

Curriculum Vitae

Peter J. Varman

Personal Data

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Education

- **Ph.D.** (1983): Electrical and Computer Engineering, University of Texas at Austin.
Thesis Title: Fault-Tolerant Wafer-Scale Architectures for VLSI
Thesis Advisor: Donald S. Fussell
- **M.S.** (1980): Electrical and Computer Engineering, University of Texas at Austin.
Thesis Title: Proving Temporal Properties of Protocols
Thesis Advisor: K. Mani Chandy
- **B. Tech.** (1978): Electrical Engineering, Indian Institute of Technology, Kanpur.
Thesis Title: Time Contractions and Expansion Using Tracking ADCs
Thesis Advisor: S. Malik

Research Interests

- Computer Systems: Storage and I/O Systems, Virtualization, Resource Scheduling
- High-end Computing: Parallel Algorithms, Parallel Architectures, Parallel IO
- Database Systems: Streaming Multimedia, Performance Evaluation

Employment History

- Summer, 2012: Visiting Faculty, Software and Systems, Intel Corporation, Portland, OR
- 2011- 2012: Scholar-In-Residence, VMWare Inc., Palo Alto, CA.
- 2006 – Present: Professor, Electrical and Computer Engineering, Rice University. (Professor, Computer Science Department, 2006 – present)
- 2003 – 2005: Program Director, Computing Processes and Artifacts Cluster, CCF Division, National Science Foundation

- 2002 – 2003: Program Director, Computer Systems Architecture Program, CCR Division, National Science Foundation.
- 1989 - 2006: Associate Professor, Electrical and Computer Engineering, Rice University. (Associate Professor, Computer Science Department, 2000 – 2006)
- Fall 2001: Visiting Associate Professor, Department of Computer Science, Duke University
- 1994 – 1995: Senior Fellow, School of Applied Science, Nanyang Technological University, Singapore.
- 1983 - 1989: Assistant Professor, Electrical and Computer Engineering, Rice University.
- Summer 1989: Visiting Faculty, IBM Almaden Research Center.
- Summer 1988: Visiting Faculty, IBM Almaden Research Center.
- Summer 1987: Visiting Faculty, IBM T. J. Watson Research Center.
- 1980 - 1983: Research Assistant, Department of Computer Science, University of Texas at Austin.
- 1978 - 1980: Teaching Assistant, Department of Electrical and Computer Engineering, University of Texas at Austin.

Awards and Memberships

- Senior Member, Institute of Electrical and Electronic Engineers
- Member of Association for Computing Machinery
- Member of IEEE Computer Society
- Member of New York Academy of Science
- Schlumberger Foundation Award, 1996.
- US Patent 5,179,699, Partitioning Sorted Lists for Parallel Processing, 1993. (with B. Iyer and G. Ricard, IBM)
- IBM Faculty Development Award, 1984.

Research Grants and Awards

- Workload Shaping for Capacity and Power Provisioning in Storage Data Centers, National Science Foundation, 2009 – 2012 (\$350,000)
- Lookahead Logic Circuits for Performance, Power, and Reliability, National Science Foundation, 2009 – 2012, co-PI (Collaborative with Kartik Mohanram), (\$384,000)
- Resource Scheduling with QoS for Parallel I/O Systems, National Science Foundation, 2006 – 2010, (\$395,000).
- PDOS: Energy Conservation in Storage Systems using Coding Techniques”, National Science Foundation, 2006 – 2009, PI (Collaborative with J. Wang, U. Nebraska), (\$226,000)

