

## Curriculum Vitae

**Alok N. Choudhary**  
**Professor, Electrical Engineering and Computer Science**  
**Chair, Computer Engineering and Systems Division**  
**Professor Kellogg School of Management**  
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### **EDUCATIONAL RECORD:**

- **Ph.D.**, University of Illinois, Urbana-Champaign, Illinois, Computer Engineering (ECE Department), August, 1989.
- **M.S.**, University of Massachusetts, Amherst, Massachusetts, Computer Engineering (ECE Department), February, 1986.
- **B.E. (Hons)**, Birla Institute of Technology and Science, Pilani, India, Electrical and Electronics Engineering, June, 1982.

### **WORK EXPERIENCE:**

- Professor EECS Department, Chair, Computer Engineering and Systems division, Northwestern University, and Director of Center for Ultra-Scale Computing and Information Security, current
- Professor, Kellogg School of Management, E-commerce, Technology and Marketing, Northwestern University, current
- Co-founder and VP research and technology, Accelchip Inc., 2000-2002
- Guest appointments with Lawrence Livermore Lab and Argonne National Labs, 2002-present
- Associate Professor, ECE Department, Northwestern University, 9/1/96 - 8/31/00.
- Associate Professor, Kellogg School of Management, Northwestern University, 3/1/99-9/1/00
- Associate Professor, ECE and CIS Department, Syracuse University, 7/1/93 - 8/31/96.
- Assistant Professor, ECE and CIS Department, Syracuse University, 8/89 - 6/93.
- Visiting Faculty, University of Vienna, 6/96 - 7/96.
- Visiting Faculty, Intel Corp, Beaverton, OR, Summer 95.
- Visiting Scientist, IBM, Thomas J. Watson Research Center, Yorktown Heights, NY, Summer 91.
- Visiting Scientist, IBM, Thomas J. Watson Research Center, Yorktown Heights, NY, Summer 88.
- Visiting Scientist, IBM, Thomas J. Watson Research Center, Yorktown Heights, NY, Summer 87.
- Research Assistant, Coordinated Science Laboratory, University of Illinois, Urbana, 1/86 to 8/89.

- Teaching Assistant, Department of Electrical and Computer Engineering, University of Illinois, Urbana , 8/87 to 1/88.
- Research Assistant, Department of Electrical and Computer Engineering, University of Massachusetts, Amherst, MA, 8/84 to 1/86.
- Teaching Assistant, Department of Electrical and Computer Engineering, University of Massachusetts, Amherst, MA, 1/84 to 1/86.
- Systems Analyst and Designer, Tata Consultancy Services, New Delhi, India (Computer Consultants), 6/82 to 1/84.
- Engineer (Trainee), Department of Electronics, Defense Cell, Government of India, New Delhi, India, 12/81 to 6/82.
- Teaching Assistant, Birla Institute of Technology and Science, Pilani, India, 7/81 to 12/81.

### **HONORS and AWARDS:**

- National science Foundation, Young Investigator Award, 1993 (1993-1999).
- Fellow of the IEEE
- Excellence in research, teaching and service award, McCormick School of Engineering, Northwestern University, 2006.
- Member, National Academy of Science Committee on the Impact of High-End Computing on Science. The committee formed on behalf of US government to understand the impact and recommend priorities.
- IBM Faculty Development Award, 1994, 2005
- Intel Research Council Award, 1993-1997, 2003-2005.
- NSF Research Initiation Award, 1991 (1991-1993).
- IEEE Engineering Foundation award.
- Received highest performance award while working with Tata Consultancy Services (For the year 1982-1983).
- National Scholarship (Government of India, 1976-1982).

### **Current Research Interests:**

- High-Performance Computing: Scalable Architectures, System Software, Runtime Systems; High-Performance Input-Output, Storage and data mining.
- Embedded Systems, security conscious architectures and software
- Business Intelligence, data mining and applications to science, scientific discoveries, business, computational biology, medicine and health care, CRM and marketing, high-performance data management.

### **JOURNAL EDITORIAL**

- *Associate Editor of IEEE Transactions on Parallel and Distributed (6 years)*
- *Subject Area Editor of Journal of Parallel and Distributed Computing*
- *Editor of International Journal on High-Performance Computing and Networking*
- *Guest Editor, IEEE Computer (top computer science magazine)*
- *Guest Editor, IEEE Parallel and Distributed Technology*

## **GRADUATE STUDENT SUPERVISION:**

### *Ph.D. Students (Graduated):*

1. Ravi Ponnusamny, Ph.D., 1994 (now own business)
2. Rajeev Thakur, Ph.D., 1995 (Research Scientist, Argonne National Labs)
3. Rajesh Bordawekar, Ph.D., 1996 (IBM T. J. Watson Research Center)
4. Chaitanya Tumuluri, Ph.D., 1996 (Silicon Graphics)
5. Senthil Krishnamoorthy, Ph.D., 1996 (Intel Corporation)
6. Divyesh Jadav, Ph.D., 1997 (IBM Almaden Research Center)
7. Meena Kandaswamy, Ph.D., 1998 (Intel)
8. Sang-hue Oh, Ph.D., 1998 (Macromedia, Seoul, Korea)
9. Chutimet Srinilta, Ph.D., Sept. 1998 (Faculty, Thailand)
10. Rakesh Krishnaiyer, Ph.D., Sept. 1998 (Intel)
11. Jaechun No, Ph.D., 1999 (Faculty, Korea)
12. Wei-keng Liao, Ph.D., 1999 (Research Faculty, Northwestern University)
13. Mahmut Kandemir, Ph.D., 1999 (Faculty, Penn State)
14. Sanjay Goil, Ph.D., 1999 (Sun Microsystems)
15. Malay Haldar, PhD 2002 (startup, India)
16. Sachin More, PhD, 2000 (EMC)
17. Anshuman Nayak, PhD 2002
18. Xioui Shen, PhD, 2001 (Motorola)
19. Steve Chiu, PhD, 2004 (faculty)
20. Ying Liu, PhD, 2005
21. Jay Pisharath, PhD, 2005 (Intel)
22. Joseph Zambreno, PhD, 2006 (Faculty, Iowa State)
23. Jianwei Li, PhD, 2006 (Wallstreet)

### *M.S. Students (Graduated, **most of the above students also obtained M.S. degree with thesis**):*

1. Sriram Raghavendran, M.S., 1998
2. Chutinet Srinilta, M.S. (Thesis), 1995
3. Sivaram Kudatipidi, M.S. (Thesis), 1996
4. Sachin More, M.S. (Thesis), 1996
5. Balaji Thiagrajan, M.S., 1995
6. Bhaven Avalani, M.S., 1995
7. Rajesh Bordawekar, M.S. (Thesis), 1994
8. Kohinoor Basu (Intel), 2001
9. Debrarata Bagchi, 2001
10. Satrajit Pal, 2001
11. Gokhan Memik, 2000
12. Jay Pisharath, 2002
13. Joe Zambreno, 2002

### **Current Ph.D. Students:**

1. Nan Jiang
2. Sanchit Misra
3. Avery Ching (DOE HPCC fellowship)
4. Kenin Coloma

5. Dan Honbo (NSF Fellowship)
6. Berkin Ozisikyilmaz
7. Ramanathan Narayanan
8. Abhisek Das
9. Arifa Nisar
10. Prabhat Kumar
11. Xi Chen

## **PUBLICATIONS:**

### BOOKS:

- A. N. Choudhary and J. H. Patel, *Parallel Architectures and Parallel Algorithms for Integrated Vision Systems*, Kluwer Academic Publisher, Boston, MA, 1990.

