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RESEARCH INTERESTS

High-Performance Computing: Programming, Compiler, Runtime, and Architectural Support;

Scalable Irregular Big Data Processing on GPGPU-based Hetrogeneous Clusters;

Software Tools for Monitoring, Analysis, Debugging, and Slicing of Parallel Programs.

EDUCATION

Ph.D. in Computer Science, University of Pittsburgh, PA, Aug. 1987 (Advisor: Prof. M.L. Soffa).

M.S. in Computer Science, University of Pittsburgh, PA, April 1984 (Advisor: Prof. M.L. Soffa).

B.Tech. in Electrical Engineering, Indian Institute of Technology, New Delhi, India, April 1982.

APPOINTMENTS

Distinguished Professor, Dept. of Comp. Science & Engr., UC Riverside, 7/2017 - present.

Professor, Dept. of Comp. Science & Engr., Univ. of California Riverside, 8/2007 - 6/2017.

Professor, Department of Computer Science, The University of Arizona, 8/1999 - 8/2007.

Professor, Department of Computer Science, University of Pittsburgh, 9/1998 - 8/1999.

Associate Professor, Dept. of Computer Science, University of Pittsburgh, 9/1994 - 8/1998.

Faculty Member, Computer Engineering Program, University of Pittsburgh, 9/1997 - 8/1999.

Visiting Faculty, Microprocessor Research Lab, Intel Corporation, 9/1996 - 12/1996.

Assistant Professor, Dept. of Computer Science, University of Pittsburgh, 9/1990 - 8/1994.

Senior Member Research Staff, Philips Laboratories, Briarcliff Manor, NY, 10/1987 - 8/1990.

Research/Teaching Assistant, Dept. of Comp. Science, Univ. of Pittsburgh, 9/1982 - 8/1987.

AWARDS AND HONORS

Technical Advisory Group

- Member, *Technical Advisory Group* on **Networking and Information Technology** for the **US President's Council of Advisors in Science and Technology**, May 2006 – Sept. 2007.

Research (h-index = 60 → `https://scholar.google.com/citations?user=6P4bGWAAAAAJ`)

- **ACM Fellow** (2009) - *for contributions to program analysis and optimization and sustained professional service to the computer science research community.*
- **IEEE Fellow** (2008) - *for contributions to computer architecture and optimizing compilers.*

- **AAAS Fellow** (2011) - *for contributions to computer architecture and optimizing compilers.*
- **UCR Doctoral Dissertation Advisor/Mentor Award**, 2012.
- **LCPC 2015 Best Student Paper Award**: "Size Oblivious Programming with *InfiniMem*," *International Workshop on Languages and Compilers for Parallel Computing*, Sept. 2015.
- **PACT 2010 Best Paper Award**: "Efficient Sequential Consistency Using Conditional Fences," *International Conference on Parallel Archiectures and Compilation*, September 2010.
- **ICSE 2003 Distinguished Paper Award**: "Precise Dynamic Slicing Algorithms," *International Conference on Software Engineering*, May 2003.
- **Most Influential Papers of PLDI 1979-1999**: "Complete Removal of Redundant Computations," *ACM SIGPLAN Conference on Programming Language Design and Implementation*, June 1998. Reprint and retrospective in *20 Years of PLDI (1979-1999): A Selection*, 2004.
- **ICPP 2003 Most Original Paper Award**: "Enabling Partial Cache Line Prefetching Through Data Compression," *International Conference on Parallel Processing*, October 2003.
- **ICECCS 1996 Outstanding Paper Award**: "Designing a Non-intrusive Monitoring Tool for Developing Complex Distributed Applications," *Second IEEE International Conference on Engineering of Complex Computer Systems*, Montreal, Canada, October 1996.
- *Dissertation Advisor* of **ACM SIGPLAN Outstanding Doctoral Dissertation Award** winners:
  - Rastislav Bodik, *Path and Value Sensitive Code Optimizations*, 2001.
  - Xiangyu Zhang, *Fault Location Via Precise Dynamic Slicing*, 2006.
- **Presidential Young Investigator Award**, National Science Foundation, 1991.
- **Faculty Impact Award**, CS Department, The University of Arizona, 2006 and 2007.
- **Making a Difference Award**, Philips Laboratories, Briarcliff Manor, New York, 1988.
- **Andrew Mellon Predoctoral Fellow**, FAS, University of Pittsburgh, Pittsburgh, PA, 1985.

Teaching: Obtained the highest student evaluation score among CS faculty teaching:

- a graduate core course during academic year 1995-1996, University of Pittsburgh.
- an advanced graduate elective during academic year 1995-1996, University of Pittsburgh.
- a graduate core course during academic year 1994-1995, University of Pittsburgh.

Service

- **ACM Recognition of Service Award** for serving as the General Chair for ASPLOS 2011.
- **ACM Recognition of Service Award** for serving as the General Chair for PLDI 2008.
- **ACM Recognition of Service Award** for serving as the Program Chair for LCTES 2005.
- **ACM Recognition of Service Award** for serving as the General Chair for CGO 2005.
- **ACM Recognition of Service Award** for serving as the Program Chair for PLDI 2003.
- **Recognition of Contributions and Leadership** at HiPC 2004.
- **ACM Recognition of Service Award** for serving as the Workshops Chair for ICS 2002.
- **IEEE Distinguished Visitor**, IEEE Computer Society, 2000-2002.

PROFESSIONAL ACTIVITIES

Associate Editor

- (PARCO) *Parallel Computing*, North Holland, 1991 – present.
- (COLA) *Journal of Computer Languages*, Elsevier, 2019 – present.
- (TACO) *ACM Transactions on Architecture and Code Optimization*, 2003 – 01/2017.
- (IEEE TC) *IEEE Transactions on Computers*, 2009 – 2014.
- (COMLAN) *Computer Languages, Systems and Structures*, Elsevier, 2006 – 12/2018.
- (JEC) *Journal of Embedded Computing*, 2003 – 2011.
- (IJPDSN) *IASTED Intl. Journal of Parallel and Distributed Systems and Networks*, 1996-2002.