- High-Performance Parallel I/O Systems, National Science Foundation, 2001-2007. (\$300,000 with supplement).
- Buffer Management for Parallel I/O Systems, National Science Foundation, 1997-2000. (\$203,317).
- Improving Parallel I/O Performance via Prefetching, Schlumberger Corporation, 1997-98. (\$30,000).
- Prediction and Randomization for Parallel I/O, Schlumberger Corporation, 1996-97. (\$30,000)
- SUR Equipment Grant, (Co-PI, with J. B. Sinclair), IBM Corporation, 1994. (\$60,000)
- Performance Evaluation of TPDC Benchmarks, IBM Corporation, 1993-94, (PI, with J.B. Sinclair). (\$18,000).
- Performance Evaluation of Disk and Buffer Management, (PI, with J.B. Sinclair), IBM Corporation, 1992-93, (\$75,000).
- Disk and Buffer Management Algorithms for Multiple Concurrent Sorts, (PI, with J.B. Sinclair), IBM Corporation, 1991-92. (\$25,000).
- Parallel Algorithms for Hierarchical Memory Multiprocessors, (PI, with J.B. Sinclair), National Science Foundation, NSF/DARPA Initiative on Parallel Computing Theory, 1990-93. (\$182,000).
- Implementations and Evaluations of Non-Numerical Algorithms for MIMD Multiprocessors, National Science Foundation, (Co-PI, with F. A. Briggs), 1989-90. (\$60,000).
- Ultra-High-Speed Algorithms for Low Level Image Processing, Naval Ocean Systems Center (with R.J.P. deFigueiredo, J.R. Jump and J.B. Sinclair), 1986-87. (\$144,000).
- IBM Faculty Development Award, 1984-86. (\$60,000).

Professional Service

Journals

- Editor, Journal of Combinatorial Optimization (since Jan. 2006).
- Associate Editor, IEEE Transactions on Computers, May 2000 – December 2006.
- Guest Co-Editor, ACM Operating System Review, Best Papers of SPEED 2008, 42(6), 2008

Conferences

- Workshop General Co-Chair, Second International Workshop on Virtualization Performance: Analysis, Characterization and Tools (VPACT'09), (held in conjunction with IEEE ISPASS'08), Boston, MA, April 2009.
- Workshop Co-Chair, First International Workshop on Virtualization Performance: Analysis, Characterization and Tools (VPACT'08), (held in conjunction with IEEE ISPASS'08), Austin, Texas, April 2008.

- Workshop Co-Chair, First International Conference on Storage and I/O Virtualization, Performance, Energy, Evaluation and Dependability (SPEED 08), (held in conjunction with 14th HPCA), Salt Lake City, Utah, February 2008.
- Program Vice Chair for Computer Architecture, International Conference on High-Performance Computing (HiPC 2007), Goa, India, December 2007.
- Program Co-Chair for Storage Systems, International Conference on Networking, Architecture, and Storage (NAS 2007), Guilin, China, July 2007.
- Chair: Panel on Reliability and Fault Tolerance, Architectures for Nanoelectronics and Beyond, SRC Workshop to chart Research Directions, September, 2005. (Organizing Committee member).

Recent Program Committees

- High Performance Grid and Cloud Computing (HPGC 2012), Shanghai, China
- International Symposium on Electronic System Design (ISED 2012), Kolkota, India
- High Performance Grid and Cloud Computing (HPGC 2011), Anchorage, AL
- International Symposium on Electronic System Design (ISED 2011), Kolkota, India
- Workshop on Energy Consumption and Reliability of Storage Systems (co-located with International Green Computing Conference, IGCC 2011), Orlando, Florida
- 9th IEEE International Symposium on Parallel and Distributed Processing with Applications (ISPA 2011), Busan, Korea
- International Symposium on Electronic System Design (ISED 2010), Bhubaneswar, India
- 30th International Conference on Distributed Computing Systems (ICDCS 2010), Genoa, Italy
- 6th IEEE International Workshop on Storage Network Architecture and Parallel I/Os, (SNAPI 2010), Lake Tahoe, NV
- 5th IEEE International Conference on Networking, Architecture, and Storage (NAS 2010), Macau, China
- International Conference on High-Performance Computing (HiPC2009), Cochin, India
- IEEE International Conference on Network, Architecture and Storage (NAS 09), China
- International Conference on High-Performance Computing (HiPC2008), Bangalore, India
- 2008 IEEE Conference on Storage Network Architectures and Parallel I/O (SNAPI 08), Baltimore, MD
- 2008 International Conference on Parallel Processing (ICPP 08), Portland, OR
- 2007 Workshop on Storage Network Architectures and Parallel I/O (SNAPI 07), San Diego, CA
- 2006 Supercomputing Conference: International Conference for High-Performance Computing, Networking, Storage and Analysis (SC06)
- 2005 International Conference on Parallel and Distributed Computing Systems (PDCS 05).
- 2005 IEEE EIT Conference
- 2004 Workshop on Communication Architectures for Clusters (CAC'04), held in conjunction with IPDPS 2004.
- 2001 International Conference on Very Large Databases (VLDB'01)
- 2000 International Conference on Parallel Processing (ICPP'00)
- 2000 Association of Intelligent Machinery, Joint Conference on Information Science