### SELECTED REFEREED JOURNAL PAPERS:

1. Gokhan Memik, Mahmut T. Kandemir, Wei-Keng Liao, Alok Choudhary, "Multi-Collective I/O: A technique for exploiting inter-file access patterns," To appear in *ACM Transactions on Storage*.
2. Ying Liu, Jianwei Li, Wei-keng Liao, Alok Choudhary, A Recommendation System Based on High Utility Itemsets Mining, to appear in the *International Journal of Data Mining and Knowledge Discovery*.
3. W. Liao, A. Choudhary, L Ward, N. Pandit. "Cooperative Write-behind Data Buffering for MPI I/O," to appear in *International Journal of High Performance Computing Applications*.
4. Steve Chiu, Wei-keng Liao, and Alok Choudhary. Distributed Smart Disks for I/O-Intensive Workloads on Switched Interconnects. In the *Journal of Future Generation Computer Systems*, 22(5): 643-656, Apr., 2006.
5. Abhisek Das, G. Memik, D. Ngyen, Joseph Zambreno, Alok Choudhary, "An FPGA-based Network Intrusion Detection Architecture," to appear in *IEEE Transactions on Information Forensics and Security*.
6. Joseph Zambreno, Alok Choudhary, Rahul Simha, Bhagirath Narahari, and Nasir Memon. SAFE-OPS: An Approach to Embedded Software Security. *ACM Transactions on Embedded Computing Systems (TECS)*, 4(1):189–210, February 2005.
7. J. Zambreno, D. Honbo, A. Choudhary, R. Simha, and B. Narahari. High-performance software protection using reconfigurable architectures. *Proceedings of the IEEE*, vol. 94, no. 2, pages 1-13, February 2006.
8. M. Kandemir, I. Kadayif, A. Choudhary, J. Ramanujam, and I. Kolcu., "Compiler-directed scratch pad memory optimization for embedded multiprocessors," To appear in *IEEE Transactions on VLSI (TVLSI)*.
9. X. Shen, W. Liao, A. Choudhary, G. Memik, and M. Kandemir, "A high performance application data environment for large-scale scientific computations," To appear in *IEEE Transactions on Parallel and Distributed Systems (TPDS)*.
10. Wei-keng Liao, Alok Choudhary, Donald Weiner, and Pramod Varshney. Performance Evaluation of a Parallel Pipeline Computational Model for Space-Time Adaptive Processing. *Journal of Supercomputing*, 31(2):137–160, February 2005
11. M. Kandemir, A. Choudhary, J. Ramanujam, and P. Banerjee, "Reducing False Sharing and Improving Spatial Locality in a Unified Compilation Framework," *IEEE Transactions on Parallel and Distributed Systems (TPDS)*, April 2003.

12. X. Shen, A. Choudhary, C. Matarazzo and P. Sinha, "A Distributed Multi-Storage Architecture and I/O Performance Prediction for Scientific Computing," *Cluster Computing* 6, pp 189-200, 2003.
13. Jaechun No, Rajeev Thakur, Alok Choudhary, "High -performance scientific data management system," *Journal of Parallel and Distributed Computing*, volumn 63, issue 4, pages 434-447(Apr 2003).
14. Nan Jiang, Jayaprakash Pisharath and Alok Choudhary. "Characterizing and Improving Energy-Delay Tradeoffs in Heterogeneous Communication Systems," In Proc. of the IEEE International Symposium on Signals, Circuits and Systems (SCS), July 2003, IEEE Press.
15. Jayaprakash Pisharath, Nan Jiang, and Alok Choudhary. "Evaluation of Application-Aware Heterogeneous Embedded Systems for Performance and Energy Consumption," In Proc. of the 9th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), May 2003, IEEE Press.
16. M. Kandemir, A. Choudhary, and J. Ramanujam," An I/O-conscious tiling strategy for disk-resident data sets," *Journal of Supercomputing*, Vol 21, Number 3, March 2002, pp. 257-284.
17. Jaechun No, Sung-soon Park, Jesus Carretero Perez and Alok Choudhary, "Design and Implementation of a Parallel I/O Runtime System for Irregular Applications," *Journal of Parallel and Distributed Computing*, volumn 62, issue 2, pages 173-326 (Feb 2002).
18. S. Goil and A. Choudhary, "PARSIMONY: An Infrastructure for Parallel Multidimensional Analysis and Data Mining," *Journal of Parallel and Distributed Computing* (Special Issue on High Performance Data Mining), Vol. 61, No. 3, March 2001.
19. G. Memik, M. Kandemir, and A. Choudhary, "Design and Evaluation of Smart Disk Cluster for DSS Commercial Workloads," *Journal of Parallel and Distributed Computing* (Special Issue on Cluster and Network-Based Computing), Nov 2001.
20. M. Kandemir, A. Choudhary, P. Banerjee, J. Ramanujam, and N. Shenoy, "Minimizing Data and Synchronization Costs in One-Way Communication," *IEEE Transactions on Parallel and Distributed Systems* (TPDS), Vol. 11, No. 12, December 2000, pp. 1232-1251.
21. A. Choudhary, M. Kandemir, J. No, G. Memik, X. Shen, W. Liao, H. Nagesh, S. More, V. Taylor, R. Thakur, and R. Stevens, "Data Management for Large-Scale Scientific Computations in High Performance Distributed Systems," *Cluster Computing: the Journal of Networks, Software Tools and Applications*, Vol. 3, No. 1, pp. 45-60, 2000.
22. M. Kandaswamy, M. Kandemir, A. Choudhary, and D. Bernholdt, "An Experimental Evaluation of I/O Optimizations on Different Applications," *IEEE Transactions on Parallel and Distributed Systems*, Vol. 13, No. 7, July 2002, pp. 728-744.
23. J. No, S. Park, J. Carretero Perez, and A. Choudhary, "Design and Implementation of a Parallel I/O Runtime System for Irregular Applications," *Journal of Parallel and Distributed Computing*, Vol. 62, No. 2, February 2002, pp. 193-220.
24. M. Kandemir, P. Banerjee, A. Choudhary, J. Ramanujam, and N. Shenoy, "A Global Communication Optimization Technique Based on Data Flow Analysis and Linear Algebra," *ACM Transactions on Programming Languages and Systems* (TOPLAS), Vol. 21, No. 6, November 1999.
25. M. Kandemir, P. Banerjee, A. Choudhary, J. Ramanujam, and E. Ayguade, "Static and Dynamic Locality Optimizations Using Integer Linear Programming," *IEEE Transactions on Parallel and Distributed Systems*, Vol. 12, No. 9, pp. 922-941, September 2001.
26. D. Jadav, A. Choudhary, and P. Berra, "Techniques for Increasing the Stream Capacity of a High-Performance Multimedia Server," *IEEE Transactions on Knowledge and Data Engineering*, Vol. 11, No. 2, March/April 1999.
27. M. Kandemir, J. Ramanujam, and A. Choudhary, "Improving Cache Locality by a Combination of Loop and Data Transformations," *IEEE Transactions on Computers*, Vol. 48, No. 2, Feb. 1999.