Guest Editor

- (TECS) *ACM Transactions on Embedded Computing Systems*, special issue of on Language, Compiler, and Tool Support for Embedded Systems, Vol. 6, No. 4, September 2007.

Steering Committee Chair

- (FCRC 2016-2019) *ACM Federated Computing Research Conference*.
- (ASPLOS 2012-2013) *SIGPLAN/SIGOPS International Conference on Architectural Support for Programming Languages and Operating Systems*.
- (LCTES June 2006-September 2009) *ACM SIGPLAN Conference on Language, Compiler, and Tool Support for Embedded Systems*.

General Chair

- (PPoPP 2020) *ACM SIGPLAN Symposium on Principles and Practices of Parallel Programming*, San Diego, California.
- (FCRC 2015) *ACM Federated Computing Research Conference*, Portland, Oregon.
- (ASPLOS 2011) *ACM SIGPLAN/SIGOPS International Conference on Architectural Support for Programming Languages and Operating Systems*, Newport Beach, California.
- (PLDI 2008) *ACM SIGPLAN Conference on Programming Language Design and Implementation*, Tucson, Arizona.
- (CGO 2005) *IEEE/ACM International Symposium on Code Generation and Optimization*, San Jose, California (Co-Chair with Jesse Z. Fang).

Program Chair

- (AGP 2017) *First International Workshop on Architecture for Graph Processing*, held in conjunction with ISCA, (Co-Chair with Xuehai Qian).
- (ICESS 2014) Track Chair, Design Methodology and Tools, *IEEE International Conference on Embedded Software and Systems*.
- (CC 2010) *International Conference on Compiler Construction*.
- (HiPEAC 2008) *International Conf. on High-Performance Embedded Architectures and Compilers*. (Co-Chair with Minolis Katevenis)
- (LCTES 2005) *ACM SIGPLAN Conference on Language, Compiler, and Tool Support for Embedded Systems*.
- (PLDI 2003) *SIGPLAN Conference on Programming Language Design and Implementation*.
- (HPCA 2003) *IEEE International Symposium on High Performance Computer Architecture*.

- (HiPC 2003) Program Vice-Chair, Computer Architecture Track, *International Conference on High Performance Computing*.
- (ADCOM 2000) *Advanced Computing and Communication*. (Co-Chair with B.P. Sinha).
- (Dagstuhl Seminar) *Code Optimisation: Trends, Challenges, and Prespectives*, Dagstuhl, Germany, 2000 (Co-Chair with Jens Knoop, Carole Dulong, and Robert Kennedy).
- *First Workshop on Profile and Feedback-Directed Compilation*, held in conjunction with PACT, 1998 (Co-Chair with Brad Calder and James Larus).
- (LCT-RTS 1997) *ACM SIGPLAN Workshop on Language, Compiler, and Tool Support for Real-Time Systems*, held in conjunction with PLDI, (Co-Chair with David Whalley).

Registration Chair

- (PACT 2005) *International Conference on Parallel Architectures and Compilation Techniques*.

Workshops Chair

- (ASPLOS 2018) *ACM International Conference on Architectural Support for Programming Languages and Operating Systems* (Co-Chair with Zhijia Zhao).
- (ICS 2002) *ACM International Conference on Supercomputing*.

Steering Committee Member

- (ASPLOS 2011-2012) *ACM International Conference on Architectural Support for Programming Languages and Operating Systems*.
- (ETAPS 2010-2011) *The European Joint Conferences on Theory and Practice of Software*.
- (PLDI 2003-2005,2007-2010) *ACM SIGPLAN Conference on Programming Language Design and Implementation*.
- (HiPEAC 2005-2009) *International Conference on High-Performance Embedded Architectures and Compilers*.
- (HPCA 2003) *IEEE International Symposium on High Performance Computer Architecture*.
- (LCTES 2000-2010) *ACM SIGPLAN Conference on Language, Compiler, and Tool Support for Embedded Systems* (Member-at-large 2003-2005).

Selection Committee Member

- (IEEE Fellows), Member of IEEE CS Fellows Evaluation Committee [2008, 2009, 2010, 2012, 2013, 2014, 2015].
- (Most Influential PLDI 2008 Paper Award), Member of the Selection Committee [2018].
- (Most Infuential PLDI 2003 Paper Award), Member of the Selection Committee [2013].
- (Most Infuential PLDI 1994 Paper Award), Member of the Selection Committee [2004].
- (Test of Time Award from CGO 2005), Member of the Selection Committee [2015].

Program Committee Member

Programming Languages and Compilers

- (POPL) *ACM SIGACT/SIGPLAN Symposium on Principles of Programming Languages* [2006].
- (PLDI) *ACM SIGPLAN Conference on Programming Language Design and Implementation* [2002, 1994].
- (PPoPP) *ACM SIGPLAN Symposium on Principles and Practices of Parallel Programming* [2012].

- (PPPJ) *International Conference on the Principles and Practice of Programming on the Java Platform* [2014].
- (CGO) *IEEE/ACM International Symposium on Code Generation and Optimization* [2011, 2010, 2006, 2004, 2003].
- (CC) *International Conference on Compiler Construction* [2017, 2007, 1998, 1996, 1994].
- (ICCL) *IEEE International Conference on Computer Languages* [1998].
- (APLAS) *The ASIAN Symposium on Programming Languages and Systems* [2011, 2008].
- (ISMM) *International Symposium on Memory Management* [2019, 2011].
- (EXADAPT) *Second International Workshop on Adaptive Self-tuning Computing Systems for the Exaflop Era* [2012, 2011].
- (COCV) *International Workshop on Compiler Optimization Meets Compiler Verification* (with ETAPS) [2004, 2002].
- (PEPM) *ACM SIGPLAN Workshop on Partial Evaluation and Sematics based Program Manipulation* (with PLDI) [2003].
- (MSP) *Workshop on Memory System Performance* (with PLDI) [2002].