Panels

- Panel Member, Science Foundation of Ireland, 2007, 2008, 2009
- Panel Member, National Research Foundation of UAE, 2009

- Panel Member, National Science Foundation, 2001, 2006, 2007, 2008, 2009, 2010, 2011, 2012
- Task Force Member, Federal High End Computing Revitalization Task Force (HECRTF), 2003-2004. The task force established by the Office of Science and Technology Policy was charged with producing a forward-looking plan for high-end computing. Final report titled “Federal Plan for High-End Computing” published May 2004.
- Panel Member, Computational Infrastructure for Lattice Gauge Theory, Department of Energy, 2003
- Moderator: From Molecules to Computers, Tutorial held in conjunction with Micro 35, Istanbul, Turkey, Nov. 2003
- Panel Member: Robotics for Nanosciences and Nanotechnology, IEEE/RJS Workshop, International Conference on High-End Intelligent Robots and Systems, Las Vegas, Nevada, October, 2003
- Panel Member: Future of Application Specific Processors: Issues and Challenges, Workshop on Application Specific Processors (WASP 2), San Diego, CA, December, 2003.

National Science Foundation

- Cluster Coordinator, Computing Processes and Artifacts, National Science Foundation (FY 2004): The cluster is made up of the following program elements: Computer Systems Architecture, Design Automation for Micro and Nano Systems, Graphics and Visualization, High-End Software Tools, and Software Engineering.
- Area Coordinator: Device and System Architecture thematic area of the Nanoscale Interdisciplinary Research Teams (NIRT) program, FY 2003, 2005.
- Participated in the following NSF-wide cross-cutting programs:
 - Information Technology Research (ITR), FY 2003, 2004
 - Nanoscale Interdisciplinary Research Teams (NIRT), FY 2003, 2004, 2005.
 - Nanoscale Science and Engineering Research Centers (NSEC), FY 2005
 - Integrative Graduate Educations and Research Training Program (IGERT) 2004
 - CAREER, FY 2003, 2004, 2005
 - CISE Research Resources, 2004

Other Activities

- External Promotion Evaluator:
 - Nanyang Technical University, Singapore
 - University of Kuwait, Kuwait
- External Thesis Examiner, Nanyang Technological University, Singapore
- IEEE Senior Member Review Panel, May 2010
- Grant Review
 - A. National Science Foundation
 - B. U.S. Dept. of Energy
 - C. National Research Council, Canada
 - D. National Science and Technology Board, Singapore
- Journal Review

- IEEE Transactions on Computers
- IEEE Transactions Parallel & Distributed Computing
- IEEE Transactions Knowledge and Data Engineering
- J. Supercomputing
- Theory of Computing Systems
- Algorithmica
- J. ACM
- Information Processing Letters
- Book Review
 - John Wiley
 - Prentice Hall
 - McGraw Hill
 - West Publishing
- Session chair at several conferences