28. M. Kandemir, A. Choudhary, N. Shenoy, P. Banerjee, and J. Ramanujam, "A Linear Algebra Framework for Automatic Determination of Optimal Data Layouts," *IEEE Transactions on Parallel and Distributed Systems*, Vol. 10, No. 2, Feb. 1999.
29. N. Shenoy, A. Choudhary, and P. Banerjee, "An Algorithm for Synthesis of Large Time-constrained Heterogeneous Adaptive Systems," *ACM Transactions on the Design Automation of Electronic Systems*, Vol. 6, No. 2, April 2001.
30. M. Kandemir, J. Ramanujam, and A. Choudhary, "Compiler Algorithms for Optimizing Locality and Parallelism on Shared and Distributed-Memory Machines," *Journal of Parallel and Distributed Computing*, 60, pp. 924-965, 2000.
31. M. Kandemir, J. Ramanujam, and A. Choudhary, "Reducing False Sharing and Improving Spatial Locality," *IEEE Transactions on Parallel and Distributed Systems*, to appear.
32. N. Shenoy, A. Choudhary, and P. Banerjee, "An Algorithm for Synthesis of Large Time-constrained Heterogeneous Adaptive Systems," *ACM Transactions on the Design Automation of Electronic Systems*, Vol. 6, No. 2, April 2001.
33. M. Kandemir, A. Choudhary, J. Ramanujam, and M. Kandaswamy, "A Unified Framework for Optimizing Locality, Parallelism, and Communication in Out-of-Core Computations," *IEEE Transactions on Parallel and Distributed Systems*, Vol. 11, No. 7, pp. 648-667, July 2000.
34. M. Kandemir, J. Ramanujam, and A. Choudhary, "Compiler Algorithms for Optimizing Locality and Parallelism on Shared and Distributed Memory Machines," *Journal of Parallel and Distributed Computing*, 60, pp. 924-965, 2000.
35. A. Choudhary, W. Liao, D. Weiner, P. Varshney, R. Linderman, M. Linderman, and R. Brown, "Design, Implementation and Evaluation of Parallel Pipelined STAP on Parallel Computers," *IEEE Transactions on Aerospace and Electronic Systems*, Vol. 36, Issue 2, April 2000, pp. 528-548.
36. M. Kandemir, A. Choudhary, J. Ramanujam, and P. Banerjee, "A Matrix-Based Approach to Global Locality Optimization," *Journal of Parallel and Distributed Computing, Special Issue on Compilation and Architectural Support for Parallel Applications*, Vol. 58, No. 2, Aug. 1999.
37. M. Kandemir, P. Banerjee, A. Choudhary, J. Ramanujam, and N. Shenoy, "A Global Communication Optimization Technique Based on Data-Flow Analysis and Linear Algebra," *ACM Transactions on Programming Languages and Systems (TOPLAS)*, Vol. 21, No. 6, Nov. 1999..
38. M. Kandaswamy, M. Kandemir, A. Choudhary and D. Bernholdt, "An Experimental Study to Analyze and Optimize Hartree-Fock Application's I/O With PASSION," *International Journal of High Performance Computing Applications*, Vol. 12, No. 4, pp. 411-439, Winter 1998.
39. M. Kandemir, J. Ramanujam, R. Bordawekar, and A. Choudhary, "Compilation Techniques for Out-of-Core Parallel Computations," *Parallel Computing*, 24(3-4): 597-628, June 1998.
40. M. Kandemir, A. Choudhary, J. Ramanujam and M. Kandaswamy, "Locality Optimization Algorithms for Compilation of Out-of-Core Codes," *Journal of Information Science and Engineering*, 14(1): 107-138, March 1998.
41. I. Foster, D. Kohr, Jr., R. Krishnaiyer, and A. Choudhary, "A Library-Based Approach to Task Parallelism in a Data-Parallel Language," *Journal of Parallel and Distributed Computing*, Vol. 45, No. 2, pp. 148-158, September 1997.
42. S. Goil and A. Choudhary, "High Performance OLAP and Data Mining on Parallel Computers," *Journal of Data Mining and Knowledge Discovery (Special Issue on Scalable High-Performance Computing for KDD)*, Vol. 1, No. 4, pp. 391-417, 1997.
43. S. Adve, D. Burger, R. Eigenmann, A. Rawsthorne, M. Smith, C. Gebotys, M. Kandemir, D. Lilja, A. Choudhary, J. Fang, P. Yew, "Changing Interaction of Compiler and Architecture," *IEEE Computer*, Vol. 30, No. 12, pp. 51-58, Dec. 1997.
44. D. Jadav, C. Srinilta, A. Choudhary, and P. B. Berra, "An Evaluation of Design Trade-Offs in a High-Performance, Media-On-Demand Server," *ACM Multimedia Systems Journal*, Vol. 5, Jan. 1997, pp. 53-68.