Computer Architecture

- (ASPLOS) *ACM International Conference on Architectural Support for Programming Languages and Operating Systems* [2018].
- (Top Picks) *IEEE Micro's Top Picks* from Computer Architecture Conferences [2007, 2005].
- (ISCA) *ACM/IEEE International Symposium on Computer Architecture* [2012, 2007].
- (HPCA) *IEEE International Symposium on High Performance Computer Architecture* [2008, 2006, 2005].
- (MICRO) *IEEE/ACM International Symposium on Microarchitecture* [2018, 2006, 2005, 2004, 2003, 2002, 2001, 2000, 1995].
- (ICS) *ACM International Conference on Supercomputing* [2004, 2003, 2001].
- (PACT) *International Conference on Parallel Architectures and Compilation Techniques* [2017, 2010, 2009, 1998, 1997, 1996, 1994].
- (ISPASS) *IEEE International Symposium on Performance Analysis of Systems and Software* [2019, 2011, 2008, 2003].
- (HiPEAC) *International Conf. on High-Performance Embedded Architectures and Compilers* [2010, 2007, 2005].
- (HPPC) *Workshop on Hardware-support for Parallel Program Correctness* [2011].
- (INTERACT) *Workshop on Interaction Between Compilers and Computer Architectures* [2012, 2011, 2010].
- (M2A2) *International Workshop on Multicore and Multithreaded Architectures and Algorithms* [2015, 2014, 2013, 2012, 2011, 2010].
- (PESPMA) *Workshop on Parallel Execution of Sequential Programs on Multi-core Architectures* (with ISCA) [2010, 2009].
- (SAMOS) *International Workshop on Systems, Architectures, Modeling, and Simulation* [2009, 2008].
- (RAAW) *Workshop on Reconfigurable and Adaptive Architectures* (with MICRO) [2007, 2006].

- (COLP) *Workshop on Compilers and Operating Systems for Low Power* (with PACT) [2003, 2002, 2001, 2000].
- (VPW) *Value Prediction Workshop* (with ISCA) [2003].
- (SSRS) *Workshop on Software Support for Reconfigurable Systems* (with HPCA) [2003].

Parallel Computing

- (IAˆ3) *7th Workshop on Irregular Applications: Architectures and Algorithms* (with SC) [2018, 2017].
- (CCGrid) *IEEE/ACM International Symposium on Cluster, Cloud and Grid Computing* [2015].
- (IPDPS) *IEEE International Parallel ang Distributed Processing Symposium* [2014, 2013].
- (HPCC) *IEEE International Conf. on High Performance Computing and Communications* [2016, 2015].
- (ICPADS) *IEEE International Conference on Parallel and Distributed Systems* [2015, 2014, 2013, 2011].
- (HiPC) *High Performance Computing Conference* [2013].
- (PDCN) *Parallel and Distributed Computing and Networks* [2006, 2004].
- (ICPP) *International Conference on Parallel Processing* [2015, 2003].
- (PDCS) *International Conference on Parallel and Distributed Computing Systems* [2000, 1998, 1997, 1992].

Software Engineering

- (QRS) *IEEE International Conference on Software Quality, Reliability, and Security* [2019, 2018, 2017, 2016, 2015].
- (ICSME) *IEEE International Conference on Software Maintenance and Evolution* [2014].
- (ICSM) *IEEE International Conference on Software Maintenance* [2013].
- (QSIC) *International Conference on Quality Software* [2014, 2013, 2012, 2011, 2010].
- (RV) *International Conference on Runtime Verification* [2011, 2010].
- (PASTE) *ACM SIGPLAN-SIGSOFT Workshop on Program Analysis for Software Tools and Engineering* [2008, 1998].
- (WODA) *Tenth International Workshop on Dynamic Analysis* [2015, 2014, 2012].
- (REGRESSION) *The Second International Workshop on Regression Testing* [2012].
- (Compute) *ACM Compute Conference* [2008].
- (DASC) *IEEE International Conference on Dependable, Autonomic and Secure Computing* [2014].
- (ICSOFT) *International Conference on Software and Data Technologies* [2006].
- (eTX) *eclipse Technology eXchange Workshop* (with OOPSLA) [2003].

Embedded Systems

- (LCTES) *ACM SIGPLAN Conference on Languages, Compilers, and Tools for Embedded Systems* [2014, 2013, 2004].
- (LCTES/SCOPES) *ACM SIGPLAN Joint Conference on Languages, Compilers, and Tools for Embedded Systems & Software and Compilers for Embedded Systems* [2002].