University and Departmental Service

- Member, Graduate Committee, Computer Engineering, 2012, 2010, 2006, 2005, 2004, 1995.
- Library Liaison, 2012, 2010
- Member, Undergraduate Committee, Department of ECE, 1998-2001, 1989-1993.
- Undergraduate Advisor in Computer Engineering, Department of ECE, 1998-2001, 1989 – 1993.
- Member, University Admissions Committee, 1997-1999.
- Member, University Admissions Committee, 1986-1989.
- Commencement Marshal, 1997.
- Faculty Sponsor, Rice Cricket Club, 1996-2000.
- Faculty Associate, Jones College, 1984-1985.
- Computer Engineering Seminar Coordinator, 1992-1993.
- Committee Member for Ph. D. Dissertation and M.S. Thesis committees (regularly from 1984 -)
 - 2012: Ph.D. Committee: Kristin Rozier (CS)
 - 2012: Ph.D. Committee: Kaushik Kumar Ram (CS)
 - 2012: M.S. Committee: Myeongjae Jeon (CS)
 - 2012: M.S. Committee: Vikas Singal (ECE)
 - 2012: M.S. Committee: Kieth Wilhelm (ECE)
 - 2012: M.S. Committee: Sami Smaili (ECE)
 - 2012: M.S. Committee: Ahmad Hammoudi (ECE)
 - 2011: Ph.D. Committee: Mihir Choudhary (ECE)
 - 2010: Ph.D. Committee: Jeffrey Schafer (ECE)
 - 2010: M.S. Thesis Committee: Rostam Massoud (ECE)
 - 2010: M.S. Thesis Committee: Ersin Oksuzoglu (ECE)
 - 2010: M.S. Thesis Committee: Thomas Barr (ECE)
 - 2007: M.S. Thesis Committee: Mihir Choudhary (ECE)
 - 2007: Ph.D. Committee: Gabriel Marin (CS)
 - 2006: Ph. D. Committee: Yuri Dotsenko (CS)
 - 2006: Ph. D. Committee: Cristian Coarafa (CS)
 - 2006: M.S. Thesis Committee: Michael Calhoun (ECE)
 - 2005: Ph. D. Thesis Committee: Alexander Grosul (Computer Science)

Recent Colloquia

- **Noisy Neighbors, Isolation, and QoS in Cloud Infrastructures**, Intel Corp., Portland, Aug., 2012
- **Resource Scheduling with QoS**, Intel Corp., Phoenix, AZ, November, 2010
- **Workload Scheduling and Shaping in Shared Storage Systems**, Corporate Affiliates Meeting, Department of ECE, [Rice University](#), September, 2009
- **Performance Virtualization in Shared Storage Servers**, Laboratory for Networking and Sensor Systems, [Hong Kong University of Science and Technology](#), Shanghai, China, August, 2007
- **Performance Virtualization in Shared Storage Servers**, Department of Computer Systems, [Tsinghua University](#), Beijing, China, August, 2007.
- **Virtualization, Performance and Energy Conservation in Storage Data Centers**, [Keynote Address](#), IEEE Conference on Networking, Architecture and Storage, [Guilin, China](#), July 2007.
- **Where's my Proposal?**, Department of Computer Science, [University of Houston](#), June, 2007.
- **Performance Virtualization in Storage Data Centers**, Department of Computer Science, [University of Houston](#), June, 2007.
- **Virtualization, Performance and Energy Conservation in Storage Data Centers**, Dean of Engineering New Professor Lecture Series, [Rice University](#), March 2007.
- **QoS Scheduling in Parallel I/O Systems**, Department of Computer Science, [University of Illinois at Urbana Champaign](#), September, 2005.
- **QoS Scheduling in Parallel I/O Systems**, Department of Computer Science, [Purdue University](#), June, 2005.
- **Computing Research in the reorganized CISE**, School of Electrical Engineering and Computer Science, [Oregon State University](#), December, 2004.
- **Single Stream and QoS Scheduling for Parallel I/O Systems**, Department of Computer Science, [University of Nebraska Lincoln](#), November, 2004.
- **Computing Research in the reorganized CISE**, Department of Computer Science, [University of Nebraska Lincoln](#), November, 2004
- **High End Computing Research**, Department of Computer Science, [University of California, Riverside](#), September, 2004
- **High End Computing Research**, Department of EE Systems, [University of Southern California](#), September 2004
- **Research Challenges in Application Specific Computing**, [WASP Panel](#), San Diego, CA December, 2003.