45. R. Thakur and A. Choudhary, "An Extended Two-Phase Method for Accessing Sections of Out-of-Core Arrays," *Journal of Scientific Programming*, Vol. 5, No. 4, pp. 301-317, Winter 1996.
46. A. Choudhary, R. Thakur, R. Bordawekar, S. More, and S. Kutipidi, "PASSION: Optimized I/O for Parallel Applications," *IEEE Computer*, (29) 6: 70-78, June 1996 (PASSION: PARallel and Scalable Software for Input-Output).
47. R. Thakur, A. Choudhary and J. Ramanujam, "Efficient Algorithms for Array Redistribution," *IEEE Trans. on Parallel and Distributed Systems*, (7) 6:587-594, June 1996.
48. D. Jadav, C. Srinilta, A. Choudhary, and P. B. Berra, "Techniques for Scheduling I/O in a High Performance Multimedia-on-Demand Server," *Journal of Parallel and Distributed Computing*, Vol. 30, No. 2, Nov. 1995.
49. R. Ponnusamy, J. Saltz, A. Choudhary, Y.-S. Hwang, and G. Fox, "Runtime Support and Compilation Methods for User-Specified Irregular Data Distributions," *IEEE Transactions on Parallel and Distributed Systems*, Vol. 6, No. 8, August, 1995.
50. M. Harry, J. del Rosario, and A. Choudhary, "The Design of VIP-FS: A Virtual, Parallel File System for High Performance Parallel and Distributed Computing," *ACM Operating Systems Review*, Vol. 29, No. 3, July 1995.
51. A. Choudhary, I. Foster, and R. Stevens, "Multimedia Applications and High-Performance Computing" (Guest Editors' Introduction), *IEEE Parallel and Distributed Technology*, Summer 1995.
52. D. Jadav and A. Choudhary, "Designing and Implementing High Performance Media-on-Demand Servers," *IEEE Parallel and Distributed Technology*, Summer 1995.
53. D. Reed, C. Catlett, A. Choudhary, D. Kotz and M. Snir, "Parallel I/O: Getting Ready for Prime Time," *IEEE Parallel and Distributed Technology*, Summer 1995.
54. R. Ponnusamy, J. Saltz, A. Choudhary, Yuan-Shin Hwang, R. Das, and G. Fox, "Supporting Irregular Distributions Using Data-Parallel Languages," *IEEE Parallel and Distributed Technology*, Vol. 3, No. 1, Spring 1995.
55. R. Thakur, A. Choudhary, R. Ponnusamy and G. Fox, "Complete Exchange on the CM-5 and Touchstone Delta," *The Journal of Supercomputing*, 1995.
56. S. Krishnamoorthy and A. Choudhary, "A Scalable Distributed Shared Memory Architecture," *Journal of Parallel and Distributed Computing*, Vol. 22, No. 3, pp. 547-554, Sept. 1994.
57. Bozkus, Alok Choudhary, Geoffrey C. Fox, T. Haupt, S. Ranka, and M. Y. Wu, "Compiling Fortran 90D/HPF for Distributed Memory MIMD Computers," *Journal of Parallel and Distributed Computing*, April 1994, pp. 15-26.
58. J. M. del Rosario and A. Choudhary, "High Performance I/O for Massively Parallel Computers: Problems and Prospects," *IEEE Computer*, March 1994, pp. 59-68.
59. A. N. Choudhary, B. Narahari, D. M. Nicol and R. Simha, "Optimal Processor Assignment for Pipeline Computations," *IEEE Transactions on Parallel and Distributed Systems*, April 1994.
60. R. Ponnusamy, N. Mansour, A. Choudhary and G. Fox, "Graph Contraction for Mapping Data on Parallel Computers: A Quality-Cost Tradeoff," *Journal of Scientific Programming*, Vol 3, pp. 73-82, 1994.
61. A. Choudhary and S. Krishnamoorthy, "Evaluation of Multilevel Caches for Shared Memory Multiprocessors," *Journal of Computer and Software Engineering*, Vol. 2, No. 1, 1994, pp. 87-110.
62. A. Choudhary and R. Thakur, "Connected Component Labeling on Course Grain Parallel Computers: An Experimental Study," *Journal of Parallel and Distributed Computing*, Vol. 20, No. 1, Jan. 1994, pp. 78-83.
63. A. N. Choudhary, G. Fox, S. Hiranandani, K. Kennedy, C. Koelbel, S. Ranka and C. W. Tseng, "Unified Compilation of Fortran 77D and 90D," *Letters on Programming Languages and Systems (LOPLAS)*, 2(1-4):95-114, March-December 1993.

64. A. Choudhary, J. H. Patel and N. Ahuja, "NETRA: A Hierarchical and Partitionable Architecture for Computer Vision," *IEEE Transactions on Parallel and Distributed Computing*, Oct. 1993, pp. 1092-1104.
65. R. Ponnusamy, R. Thakur, A. Choudhary, K. Velamakanni, Z. Bozkus and G. Fox, "Experimental Performance Evaluation of the CM-5," *Journal of Parallel and Distributed Computing*, September 1993, Vol. 19, No. 1, pp. 192-202.
66. A. Choudhary, B. Narahari, and R. Krishnamurti, "An Efficient Heuristic Scheme for Dynamic Remapping of Parallel Computations," *Parallel Computing*, Vol. 19, pp. 621-632, 1993.
67. A. N. Choudhary, "Parallel I/O Systems," *Journal of Parallel and Distributed Computing*, Jan. 1993., Vol 17, pp. 1-3.
68. W. Song, S. Hariri and A. Choudhary, "Design and Analysis of an Optical Communications Processor," *Journal of Parallel and Distributed Computing*, Vol. 17, 1993, pp. 222-229.
69. A. Choudhary, G. Fox, S. Ranka, S. Hiranandani, K. Kennedy, C. Koelbel, and J. Saltz, "Software Support for Irregular and Loosely Synchronous Problems," *International Journal of Computing Systems in Engineering*, Dec. 1992, Vol. 3, pp. 43-52.
70. S. Hariri, A. N. Choudhary and S. Sarikaya, "Architectural Support for Designing Fault-Tolerant Open Distributed Systems," *IEEE Computer*, June 1992, Vol. 25, No. 6, pp. 50-62.
71. W. Song, S. Hariri and A. N. Choudhary, "An Optical Interface Message Processor for Fiber Communication Networks," *Journal of Optics Communications*, Vol. 91, pp. 304-11, 1992.
72. A. N. Choudhary and R. Ponnusamy, "Run-Time Data Decomposition for Parallel Implementation of Image Processing and Computer Vision Tasks," *Journal of Concurrency, Practice and Experience*, June 1992, Vol. 4, No. 4, pp. 313-334.
73. A. N. Choudhary and R. Ponnusamy, "Parallel Implementation and Evaluation of a Motion Estimation System Algorithm using Several Data Decomposition Strategies," *Journal of Parallel and Distributed Computing*, Jan. 1992, Vol. 14, pp. 50-65.
74. A. N. Choudhary and S. Ranka, "Mesh and Pyramid Algorithms for Iconic Indexing," *Journal of Pattern Recognition*, Sept. 1992, Vol. 25, No. 9, pp. 1061-1067.
75. A. Choudhary and S. Ranka, "Parallel Processing for Computer Vision and Image Understanding," *IEEE Computer*, Feb. 1992, pp. 7-11.
76. A. Choudhary and S. Krishnamoorthy, "Shared Memory Multiprocessor Simulations to Study Dynamic Characteristics of Two Level Caches," *International Journal of Computer Simulation*, Vol. 2, No. 1, Jan. 1992, pp. 1-19.
77. A. N. Choudhary and R. Ponnusamy, "Implementation and Evaluation of Hough Transform Algorithms on a Shared Memory Multiprocessor," *Journal of Parallel and Distributed Computing*, June 1991, Vol. 12, pp. 178-188.
78. A. Choudhary, W. H. Kohler, J. Stankovic and D. F. Towsley, "A Modified Priority Based Probe Algorithm for Distributed Deadlock Detection and Resolution," *IEEE Transactions on Software Engineering*, Vol. 15, No. 1, January 1989, pp. 10-17.