- (CASES) *International Conf. on Compilers, Architectures and Synthesis for Embedded Systems* [2016, 2015, 2014, 2013, 2012, 2011, 2010, 2008, 2006, 2005, 2004, 2002, 1998].
- (SAMOS) *International Conference on Embedded Computer Systems: Architectures, Modeling, and Simulation* [2019, 2018, 2016, 2015, 2014, 2013, 2012, 2011, 2010].
- (DATE) *Design, Automation and Test in Europe* [2007].
- (SAC) *ACM Symp. on Applied Computing* [2018, 2016, 2015, 2014, 2013, 2012, 2011, 2010].
- (ICESS) *IEEE International Conference on Embedded Software and Systems* [2013, 2012, 2011, 2010, 2009].
- (RTCSA) *IEEE International Conference on Embedded and Real-Time Computing Systems and Applications* [2013, 2010, 2009].
- (ESA) *IEEE International Symposium on Advanced Topics on Embedded Systems and Applications* [2011].
- (EUC) *International Conference on Embedded And Ubiquitous Computing* [2004].
- (FutureTech) *International Conference on Future Information Technology* [2012, 2010].
- (LCTES) *ACM SIGPLAN Workshop on Languages, Compilers, and Tools for Embedded Systems* (with PLDI) [2001, 1998].
- (LCT-RTS) *ACM SIGPLAN Workshop on Language, Compiler, and Tool Support for Real-Time Systems* (with PLDI) [1995].
- (SCOPES) *International Workshop on Software and Compilers for Embedded Systems* [2004, 2003].
- (WESAPEC) *International Workshop on Embedded System Architectures for Pervasive Devices and Computers* (with IPC) [2007].
- (SoC) *International Workshop on SoC and MCSoC design* (with MoMM) [2006].
- (EC) *International Workshop on Embedded Computing* [2006].
- (CTCES) *Workshop on Compilers and Tools for Constrained Embedded Systems* (with CASES) [2005, 2004, 2003].
- (ECS) *International Workshop on Embedded Computing Systems* (with ICDCS) [2004].
- (LARTES) *IEEE Workshop on large Scale Real-Time and Embedded Systems* (with RTSS) [2002].

External Review Committee Member

- (ISCA) *ACM/IEEE International Symposium on Computer Architecture* [2015].
- (PLDI) *ACM SIGPLAN Conference on Programming Language Design and Implementation* [2015, 2014, 2013, 2010].
- (MICRO) *Annual IEEE/ACM International Symposium on Microarchitecture* [2014, 2012].
- (ASPLOS) *ACM International Conference on Architectural Support for Programming Languages and Operating Systems* [2016, 2015, 2012].
- (POPL) *ACM SIGACT/SIGPLAN Symposium on Principles of Programming Languages* [2012].

Membership

- ACM (Fellow & Lifetime Member); IEEE (Fellow); AAAS (Fellow).
- Member – SIGPLAN, SIGSOFT, SIGARCH, SIGMICRO, HiPEAC (Associate).

Other Refereeing and Reviewing

- **(Proposals)** NSF Panels for Programs – XPS, Expeditions in Computing, CAREER, CCF, Compilers, Computer Architecture, and ITR; Fonds Wetenschappelijk Onderzoek - Vlaanderen, Beligium; Fonds National de la Recherche, Luxembourg; The Knowledge Foundation, Sweden; Science Foundation, Ireland; UKIERI, British Council; NSERC Canada; University Grants Council of Hong Kong; UCMEXUS Review Panel; and UC Discovery Review Panel.
- **(Journals)** ACM TOSEM, ACM TOPLAS, ACM TECS, ACM TACO, ACM TODAES, ACM LOPLAS, IEEE TPDS, IEEE TSE, IEEE TC, IEEE Computer, IEEE Software, IEEE Micro, IEEE PDT, CACM, SP&E, JPDC, IJPP, Parallel Computing, J. Supercomputing, JSTVR, and JPL.
- **(Conferences)** SIGPLAN-SIGACT POPL, SIGPLAN PLDI, IEEE/ACM MICRO, ACM ASPLOS, IEEE/ACM ISCA, IEEE HPCA, ACM ICS, IEEE ICCL, CC, PEPM, CGO, ISPASS, PACT, FDDO, LCTES, CASES, SCOPES, LCPC, COLP, ISSRE, IEEE SRDS, IEEE IPPS, ICPP, HiPC, PARLE, DMCC, PDCS, Supercomputing, ICPADS, and IEEE SPDP.
- **(Others)** PhD Dissertations – SIGPLAN Doctoral Dissertation Award Nominees; Video Lectures – University Video Communications; and Book – IEEE Computer Society.

RESEARCH GRANTS

National Science Foundation, Software and Hardware Foundations, *SHF: Small: GPU-dedicated Graph Transformations for Accelerating Iterative Graph Analytics*, CCF-1813173, $499,987, 10/2018 – 9/2021 (PI: Z. Zhao; Co-PI: R. Gupta).

National Science Foundation, Secure & Trustworthy Cyberspace, *TWC: Small: Collaborative: Improving Android Security with Dynamic Slicing*, CNS-1617424, UCR Portion $250,000, 9/2016 – 8/2019 (PIs: I. Neamtiu - NJIT; R. Gupta - UCR).

National Science Foundation, Software and Hardware Foundations, *SHF: Small: Transformations for Synergistic Analysis of Large Evolving Graphs*, CCF-1524852, $400,000, 7/2015 – 6/2019 (PI: R. Gupta).

Intel Corporation, *Dynamic Slicing on Android-x86*, $65,000, 7/2014 – 9/2015 (PI: I. Neamtiu; Co-PI: R. Gupta).

National Science Foundation, Software and Hardware Foundations, *SHF: Small: Memory Consistency – Hardware, Compiler, and Programming Support*, $539,999, CCF-1318103: $450,000 (9/2013) + CCF-1547990: $89,999 supplement (8/2015), 9/2013 – 8/2017 (PI: R. Gupta).

Intel Corporation, *Dynamic Slicing for Interactive Debugging of Multithreaded Programs*, $65,000, 7/2013 – 9/2014 (PI: R. Gupta; Co-PI: I. Neamtiu).

Google Research Award, *Size Oblivious Programming for Large Dynamic Data Structures*, $48,500, 03/2013 – 02/2014 (PI: R. Gupta).

National Science Foundation, Computing Systems Research, *EAGER: Developing a Programming Environment for Heterogeneous Multiprocessors*, CNS-1157377, $299,288, 9/2012 – 8/2014 (PI: L.N. Bhuyan; Co-PI: R. Gupta).

Intel Corporation, *Supporting Dynamic Slicing for Interactive Debugging*, $65,000, 6/2012 – 5/2013 (PI: R. Gupta).