Students Supervised

- **H Wang**, Ph.D. (In Progress)
- **A. Elnably**, M.S., May 2012, Reward Scheduling for QoS in Cloud Applications.
- **H. Wang**, M.S., May. 2012, Nested QoS: Providing Flexible SLAs in Shared Storage Systems.
- **K. Du**, M.S. (joint with K. Mohanram), Dec. 2011, High Performance Reliable Variable Latency Carry Select Addition.
- **L. Lu**, MS, May, 2009, Workload Decomposition for Capacity and Power Provisioning in Storage Systems.
- **A. Gulati**, Ph.D., May 2008, Performance Virtualization and QoS in Shared Storage Systems. First employment: VMWare, CA.
- **A. Gulati**, M.S., December 2004, QoS Scheduling with in Parallel I/O Systems.
- **M. Kallahalla**, Ph. D., December 2000, Prefetching and Caching for Parallel I/O Systems. First Employment: Research Staff Member, HP Research Labs, Palo Alto, CA. (Presently at Google, USA)
- **M. Kallahalla**, M.S. May 1997, Competitive Buffer Management for Parallel I/O Systems.
- **O. Ertug**, M.S. December 2000, Real-Time Prefetching and Buffer Management for Parallel Multimedia I/O Systems.
- **J. Tang**, M.S. May 1993, Performance of Parallel I/O Systems.
- **V. Pai**, M.S. May 1991, Performance Analysis of Parallel I/O Models for External Merge Sort.
- **K. Doshi**, Ph. D., December 1988, Communication Efficient Parallel Algorithms for Non-numeric Computing. First employment: Research Staff Member, AT&T Bell Labs. (Presently at: Intel Labs, Phoenix, AZ.)
- **M. Lu**, Ph. D., May 1987, Mesh-Connected Computer Algorithms for Computational Geometry. Current Position: Professor, Department of ECE, Texas A&M University.
- **K. Mitra**, M. S. May 1987, Parallel Solutions for the Linear Recurrence Problem.

Undergraduate Students

- Tate Hornbeck
- Matt Walker,
- Bill Hodges,
- Vernon Edwards,
- Ellis Giles,
- Eston Ferguson,
- Adnan Nishat,
- Brady Patterson,
- Ahmad Raga,
- Matthew Dunn,
- Scott Scheufler

Courses Taught

- Elec/Comp 526: High Performance Computer Architecture (Spring '08, '09, '10)
- Elec/Comp 425: Computer Systems Architecture (Fall '08, '09, '10)
- Elec/Comp 320: Computer Organization and Programming

- Elec/Comp 519: Parallel Algorithms and Architectures
- Elec 326: Logic Design (Fall '12)
- Elec/Comp 421: Operating Systems
- Elec/Comp 316: Discrete Mathematics
- Elec 619: VLSI Algorithms
- Elec 693: Topics on Database Performance
- Elec 694: Topics on Randomized Algorithms
- Elec 696: Seminar on Computer Architecture (co taught with S. Rixner, 2008-2011) and (K. Mohanram, Spring '09, '10)

Journal Publications and Book Chapters

1. Wang, H., Doshi, K., and Varman, P., Nested QoS: Adaptive Burst Decomposition for Virtualized Servers, Intel Technology Journal, (Special Issue on Exploring Control and Autonomic Computing), June 2012,
2. Wang, J-Z., Varman, P., Xie, C-S., Optimizing Storage Performance in Public Cloud Platforms, Journal of Zhejiang University - Science C, 2011, 12(12), Pages 951-964.
3. Lu, L., Doshi, K., and Varman, P., Decomposing Workload Bursts for Efficient Storage Resource Management, IEEE Transactions on Parallel and Distributed Systems, 22(5), May 2011, pp. 860-873.
4. Gulati, A., Merchant, A., Uysal, M. and Varman, P. Towards Fairness and Efficiency in Storage Systems, ACM SIGMETRICS Performance Evaluation Review, 35(3), December, 2007.
5. Varman, P. and Gulati, A., QoS Scheduling in Network and Storage Systems”, Handbook of Parallel Computing: Models, Algorithms, Applications, S. Rajasekaran and J. Reif (eds.), CRC Press, December, 2007 .
6. Kallahalla, M. and Varman, P., Optimal Read-Once Parallel Disk Scheduling, Algorithmica, 43(4), December, 2005, pp. 309-343.
7. Anastasiadis, S., Varman, P., Vitter, J. S., and Yi, K., Optimal Lexicographic Smoothing for Multimedia Traffic, IEEE Transactions on Computers , 54(4), April, 2005, pp. 398-408.
8. Varman, P., Memory and Storage Systems, in The Engineering Handbook, 2nd Edition, Richard C. Dorf (ed.), CRC Press, 2004..
9. Kallahalla, M. and Varman, P., Analysis of Simple Randomized Buffer Management for Parallel I/O, Information Processing Letters, 90(1), April 2004, pp. 47-52.
10. Kallahalla, M., Lee, K., Lee, B. and Varman, P., Performance Comparison of Sequential Prefetch and Forecasting in Parallel I/O Systems, Journal Parallel and Distributed Systems and Networks, 5-2 (2002), pp. 76-84.