#### SELECTED BOOK CHAPTERS:

1. Avery Ching, Kenin Coloma, Jianwei Li, and Alok Choudhary. High-performance techniques for parallel I/O. In *Handbook of Parallel Computing: Models, Algorithms, and Applications*. CRC Press, 2007.
2. Jianwei Li and Alok Choudhary and Nan Jiang and Wei-keng Liao, Mining Frequent Patterns by Differential Refinement of Clustered Bitmaps, Proceedings of the {SIAM} Int'l Conf. on Data Mining, April 2006.
3. Jianwei Li, Ying Liu, Wei-keng Liao, Alok Choudhary, Parallel Data Mining Algorithms for Association Rules and Clustering, *Handbook of Parallel Computing: Models, Algorithms and Applications*. Sanguthevar Rajasekaran and John Reif, ed., CRC Press, 2006.

4. Wei-keng Liao, Alok Choudhary, Kenin Coloma, Lee Ward, Eric Russell, and Neil Pundit. MPI Atomicity and Concurrent Overlapping I/O. Book chapter 10 in High Performance Computing: Paradigm and Infrastructure, pp. 203 -- 218, John Wiley & Sons Inc. November 2005.
5. I. Kadayif, M. Kandemir, A. Choudhary, M. Karakoy, N. Vijaykrishnan, and M. J. Irwin, "Compiler-directed communication energy optimizations for microsensor networks," In Frontiers in Distributed Sensor Networks, edited by R. Brooks and R. Iyengar, CRC Press, 2003.
6. G. Memik, M. Kandemir, A. Choudhary, "Hardware/software techniques for improving cache performance in embedded systems," Embedded Software for SoC, Edited by Jerraya/Yoo/Wehn/Verkest, Kluwer, June 2003.
7. A. Choudhary and M. Kandemir, "Compilation for distributed-memory architectures," The Compiler Design Handbook: Optimizations and Machine Code Generation, CRC Press, 2002.
8. H. Nagesh, S. Goil, and A. Choudhary, "Parallel Algorithms for Clustering High-dimensional Large-Scale Datasets," in *Data Mining for Scientific and Engineering Applications*, Editors: R. Grossman, C. Kamath, P. Kegelmeyer, V. Kumar, and R. Namburu, Kluwer Academic Publishers, 2001.
9. M. Kandemir and A. Choudhary, "I/O Programming Paradigms: Past and Future," in *High Performance Mass Storage and Parallel I/O: Theory and Practice*, Editors: H. Jin, T. Cortes, and R. Buyya, IEEE Press, 2000.
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7. M. Kandemir, R. Bordawekar, A. Choudhary, and J. Ramanujam, "A Unified Tiling Approach for Out-of-Core Computations," *Sixth Workshop of Compilers for Parallel Computers*, Aachen, Germany, Dec. 1996.
8. I. Foster, D. R. Kohr, Jr., R. Krishnaiyer, and A. Choudhary, "MPI As a Coordination Layer for Communicating HPF Tasks," *Proc. 1996 MPI Developers Conference*, Notre Dame, IN, July 1996, pp. 68-78.
9. A. Choudhary, B. Narahari, V. Gehlot, M. Benincasa, and R. Metzger, "A Specification Language for Parallel Real-Time Systems," *IPPS 95, Workshop on Parallel and Distributed Real-Time Systems*, April 1995.
10. A. Choudhary, B. Narahari, V. Gehlot, M. Benincasa, and R. Metzger, "PRETSEL: A Parallel Real-Time Specification Language," *International Workshop on Parallel Processing*, Dec. 1994.
11. M. Raziuddin, R. Ponnusamy, and A. Choudhary, "A Loop Distribution Technique for Irregular Computations on Distributed Shared Memory Machines," *Proc. of the International Workshop on Parallel Processing*, Bangalore, India, Dec. 1994.
12. R. Thakur, R. Bordawekar, A. Choudhary, R. Ponnusamy, and T. Singh, "PASSION Runtime Library for Parallel I/O," *Scalable Parallel Libraries Conference*, Oct. 1994.
13. R. Thakur, R. Bordawekar and A. Choudhary, "Compilation of Out-of Core Data Parallel Programs for Distributed Memory Machines," *Proc. of the Workshop on I/O in Parallel Computer Systems at IPPS-94*, April 1994.
14. J. M. del Rosario, R. Bordawekar, and A. Choudhary, "Improving Parallel I/O Performance Using a Two-Phase Access Strategy," *Workshop on Parallel I/O, in IPPS'93*, April 1993.
15. S. Krishnamoorthy and A. Choudhary, "A Scalable Distributed Memory Architecture," *Workshop on Analyzing Scalability of Parallel Algorithms and Architectures*, at IPPS'93, April 13, 1993.
16. R. Bordawekar and A. Choudhary, "Compiler and Language Support for Parallel I/O," invited paper in *Fourth Workshop on Compilers for Parallel Computers*, Delft, The Netherlands, Dec. 1993.
17. A. Choudhary, L. Meadows, S. Nakamoto, V. Schuster, "Retargetable High Performance Fortran Compilers," *Supercomputing Europe '93*, Feb. 1993.

18. R. Babb, A. Choudhary, L. Meadows, S. Nakamoto, and V. Schuster, "Retargetable High Performance Compiler Challenges," *Proc. of Comcon*, Feb. 1993.
19. R. Ponnusamy, J. Saltz, A. Choudhary, R. Das, and D. Mavriplis, "The Dybbuk Runtime System," *Proc. of Comcon*, Feb. 1993.
20. I. Ahmad, A. Choudhary, G. Fox, K. Parasuram, R. Ponnusamy, S. Ranka, and R. Thakur, "Fortran 90D Intrinsic Functions on Distributed Memory Machines," *Hawaii International Conference on Systems Sciences*, Jan. 1993.
21. Z. Bozkus, A. Choudhary, G. Fox, T. Haupt, S. Ranka, R. Thakur, and J. Wang, "Scalable Libraries for High Performance Fortran," *Proc. of Scalable Parallel Libraries Conference*, Mississippi State University, Oct. 1993.
22. A. Choudhary, G. Fox, T. Haupt, and S. Ranka, "Which Applications Can Use High Performance Fortran and Fortran-D: Industry Standard Data Parallel Languages?" *Fifth Australian Supercomputing Conference*, Melbourne, Australia, Dec. 1992.
23. A. Choudhary, G. Fox, S. Ranka, S. Hiranandani, K. Kennedy, C. Koelbel, and J. Saltz, "Software Support for Irregular and Loosely Synchronous Problems," *1992 High Performance Computing Conference for Flight Vehicles*.
24. R. Ponnusamy, J. Saltz, R. Das, C. Koelbel, and A. Choudhary, "Embedding Data Mappers With Distributed Memory Machine Compilers," *Workshop on Languages, Compilers, and Run-Time Environments for Distributed Memory Multiprocessors*, Boulder, CO, Sept. 30 - Oct. 2, 1992.
25. A. Choudhary and S. Krishnamoorthy, "Experimental Evaluation of Multilevel Caches for Shared Memory Multiprocessors," *Hawaii International Conference on Systems Sciences*, Jan. 1991.
26. A. Choudhary and S. Ranka, "Software Development Tools for Implementing Vision Systems on Multiprocessors," *19th AIPR Workshop on Image Understanding in the 1990s*, Arlington, VA, Oct. 17-19, 1990.
27. A. Choudhary, S. Hariri, W. Song, and S. Ranka, "OPTIMP: Optical Interface Message Processor," *1990 Optical Society Meeting*.
28. A. Choudhary, S. Das, J. H. Patel, and N. Ahuja, "High Speed Stereo," *Indo-U.S. Workshop on High Speed Digital Processing*, N. Delhi, India, Nov. 1989 (invited paper).
29. A. Choudhary and J. H. Patel, "Performance of Integrated Image Understanding Benchmarks on NETRA: A Parallel Architecture for Integrated Vision Systems," *DARPA Image Understanding Benchmark Workshop*, Avon, CT, Oct. 1988.
30. A. Choudhary and J. H. Patel, "Performance of Integrated Image Understanding Benchmarks on Intel ipsc/2 Hypercube Multiprocessor," *DARPA Image Understanding Benchmark Workshop*, Avon, CT, Oct. 1988.