National Science Foundation, Software and Hardware Foundations, *WORKSHOP: Support for the Sixteenth International Conference on Architectural Support for Programming Languages and Operating Systems* (ASPLOS 2011), CCF-1059827, $15,000, 12/2010 – 6/2011 (PI: P. Brisk; Co-PI: R. Gupta).

National Science Foundation, Software and Hardware Foundations, *SHF: Medium: Programmable Monitoring Framework for Multicore Systems*, CCF-0963996, $726,000, 9/2010 – 8/2014 (PI: R. Gupta; Co-PI: I. Neamtiu).

National Science Foundation, Software and Hardware Foundations, *SHF: Medium: Hardware/Software Partitioning for Hybrid Shared Memory Multiprocessors*, CCF-0905509, $800,000, 9/2009 – 8/2015 (PI: L. Bhuyan; Co-PIs: R. Gupta, W. Najjar).

National Science Foundation, Computing Systems Research, *Scalable and Efficient Dynamic Information Flow Tracking in Multithreaded Programs*, CNS-0751961/0719791, UCR funds $180,000, 9/2007 – 8/2010 (PI: R. Gupta; Co-PI: X. Zhang).

National Science Foundation, Computing Research Infrastructure, *An Advanced Infrastructure for Generation, Storage, and Analysis of Program Execution Traces*, CNS-0751949/0708199, UCR funds $85,000, 9/2007 – 9/2010 (PI: R. Gupta; Co-PIs: N. Gupta, X. Zhang).

National Science Foundation, Computing Systems Research, *ExPert: dynamic analysis based fault location via Execution Perturbations*, CNS-0810906/0614707, $332,000, 9/2006 – 8/2010 (PIs: R. Gupta, N. Gupta).

Microsoft Research, Redmond, Washington, *Integrating Dynamic Slicing into the coredbg Debugger*, $48,000, 4/2006 – 3/2007 (PI: N. Gupta; Co-PI: R. Gupta).

National Science Foundation, Computing Processes and Artifacts, *Dynamic Unmasking of Compiler Optimizations and Obfuscations*, CCF-0753470/0541382, $300,000, 2/2006 – 1/2010 (PI: R. Gupta).

IBM, Eclipse Innovation Award, *An Eclipse Module for Matching Execution Histories of Program Versions*, $27,000, 1/2005 – 12/2005 (PI: R. Gupta; Co-PI: N. Gupta).

National Science Foundation, ITR Medium Grants, *Morphable Software Services: Self-Modifying Programs for Distributed Embedded Systems*, CCF-0324969, U. of Arizona funds $166,225, 10/2003 – 9/2007 (PI: K. Schwan; Co-PIs: T. Balch, G. Eisenhauer, R. Gupta, S. Pande, C. Pu, H-H. S. Lee).

Microsoft Research, Redmond, Washington, *Using Phoenix for Program Slicing and its Application to Defect Analysis*, $121,000, 9/2003 – 8/2006. Matching funds from ACIST at Univ. of Arizona $42,500 (PI: R. Gupta).

Intel Corporation, MRL, Santa Clara, California, *Compiling for Processors with Fine-Grained Threading, Heterogenous Cores, and Sophisticated Data Management*, $108,500, 9/2003 – 8/2006 (PI: R. Gupta).

IBM, Eclipse Innovation Award, *Protecting Software through Slicing and Obfuscation Transformations*, $27,000, 1/2003 – 12/2003 (PI: R. Gupta). Seed grant of $14,000 provided by ACIST, Univ. of Arizona.

National Science Foundation, Computer Systems Architecture, *Information Encoding for Energy Efficient Processor Design*, CCF-0208756, $280,000, 9/2002 – 8/2006 (PI: R. Gupta).

National Science Foundation, ITR Small Grants, *Code and Data Segment Optimizations for Mixed Width Instruction Set Embedded Processor*, CCF-0220334, U. of Arizona funds $149,112, 9/2002 – 8/2005 (PI: R. Gupta; Co-PI: S. Pande). Seed grant of $10,000 provided by ACIST, Univ. of Arizona.

National Science Foundation, Compilers, *Data Compression Techniques for Improving Memory Hierarchy Performance*, CCF-0105355, $270,000, 9/2001 – 8/2005(PI: R. Gupta).

DARPA, Power Aware Computing/Communication, *Power-Adaptive Microarchitecture and Compiler Design for Mobile Computing*, Award no. F29601-00-1-0183, $572,396, 7/2000 – 11/2002 (PI: R. Gupta; Co-PIs: S. Onder and S. Pande).

National Science Foundation, CISE Research Infrastructure, *Optimization of Distributed and Networked Systems: A Spectrum of Techniques*, EIA-0080123, $1,396,252, 9/2000 – 9/2005 (PIs: G.R. Andrews, S. Debray, R. Gupta, S. Pink, and R.T. Snodgrass).

Intel Corporation, MRL, Santa Clara, California, *Exploiting Speculation and Predication for Branch and Load Optimizations*, $96,000, 9/1999 – 6/2002 (PI: R. Gupta).

National Science Foundation, Experimental Systems, *Experimental Evaluation of Scalable Optimization Techniques*, EIA-9806525, $400,000, 9/1998 – 9/2001 (PI: M.L. Soffa; Co-PIs: R. Gupta, L.L. Pollock, and D. Whalley).

National Science Foundation, Compilers, *A Framework for Path and Resource Sensitive Optimizations*, CCR-0096122/CCR-9808590, $360,000, 9/1998 – 9/2002 (PI: R. Gupta; Co-PI: M.L. Soffa).

Intel Corporation, MRL, Santa Clara, California, *Machine Dependent Analysis for Exploiting ILP in VLIW Architectures*, $32,000, 1/1998 – 12/1998 (PI; R. Gupta).

Hewlett Packard Laboratories, Chelmsford, Massachusetts, *Comparative Debugging of Optimized Code*, $236,131, 5/1997 – 4/1998 (PI: M.L. Soffa; Co-PI: R. Gupta).