11. Kallahalla, M. and Varman, P., PC-OPT: Optimal Caching and Prefetching for Parallel I/O Systems, IEEE Transactions on Computers, 51-11, (2002), pp. 1333-1344.
12. Kallahalla, M. and Varman, P., I/O Prefetching and Caching, Annual Review of Scalable Computing, Vol. 4, World Scientific Press, 2002
13. Varman, P., Parallel I/O Systems, The Computer Engineering Handbook, V. G. Oklobdzija (ed.), CRC Press, 2002.
14. Barve, R., Kallahalla, M, Varman, P. and Vitter, J, Competitive Parallel Disk Prefetching, Journal of Algorithms, 36 (2) (2000), pp. 152--181.
15. Kallahalla, M. and Varman, P., ASP: Adaptive Online Parallel Disk Scheduling, in External Memory and Visualization, J. Abello and J. S. Vitter (eds.), DIMACS Series of the American Mathematical Society, December, 1999.
16. Kallahalla, M. and Varman, P., Randomized Parallel Prefetching and Buffer Management, in Advances in Randomized Parallel Computing, P. Pardalos and S. Rajasekaran (eds.), Kluwer Academic Publishers, August, 1999.
17. Varman, P. and Verma, R., Tight Bounds for Prefetching and Buffer Management Algorithms for Parallel I/O Systems, IEEE Transactions on Parallel and Distributed Systems, 10 (12), (1999), pp. 1262-1275.
18. Varman, P. and Verma, R., An Efficient Multiversion Access Method, IEEE Transactions on Knowledge and Data Engineering, 9 (3) (1997), pp. 391--409.
19. Sinclair, J., Tang, J. and Varman, P., Placement Related Problems in Shared-Disk I/O, in Parallel I/O Systems, R. Jain, J. Werth, J.C. Browne (eds.), Kluwer Academic Publishers, 1996.
20. Pai, V., Schaffer A. and Varman, P., Markov Analysis of Multiple Disk Prefetching Strategies, Theoretical Computer Science, 128 (1-2), (1994) pp. 211-239.
21. Verma, R. and Varman, P., Efficient Archivable Time Index: A Dynamic Indexing Scheme for Temporal Data, in Computer Systems and Education, N. Balakrishnan, T. Radhakrishnan, D. Sampath and S. Sundaram (eds.), Tata-McGraw-Hill Publishers, 1994.
22. Sinclair, J., Tang, J. and Varman, P., Instability in Parallel I/O Systems, ACM SIGARCH Computer Architecture News, November, 1994.
23. Varman, P. and Doshi, K., Sorting with Linear Speedup on a Pipelined Hypercube, IEEE Transactions on Computers, C-41 (1), (1992), pp. 97-103.
24. Varman, P., Iyer, B., Scheufler, S. and Ricard, G., Merging Multiple Lists on a Hierarchical-Memory Multiprocessor, (Special Issue on Shared-Memory Multiprocessors), Journal of Parallel and Distributed Computing, 12 (2), (1991), pp. 171-177.
25. Varman, P., Iyer, B. and Haderle, D., Parallel Merging on Shared and Distributed Memory Multiprocessors, in Parallel Architectures, N. Rishi, S. Navathe and D. Tal (eds.), IEEE Computer Society Press, 1991.