#### SELECTED INVITED PRESENTATIONS and TALKS.

- **Invited/Keynote talk**, "Are Data Mining Applications Different from Traditional Applications? An Architecture Perspective" The 17th European Conference on Machine Learning and the 10th European Conference on Principles and Practice of Knowledge Discovery in Databases, Berlin, Germany, Sept 2006
- **Keynote talk**, "A Case for using High-level Knowledge for Scalable I/O Optimizations," IEEE International Conference on Cluster Computing, Barcelona, Spain, Sept 2006.
- **Invited Talk**, "Architecture, High-Performance Computing and Information Assurance Research at Northwestern University," Intel Corp. Bangalore, India, July 2006.
- **Panel talk**, "Complexity in Future High-Performance Storage Systems," SOS workshop, Maui, March, 2006.
- **Panel talk**, "Future System Software Issues for Supercomputing," IBM Bluegene Workshop, Tokyo, Japan, April 2006.

- **Keynote talk**, "Scientific Data Management : Science in an Information-Dominated Age" International Conference on Computational Science, May 2005, Atlanta.
- **Keynote talk**, "Ultra-Scale I/O, Challenges and Prospects." At SOS Conference, March 2005, Davos, Switzerland.
- **Keynote talk**, "A Case for On-Line Analysis in Scientific Simulations", European Simulation Conference, Oct 2003, Naples, Italy.
- **Keynote talk**, "Scientific Data Management ", Richard Tapia Celebration of Diversity in Computing Conference, October 2003.
- **IIT, Chicago, Distinguished Lecture**, "Scalable Scientific Data Management", Sept. 2003
- Rice University, "Scalable Scientific Data Management", May 2003.
- Lawrence Livermore national laboratories, "Scientific Data Management: A Case for using High-level Information for I/O Optimizations ", May 2003.
- KAIST, Korea, "Compilation and Architecture Techniques for Power Aware Systems and Software Protection," May 2003.
- Indian Institute of Sciences, Bangalore, India, "Parallel and Scalable Data Mining," Jan 2003.
- University of Madrid, Spain, "Power-Aware Computing," March 2003.
- University of Madrid, Spain, "Scalable I/O", March 2003.
- Kellogg School of Management, "Lessons Learned in CRM Panel on Nov 14, 2002.
- Sandia National Laboratories, "Scientific Data Management", Aug 2002.
- Invited Speaker, University of Paris, Dauphine, "Scalable Multidimensional Data Mining," September 2001.
- Invited Speaker, University of Madrid, "Scalable Data Mining," March 2002.
- Invited Speaker, DOE Salishan Conference, "High-Performance Data Mining and Analysis for Scientific Discoveries," 2001.
- Keynote Speaker, Conference on High Speed Computing, "Scalable Scientific Data Management," Gleneden Beach, OR, April 2001.
- Invited speaker, "Power-Aware compilation and Synthesis for Heterogeneous Embedded Systems," NASA Jet Propulsion Laboratory, Pasadena, CA, June 2001.
- "Scalable Data management for Large-Scale Scientific Computing," CALTECH, Feb, 1999.
- "Recent Results in High-Performance I/O," Sandia National Laboratory, Albuquerque, NM, Aug. 1998.
- "High-Performance Data Mining," Technical Strategies to Beat Your Competition by the Year 2000, New York, NY, Oct. 1997.
- "On Languages and Libraries," Panel at ICPP '97, Aug. 1997.
- "PASSION: Optimized Parallel I/O for High-Performance Computers," Lawrence Livermore National Laboratories, Livermore, CA, Aug. 1997.
- "PASSION: Optimized Parallel I/O for High-Performance Computers," University of Alberta, Edmonton, Canada, Aug. 1997.
- "The Design of the PASSION System," Workshop on High-Performance Fortran, Vienna, July 1997.
- "Runtime Systems for I/O in Irregular Applications on HPCs," Sandia National Labs, June 1997.
- "Where Should Collective I/O Be Performed? Runtime Systems or File Systems," SIAM, Parallel Processing Conference, March 1997.
- "High-Performance On Line Analytical Processing," The George Washington University, March 1997.