Hewlett Packard Laboratories, Palo Alto, California, *Optimizations Techniques for Superscalar and VLIW Architectures*, $34,484, 5/1997 – 4/1998 (PI: R. Gupta; Co-PI: M.L. Soffa).

National Science Foundation, Operating Systems, *On-line Avoidance of Monitoring Intrusion in Distributed Systems*, CCR-9996362/CCR-9704350, $156,012, 6/1997 – 8/2000 (PI: R. Gupta).

Intel Corporation, Santa Clara, California, *Machine Dependent Analysis for Exploiting ILP in VLIW Architectures*, $72,038, 1/1997 – 12/1997 (PI: R. Gupta).

National Science Foundation, Compilers, *Research Experience with Undergraduates*, supplement to *Loop Transformations and Scheduling Strategies for Parallelizing Software*, CCR-9157371, $4,950, 8/1996 – 7/1997 (PI: R. Gupta).

Hewlett Packard Laboratories, Palo Alto, California, *Optimizations Techniques for Superscalar/VLIW Architectures*, $68,550, 1/1996 – 4/1997 (PI: R. Gupta; Co-PI: M.L. Soffa).

Hewlett Packard Laboratories, Chelmsford, Massachusetts, *Debugging of Optimized Code*, $102,290, 1/1996 – 4/1997 (PI: M.L. Soffa; Co-PI: R. Gupta).

Intel Corporation, Santa Clara, California, *Static Analysis and Optimization Techniques for Exploiting ILP in Superscalar/VLIW Architectures*, $20,000, 1/1996 – 12/1996 (Pi: R. Gupta).

National Science Foundation, Software Engineering, *Demand Driven Computation of Partial Data Flow and its Application in Software Engineering*, CCR-9402226, $240,000, 9/1995 – 8/1998 (PI: M.L. Soffa; Co-PI: R. Gupta).

Hewlett Packard Laboratories, Palo Alto, California, *Data Flow Analysis and Optimization Techniques for Superscalar/VLIW Architectures*, $57,022, 3/1995 – 4/1996 (PI: R. Gupta).

Intel Corporation, Santa Clara, California, *Optimizations to Facilitate ILP for Superscalar/VLIW Architectures*, $21,116, 1/1995 – 12/1995 (PI: R. Gupta).

Digital Equipment Corporation, Pittsburgh, Pennsylvania, *Equipment Support for Studying the Interaction between Transformations and Scheduling Strategies in Compilers*, $14,661, 2/1993 (PI: R. Gupta).

Siemens Corporate Research, Inc., Princeton, New Jersey, *Research Assistantships*, $25,000, 6/1992 (Pi: R. Gupta).

Honeywell Inc., Minneapolis, Minnesota, *PORTAL Compiler and Fine-Grained Adaptation of Real-Time Schedules*, $5,000, 4/1992 – 8/1992 (PI: R. Gupta).

Philips Laboratories, Briarcliff Manor, New York, *POOMA Multiprocessor Prototype*, $35,000, 8/1992 (PI: R. Gupta).

National Science Foundation, Compilers, *Loop Transformations and Scheduling Strategies for Parallelizing Software*, Presidential Young Investigator Award CCR-9157371, $271,109, 8/1991 – 12/1997 (PI: R. Gupta).

PATENTS ISSUED

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231. P. Gopinath and R. Gupta, "A Hybrid Approach to Load Balancing in Distributed Systems," *Symposium on Experiences with Distributed and Multiprocessor Systems* (SEDMS), pages 133-147, Atlanta, March 1991.

232. P. Gopinath and R. Gupta, "Applying Compiler Techniques to Scheduling in Real Time Systems," *IEEE 11th Real-Time Systems Symposium* (RTSS), pages 247-256, Orlando, Florida, December 1990.

233. R. Gupta, M. Epstein, and M. Whelan, "The Design of a RISC based Multiprocessor Chip," *Supercomputing* (SC), pages 920-929, New York, November 1990.

234. R. Gupta and Chi-Hung Chi, "Improving Instruction Cache Performance by Reducing Cache Pollution," *Supercomputing* (SC), pages 82-91, New York, November 1990.

235. R. Gupta, "Loop Displacement: An Approach for Transforming and Scheduling Loops for Parallel Execution," *Supercomputing* (SC), pages 388-397, New York, November 1990.

236. M.J. Harrold, R. Gupta, and M.L. Soffa, "A Methodology for Controlling the Size of a Test Suite," *IEEE-CS International Conference on Software Maintenance* (ICSM), pages 302-310, San Diego, CA, November 1990.

237. R. Gupta, "A Fresh Look at Optimizing Array Bound Checking," *ACM SIGPLAN Conference on Programming Language Design and Implementation* (PLDI), pages 272-282, White Plains, New York, June 1990.

238. M.J. Harrold, R. Gupta, and M.L. Soffa, "TBM: A Testbed Management Tool," *7th International Conference on Testing Computer Software*, pages 47-56, San Francisco, California, June 1990.

239. P. Gopinath and R. Gupta, "Opportunistic Evaluation of Communication Link Loads," *IEEE-CS 10th International Conference on Distributed Computing Systems* (ICDCS), pages 406-413, Paris, France, May 1990.

240. R. Gupta and P. Gopinath, "A Hierarchical Approach to Load Balancing in Distributed Systems," *5th Distributed Memory Computing Conference* (DMCC), pages 1000-1005, Vol. II, Charleston, South Carolina, April 1990.

241. R. Gupta, "Employing Register Channels for the Exploitation of Instruction Level Parallelism," *ACM SIGPLAN 2nd Symposium on Principles and Practice of Parallel Programming* (PPoPP), pages 118-127, Seattle, Washington, March 1990.

242. R. Gupta, "Synchronization and Communication Costs of Loop Partitioning on Shared-Memory Multiprocessor Systems," *International Conference on Parallel Processing* (ICPP), Vol. II, pages 23-30, St. Charles, Illinois, August 1989.