26. Varman, P., Iyer, B., Haderle, D., and Dunn, S., Parallel Merging: Algorithm and Implementation, Parallel Computing, 15 (1-3), (1990), pp. 165-177.
27. Varman, P. and Ramakrishnan, I.V., Optimal Matrix Multiplication on a Fault-Tolerant VLSI Array, IEEE Transactions on Computers, 38 (2) (1989), pp. 278-283.
28. Varman, P. and Doshi, K., An Efficient Parallel Algorithm for Updating Minimum Spanning Trees, Theoretical Computer Science, 58, (1988), pp. 379-397.
29. Lu, M. and Varman, P., Mesh-Connected Computer Algorithms for Rectangle Intersection Problems, Journal Parallel and Distributed Computing, 5 (2), (1988), pp. 154-171.
30. Lu, M. and Varman, P., Solving Geometric Problems on Two-Dimensional Array Computers, Circuits, Systems and Signal Processing, 7 (2), (1988), pp. 191-211.
31. Doshi, K. and Varman, P., Optimal Graph Algorithms on a Fixed-Size Linear Array, IEEE Transactions on Computers, (Special issue on Parallel and Distributed Computing), C-36(4) (1987), pp. 460-470.
32. Varman, P., Ramakrishnan, I.V. and Fussell, D.S., Fault-Tolerant VLSI Sorters, Circuits, Systems and Signal Processing, 6(2), (1987), pp. 153-176.
33. Varman, P. and Ramakrishnan, I.V., Synthesis of a Family of Optimal Matrix Multiplications on a Linear Array, IEEE Transactions on Computers, C-35 (11) (1986), pp. 989-996.
34. Ramakrishnan, I.V. and Varman, P., Modular Matrix Multiplication on Linear Arrays, IEEE Transactions on Computers, C-33 (11), (1984), pp. 952-958.
35. Varman, P., Ramakrishnan, I.V. and Fussell, D.S., A Robust Matrix-Multiplication Array, IEEE Transactions on Computers, C-33 (10), (1984), pp. 919-922.

Reviewed Conference Publications

1. Gulati, A., Merchant, A., Padala, P., Uysal, M., and Varman, P., Workload Dependent IO Scheduling for Fairness and Efficiency in Shared Storage Systems, *19th Annual International Conference on High Performance Computing*, December, 2012 (to appear).
2. Doshi, K. and Varman, P., "WrAP: Managing Byte-Addressable Persistent Memory, *Memory Architecture and Organization Workshop*, (Held with ESS Week), Tampere, Finland, October, 2012 (to appear).
3. Elnably, A., Wang, H., Gulati, A., and Varman, P., Efficient QoS for Multi-tiered Storage Systems, *4th Usenix Workshop on Hot Topics in Storage and File Systems*, June 2012.