- "PASSION Runtime System," Sandia National Laboratories, Albuquerque, NM, May 1996.
- "PASSION Runtime System," University of Minnesota, Jan. 1996.
- "Models, Language and Compiler Support for Input-Output for I/O Intensive Applications," SPDP Workshop on Models and Strategies for Input-Output, Oct. 1995.
- "Increasing stream-capacity of a Multimedia-on-Demand Server Using Dynamic Buffer Allocation Strategies," Intel SSD, August, 1995.
- "The PASSION System," IBM, Kingston, SP-2 Division, May 1995.
- "Runtime Support for Parallel I/O," UCLA, April 1995.
- "Runtime Support for Parallel I/O," UCSD, April 1995.
- "The PASSION System," Carnegie-Mellon University, March 1995.
- "Design of the PASSION System," Intel SSD, Feb. 1995.
- "Scheduling Input-Output in High-Performance Servers for Multimedia-on-Demand," CASE Center Fall Workshop, Minnowbrook, NY, Sept. 1994.
- "Scheduling Input-Output in High-Performance Servers for Multimedia-on-Demand," Intel SSD, Beaverton, OR, Aug 1994.
- "Scheduling Input-Output in High-Performance Servers for Multimedia-on-Demand," IBM, Poughkeepsie, NY, July 1994.
- "Software Support for High-Performance Computers," IBM T. J. Watson Research Center, Aug. 1994.
- "Compiler and Runtime Support for Parallel I/O," University of Vienna, July 1994.
- "Integrating Task and Data Parallelism," University of Vienna, July 1994.
- "Compiling Out-of-Core Problems on Distributed Memory Machines," IBM, T. J. Watson Research Center, Feb. 1994.
- "Compiler and Runtime Support for Parallel I/O," Intel SSD, Feb 1994.
- "Compiling F90D/HPF on Distributed Memory Machines," CDAC, India, March 1994.
- "Integrating Task and Data Parallelism," Caltech, Jan. 1994.
- "Runtime Support for Parallel I/O," Caltech, Jan. 1994.
- "Scalable Parallel I/O," CALTECH, Jan. 19, 1993.
- "Runtime Support for Parallel I/O," CRPC, Rice University, Jan. 26, 1993.
- "A Fortran 90D/HPF Compiler for Distributed Memory Machines," CALTECH, Feb. 9, 1993.
- "A Fortran 90D/HPF Compiler for Distributed Memory Machines," IBM Yorktown Heights, April 2, 1993.
- "Compiling For Distributed Memory Machines," National Institute of Health, Bethesda, MD, May 19, 1993.
- "Runtime and Compiler Support for Implementing Programs on Distributed Memory Parallel Computers," National Institute of Health, Bethesda, MD, May 19, 1993.
- "Parallel Architectures and Software : State-of-the-art and Future Directions," Dual-Use Technology Conference, SUNY, Utica, May 25, 1993.
- "A Fortran 90D/HPF Compiler for Distributed Memory Machines," IBM Almaden Research Center, San Jose, CA, June 4, 1993.
- "A Fortran 90D/HPF Compiler for Distributed Memory Machines," Intel SSD, Beaverton, OR, July 16, 1993.

### **PROFESSIONAL ACTIVITIES:**

- Program Vice-Chair, International Conference on High-Performance Computing, Dec. 1999.
- General Chair, Fifth International Workshop on I/O in Parallel and Distributed Systems (IOPADS), Nov. 1997, San Jose, CA.

- Associate Editor of *IEEE Transactions on Parallel and Distributed Systems*
- Subject Area Editor of *Journal of Parallel and Distributed Computing* .
- Program Chair, Fourth International Workshop on I/O in Parallel and Distributed Systems (IOPADS), with FCRC, May 1996, Philadelphia.
- Program Co-Chair, International Conference on Parallel Processing, 1993.
- Tutorials Chair, International Parallel Processing Symposium, 1994.
- Panelist, Several Panels in National Science Foundation
- Guest Editor of *IEEE Computer*.
- Guest Editor of *IEEE Parallel and Distributed Technology*.
- Guest Editor of *Journal of Parallel and Distributed Computing*.
- Served on Program Committees of
  - IPDPS, 2005, 2007
  - ICWS, 2004, 2005, 2006
  - PDM 2006
  - Hot AC, 2006
  - HiperIO, 2006
  - SSDBM 2004
  - ISPAN 2005
  - ISPA 2004
  - IEEE Conference on Web Services, 2003
  - SDM04
  - ICPP 2004
  - ESMc Conference, Naples on 27 - 29 October 2003.
  - DMKD03
  - HCW 03
  - HPDM03
  - SDM03
  - IPSN'04
  - HPCA-8, 2002
  - ACM Data Mining, 2002
  - IPDPS 2002, High Performance Computational Biology(December 2001),
  - INTERACT-6 (2002),
  - SDM'2001 (Scientific Data Mining),
  - Sixth International Symposium on Parallel Architectures, Algorithms, and Networks (I-SPAN'02),
  - 5<sup>th</sup> International High Performance Data Mining Workshop (April 2002),
  - WDAS-2002
  - IEEE Data Mining.
  - Program Committee, 4th International Workshop, CANPC 2000, Toulouse, FRANCE, January 2000.
  - *High-Performance Computer Architectures, 1996.*
  - *International Parallel Processing Symposium, 1996, 1997, 1998.*
  - *International Conference on Multimedia Computing Systems, 1995.*
  - *International Conference on Distributed Computing Systems, 1995.*
  - *International Conference on High-Performance Computing, 1995.*
  - *Symposium on Frontiers of MPPs, 1995.*
  - *International Symposium on Computer Architecture, 94.*
  - *International Conference on Computer Vision and Pattern Recognition, 1992.*
  - *First International Conference on High-Performance Distributed Computing, 1992.*
  - *Minnowbrook Workshop on Software Engineering for Parallel Computers, July, 1991.*

- Member of the Association of Computing Machinery, Member of the IEEE Computer Society.
- Chair, Panel on Software Tools for Parallel Computers, *Minnowbrook Workshop on Software Engineering for Parallel Computers*, July, 1991.
- Session Chair, *Fifth International Symposium on Parallel Processing*, April-May, 1991.
- Session Chair, *Sixth International Parallel Processing Symposium*, March, 1991.
- Member of the High-Performance Fortran Forum, An Industry, Academia and Government Committee to define standard for High-Performance Fortran
- Served as a Referee for: International Symposium on Computer Architecture, International Conference on Parallel Processing, IEEE Transactions on Computers, IEEE Computer Society Conference on Computer Vision and Pattern Recognition, International Conference on Distributed Computing Systems, IEEE Computer Magazine, IEEE Transactions on ASSP, Journal of Computer Vision, Graphics and Image Processing, Conference on Fault Tolerant Computing Systems, IEEE Transactions on Parallel and Distributed Systems, IEEE Transactions on Knowledge and Data Engineering, Journal of Parallel and Distributed Computing, International Parallel Processing Symposium, IBM Journal of Research and Development.

#### **SELECTED PAST Research grants:**

- Lawrence Livermore National Laboratories, On-Line Data Mining and Analysis, \$100,000
- DOE, High Performance Data Management, Access and Storage Techniques for Tera-scale Scientific Applications, \$876,000
- NSF Young Investigator Award, "Compiler and Runtime Optimizations for Distributed Memory Machines," 1993-1999, \$62,500 per year.
- NSF, Scalable I/O Management and Access Optimizations for Scientific Applications for High-Performance Computing, \$99,827.
- NSF (Subcontract from University of Wyoming), "Interoperable Data Files for High-Performance Computing," \$152,867, 7/1/97 - 6/30/00.
- Department of Energy (ASCI Level 2), "Large High-Performance Data Management, Access and Storage Techniques for Tera-scale Scientific Applications," \$1,065,658, 10/98 - 10/01.
- NSF (CISE Research Infrastructure Program) (CO-PI with P. Banerjee et. al.), "A Distributed High-Performance Computing Infrastructure," \$906,512, 9/1/97 - 8/31/02.
- DARPA (Co-PI), "A MATLAB Compilation Environment for Adaptive Computing," \$1,855,662, 1998-2001.
- DARPA (Co-PI), "PACT: Power-Aware Architectural and Compilation Techniques," \$1,958,000, 2000-2003.
- DARPA (Subcontract from Caltech), "Scalable I/O Initiative" \$155,000 per year 1995-1999.
- NSF, "System Software Support for Input-Output on Parallel Computing," \$190,000, 11/1/96 - 4/30/99.