243. R. Gupta, M.L. Soffa, and T.F. Steele, "Register Allocation via Clique Separators," *ACM SIGPLAN Conference on Programming Language Design and Implementation* (PLDI), pages 264-275, Portland, Oregon, June 1989.

244. R. Gupta and M. Epstein, "Achieving Low Cost Synchronization in a Multiprocessor System," *Conference on Parallel Architectures and Languages Europe* (PARLE), Vol. I, pages 70-84, Eindhoven, The Netherlands, June 1989.

245. R. Gupta, "The Fuzzy Barrier: A Mechanism for High-Speed Synchronization of Processors," *ACM 3rd International Conference on Architectural Support for Programming Languages and Operating Systems* (ASPLOS), pages 54-64, Boston, April 1989.

246. T.S. Anand and R. Gupta, "A Knowledge-based Tool for Parallelization of Scientific Programs," *IMACS Conference on Expert Systems in Numerical Computation*, Purdue University, Indiana, December 1988.

247. R. Gupta and M.L. Soffa, "Compile-time Techniques for Efficient Utilization of Parallel Memories," *ACM SIGPLAN Symposium on Parallel Programming: Experience with Applications, Languages and Systems* (PPEALS), pages 235-246, New Haven, July 1988.

248. R. Gupta, "Debugging Code Reorganized by a Trace Scheduling Compiler," *3rd International Conference on Supercomputing*, Boston, Vol. III, pages 422-430, May 1988.

249. R. Gupta and M.L. Soffa, "A Matching Approach to Utilizing Fine-Grained Parallelism," *21st Annual Hawaii International Conference on System Sciences* (HICSS), Vol. I, pages 148-156, Kona, Hawaii, January 1988.

250. R. Gupta and M.L. Soffa, "A Reconfigurable LIW Architecture," *International Conference on Parallel Processing* (ICPP), pages 893-900, St. Charles, Illinois, August 1987.

251. R. Gupta and M.L Soffa, "Region Scheduling," *2nd International Conference on Supercomputing*, Vol. III, pages 141-148, Santa Clara, May 1987.

252. R. Gupta and M.L. Soffa, "SHAPE: A Highly Adaptable and Parallel System," *Computer Science Conference*, pages 107-114, Cincinnati, February 1986.

253. R. Gupta and M.L. Soffa, "The Efficiency of Storage Management Schemes for Ada Programs," *Ada International Conference*, pages 164-172, Paris, May 1985. Also published in *Sigplan Notices*, Vol. 20, No. 11, pages 30-38, November 1985.

WORKSHOP PUBLICATIONS

254. H. Li, Z. Chen, R. Gupta, and M. Xie, "Non-Intrusively Avoiding Scaling Problems in and out of MPI Collectives," *International Workshop on High-Level Parallel Programming Models and Supportive Environments* (HIPS), pages 415-424, in IEEE IPDPSW Proceedings, Vancourver, British Columbia, Canada, May 2018.

255. F. Khorasani, K. Vora, R. Gupta, and L.N. Bhuyan, "Enabling Work-Efficiency for High Performance Vertex-Centric Graph Analytics on GPUs," *Seventh Workshop on Irregular Applications: Architectures and Algorithms* (IAˆ3), Article No. 11, 4 pages, Denver, Colorado, November 2017.

256. S.C. Koduru, R. Gupta, and I. Neamtiu, "Size Oblivious Programming with *InfiniMem*," *The 28th International Workshop on Languages and Compilers for Parallel Computing* (LCPC), LNCS 9519, Springer, Chapter 1, pages 3-19, Raleigh, North Carolina, Sept. 2015. *Recipient of the* **Best Student Paper Award**.

257. A. Kusum, I. Neamtiu, and R. Gupta, "Adapting Graph Application Performance Via Alternate Data Structure Representations," *5th International Workshop on Adaptive Self-tuning Computing Systems* (ADAPT), 7 pages, Amsterdam, The Netherlands, January 2015.

258. M. Feng, F. Khorasani, R. Gupta, and L.N. Bhuyan, "LightPlay: Efficient Replay with GPUs," *The 27th International Workshop on Languages and Compilers for Parallel Computing* (LCPC), LNCS 8967, Springer, Chapter 22, pages 332-347, Hillsboro, Oregon, Sept. 2014.

259. M. Feng, R. Gupta, and L.N. Bhuyan, "Optimistic Parallelism on GPUs," *The 27th International Workshop on Languages and Compilers for Parallel Computing* (LCPC), LNCS 8967, Springer, Chapter 1, pages 3-18, Hillsboro, Oregon, September 2014.

260. M. Belviranli, C. Chou, L.N. Bhuyan, and R. Gupta, "A Paradigm Shift in GP-GPU Computing: Task Based Execution of Applications with Dynamic Data Dependences," *The 6th International Workshop on Data-intensive Distributed Computing* (DIDC), pages 29-34, June 2014.

261. S-C. Koduru, K. Vora, and R. Gupta, "ABC^2: Adaptively Balancing Computation & Communication in a DSM cluster of Multicores for Irregular Applications," *International Workshop on High-Level Parallel Programming Models and Supportive Environments* (HIPS), pages 391-400, in IEEE IPDPSW Proceedings, Phoenix, Arizona, May 2014.

262. M. Feng, R. Gupta, and I. Neamtiu, "Programming Support for Speculative Execution with Software Transactional Memory," *International Workshop on High-Level Parallel Programming Models and Supportive Environments* (HIPS), pages 394-403, in IEEE IPDPSW Proceedings, Boston, Massachusetts, May 2013.

263. M. Feng, C. Tian, and R. Gupta, "Enhancing LRU Replacement via Phantom Associativity," Workshop on Interaction between Compilers and Computer Architectures (INTERACT), 8 pages, Feb. 2012.