4. Elnably, A. and Varman, P, Application-sensitive QoS scheduling in Storage Servers, *24th ACM Symposium on Parallelism in Algorithms and Architecture (SPAA 12)*, June, 2012 (short paper).
5. Gulati, A., Shanamugan, G., X. Zhang. and Varman, P., “Demand Based Hierarchical QoS using Storage Resource Pools, *2012 Usenix Annual Technical Conference (Usenix ATC '12)*, June, 2012.
6. Elnably A., Du, K. and Varman, P., Reward Scheduling for QoS in Cloud Applications, *12th IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing, (CCGRID 12)*, May, 2012.
7. Du, K., Varman, P. and Mohanram, K., High Performance Reliable Variable Latency Carry Select Addition, *Design, Automation and Test in Europe (DATE '12)*, March, 2012. A short version was presented at the *International Conference on Computer Design (ICCD)*, Oct. 2011.
8. Wang, H. and Varman, P., Nested QoS: Providing Flexible Performance Guarantees in Shared IO Environments, *3rd Workshop on I/O Virtualization (WIOV 2011)*. Earlier version was presented as Work-In-Progress at *Usenix FAST 2011*.
9. Wang, H. and Varman, P., A Flexible Approach to Efficient Resource Sharing in Virtualized Environments , *ACM International Conference on Computing Frontiers (CF 2011)*, May, 2011.
10. Wang, J., Varman, P., and Xie, C., Avoiding Performance Fluctuation in Cloud Storage, *17th Annual International Conference on High Performance Computing (HiPC 2010)*, December, 2010.
11. Wang, J., Varman, P., and Xie, C., Middleware Enabled Data Sharing on Cloud Services, *5th Workshop on Middleware for Service Oriented Computing (MW4SOC 2010)*, co-located with *11th ACM/IFIP International Middleware Conference*, December, 2010.
12. Gulati, A, Merchant, A, and Varman, P., mClock: Handling Throughput Variability for Hypervisor IO Scheduling, *9th USENIX Symposium on Operating Systems Design and Implementation (OSDI, 2010)*, October, 2010.
13. Wang, H., and Varman, P., Statistical Workload Shaping for Storage Systems, *16th Annual International Conference on High Performance Computing (HiPC 09)*, December, 2009.
14. Lu, L., Doshi, K., and Varman, P., Graduated QoS by Decomposing Bursts: Don't Let the Tail Wag your Server, *29th Int'l Conference on Distributed Computing Systems (ICDCS 2009)*, June, 2009.
15. Lu, L, and Varman, P., Workload Decomposition for Power Efficient Storage Systems, *Workshop on Power Aware Computing and Systems (HotPower'08) co-located with 8th USENIX OSDI*, December, 2008.
16. Lu, L., Doshi, K., and Varman, P., Workload Decomposition for QoS in Hosted Storage Services, *3rd Workshop on Middleware for Service Oriented Computing (MW4SOC)*, co-located with *9th ACM/IFIP International Middleware Conference*, December, 2008.
17. Gulati, A. and Varman, P. RFQ: Redemptive Fair Queuing, *16th Annual European Symposium on Algorithms (ESA 2008)*, LNCS 5193, Springer, September, 2008 .

18. Hon, W-K, Shah, R, Varman, P., and Vitter J.S., Tight Competitive Ratios for Parallel Disk Prefetching and Caching, 20th Annual *ACM SIGACT/SIGARCH Symposium on Parallelism in Algorithms and Architectures* (SPAA 2008), June 2008.
19. Gulati, A, Merchant, A, and Varman, P. d-Clock: QoS scheduling for Heterogeneous Servers, *ACM SIGACT/SIGOPS Symposium on Principles of Distributed Computing* (PODC 2007), (short paper), August, 2007.
20. Lu, L., Varman, P. and Wang, J., DiskGroup: Energy Efficient Disk Layout for RAID-1 Systems, *IEEE Symposium on Networking, Architecture and Storage*, (NAS 07), July, 2007.
21. Gulati, A, Merchant, A. and Varman, P., p-Clock: An Arrival Curve based approach for QoS guarantees in shared storage servers, *ACM International Conference on Measurement and Modeling of Computer Systems* (SIGMETRICS 2007), June, 2007.
22. Gulati, A. and Varman, P., Scheduling Multiple Flows on Parallel Disks, *Proc. Intl. Conference on High Performance Computing* (HiPC 2005), December, 2005.
23. Gulati, A., Merchant, A. and Varman, P., Towards Multi-objective scheduling in Shared Storage Systems, *International Workshop on Storage Network Architectures and Parallel I/O*, (held in conjunction with PACT 2005), September, 2005..
24. Li, D., Wang, J. and Varman, P., Conserving Energy in Conventional RAID-based Disk Systems, *International Workshop on Storage Network Architectures and Parallel I/O*, (held in conjunction with PACT 2005), September, 2005..
25. Gulati, A. and Varman, P., Lexicographic QoS Scheduling for Parallel I/O, *Proc. 17th ACM Symposium on Parallelism in Algorithms and Architectures*, (SPAA'05), July, 2005.
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