- Intel Corporation, ``Modeling and Evaluation of I/O Architectures in Servers," \$45,000, 1995-96.
- Intel Corporation, ``Modeling and Evaluation of I/O Architectures in Servers," \$45,000, 1996-97.
- Intel Corporation, ``Modeling and Evaluation of I/O Architectures in Servers," \$45,000, 1997-98.
- Air Force Systems Command (Rome Labs) (Subcontract form Syracuse University), ``Design, Development, Benchmarking and Evaluation of Parallel Applications," \$118,87 per year, 12/24/96 - 1/31/99.
- Sandia National Laboratories, ``Runtime Libraries for Large-Scale Parallel I/O," \$74,986, 1/15/97 - 1/14/98.
- Department of Energy (with Argonne National Laboratory), ``Hybrid Technology Multi-threaded Computer Architecture for Petaflops Computing," \$48,800, 10/1/97 - 9/30/98.
- Intel Corporation, ``I/O Architectures for Multi-Media Servers," \$40,000, 1995-96.
- Intel Corporation, ``Compiler and Runtime Support for Parallel I/O," matching funds for NYI, \$38,000, 1995-96.
- Rome Labs, ``Software Specification and Verification of Real-Time Systems of Parallel Computers, \$99,600, 1994-95.
- Intel Corporation, ``Compiler and Runtime Support for Parallel I/O," matching funds for NYI, \$38,000, 1994-95.
- IBM Faculty Development Award, \$30,000, 1994-95.
- NASA-CESDIS, ``High Performance Input-Output Support for Four Dimensional Data Assimilation, \$50,000 per year for three years, 1993-96.
- NSF Research Initiation, ``Design, Analysis, Modeling and Evaluation of Hierarchical Caches for Multiprocessors," \$69,936, 1991-94.
- ARPA (Defense Advance Research Project Agency), ``Fortran 77D and Fortran 90D: Scalable and Protatable Software Modules for SIMD and MIMD Distributed Memory Parallel Computers" (with G. Fox), \$1,729,000, 1991-94.
- ONR, ``Software Environments and Scalable High Level Data Structure Extensions of Fortran for Irregular Loosely Synchronous Problems on SIMD and MIMD Parallel Computers" (with G. Fox), \$50,000 per year, 1992-95.
- NSF/NASA, ``Software Environments and Scalable High Level Data Structure Extensions of Fortran for Irregular Loosely Synchronous Problems on SIMD and MIMD Parallel Computers" (with G. Fox), \$150,00 per year, 1992-95.
- IBM, ``Development of Software and Applications for Parallel Processors" (with G. Fox), \$143,823, 1992.
- IEEE Engineering Foundation, ``Parallel Processing for Computer Vision," \$20,000, 1990-91.
- Unrestricted Award from Texas Instruments, ``Parallel Processing," \$15,000, 1991.
- Rome Labs, ``Design and Analysis of Optical Interface Message Processor (OPTIMP)" (with S. Hariri and Q. Wang Song), \$100,000, 1991-92.

### **Selected Industry Advising, Consulting, Collaboration and Technology transfer in the past few years**

- Co-founder and VP of research and technology (1999-2002) of Accelchip Inc.
  - Tools and software for synthesizing hardware on FPGAs from high-level languages such as MATLAB in particular for applications in Digital Signal Processing (DSP), Communication and embedded systems. Company acquired by Xilinx Inc.
- Board of Directors of C3Research

- Consultant and advisor, Sun Microsystems
- Consultant, Microsoft
- Consultant, Lucent
- Consultant, Futuretrading
- Technical advisory board, Xtreme data Inc
- Advisor/consultant Netteza Inc.
  - Scalable Data warehouses
  - Architectures and algorithms for scalable data analysis, OLAP and decision support (applications in Retail, communication, marketing and other fields)
- Technical Advisory Board and consultant to Virtual Gold Inc.
  - Data mining applications (e.g., sports, entertainment, CRM, communication)
  - Multidimensional databases and analysis
- Consultant ZS Associates
  - Datawarehouse design for pharmaceutical applications
- IBM
  - Database systems design
  - Algorithm development
  - Performance analysis
  - High-performance systems
- Intel
  - Multimedia Server systems design and analysis
  - High-performance I/O and Storage Architectures
  - Data Mining
- Technical Advisory Board, Prismmedia and Acciro Inc
  - Distributed file systems for multimedia
- CTO summit attendee and collaborator with Teradata (a division of NCR)
- High-performance file systems and I/O software from research projects adopted by various public domain software systems and companies
- Technology transfer to Portland group Inc. (now part of ST Microelectronics) of Compiler Research project
  - Department of defense research project on compiling for high-performance parallel machines, when I was at Syracuse University
- Tata Consultancy Services (1982-1984)
  - Systems Analyst and Designer (database design and applications)
- Granted several patents and filed several patents.

## **TEACHING EXPERIENCE and CURRICULUM DEVELOPMENT:**

- Graduate/Undergraduate Level
  - Operating Systems
  - Computer Organization
  - Computer Architecture
  - Advanced Computer Architecture
  - Database Systems
  - Information Security and Assurance
  - Parallel Computing
- Undergraduate Level
  - Object Oriented Design and C++
  - Digital Logic Design
  - Computer Architecture projects
- Graduate Level

- Distributed Computing
- Memory Systems for Multiprocessors and Scalable Architectures
- Advanced Computer Architecture
- Parallel Computing Systems
- Distributed Databases and Information Systems
- Information Assurance and Security
- Advanced Data Mining
- Business/Technology Courses in Kellogg School of Management
  - **Academic Director**, Executive program on Managing Customer Relationships for Profit, Kellogg School of Management
  - Customer Relationship Management and Analytical Marketing, Kellogg School of Management, NWU
  - Custom Executive Program for Microsoft and Sony.
  - Strategic Data and Knowledge Management for Business Intelligence at Kellogg School of Management, NWU
  - Business Intelligence Technologies and Customer Relationship Management at Kellogg School of Management, NWU
  - Distributed Information Systems at Masters of Information Technology Program at NWU
- Tutorials at Conferences
  - Memory Systems for Multiprocessors and Scalable Architectures, at ISCA 91, Supercomputing 91, 92.
  - Compiling for Distributed Memory Machines, at SHPCC 94, ISCA 94.
  - Issues in Designing Parallel I/O Systems, at ISCA 97,98, Supercomputing 97.
- Program Development
  - Revised Computer Engineering curriculum as chair and director of the computer engineering curriculum
  - Founding member of the bioinformatics program
  - Development of Interdisciplinary programs with Kellogg School of management, School of medicine
  - Developed an interdisciplinary center for information security and assurance