asynchronous-Algorithm Development, National Science Foundation, 1/1/2005-12/31/2007, $650,000.

Past Grants

1. Ahmed Sameh and Ananth Grama, Evaluating Sparse Linear System Solvers on Scalable Parallel Architectures, AFRL, 08/24/06 - 08/23/07, $149,999.

2. Ahmed Sameh, Ananth Grama, and Christoph Hoffmann, ITR/AP: Collaborative Research on Model Reduction of Dynamical Systems for Real-time Control, National Science Foundation, 9/1/2003-8/31/2007, $958,502.

3. Suresh Jagannathan and Ananth Grama, Plethora: A Wide-Area Read-Write Object Repository for the Internet, National Science Foundation, 9/15/2003-8/31/2007, $549,635.

4. Mete Sozen, George Chiu, Ananth Grama, Ahmed Sameh, and Christoph Hoffmann, Towards Real-Time Sensing and Control of Active Structures, National Science Foundation, 8/1/2004-7/31/2007, $200,000.

5. Suresh Jagannathan, Jan Vitek, Tony Hosking, and Ananth Grama, A Computational Infrastructure for Experimentation on Relaxed Concurrency Abstracts, National Science Foundation, 3/1/2006-2/28/2008, $99,979.

6. Ananth Grama, Biochemical Pathways Workbench, Purdue Research Foundation, 8/1/06 - 7/31/07, $40,000.

7. Ahmed Sameh, Ananth Grama, and Gene Golub, Network for Computational Nanotechnology, NSF, 9/02 - 9/06, $1.3M.

8. Greg Frederickson, Susanne Hambrusch, and Ananth Grama, GAANN Fellowship Program, Department of Education, 8/03 - 7/06, $650K.

9. Zhiyuan Li and Ahmed Sameh, Dynamic Compilation and Scheduling Techniques for Complex Simulations, NSF, 8/00 - 3/05, $280K.

10. Bruce Craig and Ananth Grama, Calibrating the Two Antimicrobial Susceptibility Tests, NIH, 7/01 - 6/04, $161K.

11. Ananth Grama and five other PIs, System Support, Appl. Dev., Benchmarking, and Instructional Infrastructure Using McKinley Servers, HP, 9/02 - , $350K.

12. Christoph Hoffmann, Ananth Grama, Ahmed Sameh, David Ebert, Voicu Popescu, MRI: Acquisition of Equipment for Purdue Envision Center for Data Perceptualization, NSF, 9/02 - , $900K.

13. Susanne Hambrusch, Ananth Grama, and Jens Palsberg, Department of Education Fellowships in Areas of National Need, 8/00 - 8/03, $425K.

14. Ananth Grama, Fast Methods for Particle Dynamics and their Applications, NSF, 02/99 - 01/04, $235K.

15. Ananth Grama and Paul Ruth, Los Alamos National Lab Fellowship for PhD Research in High Performance Computing, Department of Energy, 8/00 - 8/03, $100K.

16. Ahmed Sameh and Ananth Grama, Innovative Algorithms and Techniques for Large Scale Simulations, NSF, 6/99 - 5/03, $309K.

17. Ananth Grama, Analytical and Computational Framework for n-Body Simulations, NSF, 12/98 - 11/03, $188K.

18. Ananth Grama, Kihong Park, and David Yau, ISAC: Integrated System Support for Adaptive Communication and Computation Control in Clustered Environments, NSF, 08/98-08/02, $584K.

19. Ananth Grama (and four other PIs), A Distributed Infrastructure for High Performance Computing and Networking, Intel, 6/98 - , $998K.

20. Ananth Grama, Dominant and Deviant Pattern Detection in Event Traces for Intrusion Detection, Lilly/CERIAS, 6/00 - 12/01, $50K.

21. Ahmed Sameh and Ananth Grama, Computational Methods in VLSI Design, NSF, 07/98 - 07/01, $66K.

22. Ahmed Sameh, Ananth Grama, Zhiyuan Li, and Vivek Sarin, Development of Research Infrastructure for Scientific Computing and Computer Science, NSF, 7/98 - 7/01, $800K.

23. Ahmed Sameh and Ananth Grama, Performance Evaluation and Optimization for Scientific Kernels, SGI, 7/98 - 7/01, $25K.

24. Ananth Grama, n-Body Methods and their Applications in Dense Linear Solvers, Purdue Research Foundation, 07/98 - 07/00, $22K.