264. M. Feng and R. Gupta, "Learning Universal Probabilistic Models for Fault Localization," *Ninth ACM SIGPLAN-SIGSOFT Workshop on Program Analysis for Software Tools and Engineering* (PASTE), pages 81-88, June 2010.

265. V. Nagarajan and R. Gupta, "Speculative Optimizations for Parallel Programs on Multicores," *22nd International Workshop on Languages and Compilers for Parallel Computing* (LCPC), LNCS 5898/2010, pages 323-337, Newark, Delaware, October 2009.

266. V. Nagarajan and R. Gupta, "Support for Symmetric Shadow Memory in Multiprocessors," *Workshop on Parallel and Distributed Systems: Testing, Analysis, and Debugging* (PADTAD), 9 pages, July 2008.

267. C. Tian, V. Nagarajan, and R. Gupta, "Synchronization Aware Conflict Resolution for Runtime Monitoring Using Transactional Memory," *Workshop on Software Tools for Multicore Systems* (STMCS), 6 pages, April 2008.

268. R. Gupta, N. Gupta, X. Zhang, D. Jeffrey, V. Nagarajan, S. Tallam and C. Tian, "Scalable Dynamic Information Flow Tracking and its Applications," *NSF Next Generation Software Workshop* (NSFNGS), 5 pages, April 2008.

269. V. Nagarajan, H-S. Kim, Y. Wu, and R. Gupta, "Dynamic Information Flow Tracking on Multicores," *Workshop on Interaction between Compilers and Computer Architectures* (INTERACT), 10 pages, Feb. 2008.

270. N. Gupta and R. Gupta, "ExPert: Dynamic Analysis based Fault Location via Execution Perturbations," *NSF Next Generation Software Workshop* (NSFNGS), 6 pages, March 2007.

271. B. Li, Y. Zhang, and R. Gupta, "Speculative Subword Register Allocation in Embedded Processors," *The 17th International Workshop on Languages and Compilers for Parallel Computing* (LCPC), *LNCS 3602, Springer Verlag*, pages 56-71, West Lafayette, Indiana, September 2004.

272. S. Tallam and R. Gupta, "Profile-Guided Java Program Partitioning for Power Aware Computing," *Sixth International Workshop on Java for Parallel and Distributed Computing*, Sante Fe, NM, April 2004.

273. C. Jaramillo, R. Gupta, and M.L. Soffa, "Verifying Optimizers through Comparison Checking," *International Workshop on Compiler Optimization Meets Compiler Verification* (COCV), in conjunction with ETAPS, Grenoble, France, April 2002.

274. D. Berson, R. Gupta, and M.L. Soffa, "An Evaluation of Integrated Scheduling and Register Allocation Techniques," *11th International Workshop on Languages and Compilers for Parallel Computing* (LCPC), *LNCS 1239, Springer Verlag*, pages 207-221, North Carolina, Chapel Hill, August 1998.

275. J. Tims, R. Gupta, and M.L. Soffa, "Dataflow Analysis Driven Dynamic Data Partitioning," *4th Workshop on Languages, Compilers, and Run-time Systems for Scalable Computers*, *LNCS 1511, Springer Verlag*, pages 75-90, Pittsburgh, PA, May 1998.

276. X. Yuan, R. Gupta, and R. Melhem, "An Array Data Flow Analysis based Communication Optimizer," *10th Annual Workshop on Languages and Compilers for Parallel Computing* (LCPC), *LNCS 1366, Springer Verlag*, pages 246-260, Minneapolis, Minnesota, August 1997.

277. X. Yuan, R. Gupta, and R. Melhem, "Does Time Division Multiplexing Close the Gap between Memory and Optical Communication Speeds," *Workshop on Parallel Computing, Routing, and Communication*, *LNCS 1417, Springer Verlag*, pages 261-271, Atlanta, Georgia, June 1997.

278. X. Yuan, R. Gupta, and R. Melhem, "Demand-Driven Data Flow Analysis for Communication Optimization," *Workshop on Challenges in Compiling for Scalable Parallel Systems*, New Orleans, Louisiana, October 1996 (invited paper).

279. D. Berson, P. Chang, R. Gupta and M.L. Soffa, "Integrating Program Optimizations and Transformations with the Scheduling of Instruction Level Parallelism," *9th Annual Workshop on Languages and Compilers for Parallel Computing* (LCPC), *LNCS 1239, Springer Verlag*, pages 207-221, Santa Clara, California, August 1996.

280. R. Bodik and R. Gupta, "Array Data-Flow Analysis for Load-Store Optimizations in Superscalar Architectures," *8th Annual Workshop on Languages and Compilers for Parallel Computing* (LCPC), *LNCS 1033 Springer Verlag*, pages 1-15, Columbus, Ohio, August 1995.

281. D. Berson, R. Gupta, and M.L. Soffa, "GURRR: A Global Unified Resource Requirements Representation," *ACM SIGPLAN Workshop on Intermediate Representations*, pages 23-34, San Francisco, California, January 1995.

282. C. Gong, R. Melhem, and R. Gupta, "Replicating Statement Execution for Fault Detection on Distributed Memory Multiprocessors," *IEEE Fault-Tolerant Parallel and Distributed Systems Workshop*, pages 132-141, College Station, Texas, June 1994.

283. M. Spezialetti and R. Gupta, "Timed Perturbation Analysis: An Approach for Non-Intrusive Monitoring of Real Time Computations," *ACM SIGPLAN Workshop on Language, Compiler, and Tool Support for Real-Time Systems* (LCT-RTS), pages 1-11, Orlando, Florida, June 1994.

284. R. Gupta and P. Gopinath, "Correlation Analysis Techniques for Refining Execution Time Estimates of Real-Time Applications," *IEEE 11th Workshop on Real-Time Operating Systems and Software* (RTOSS), pages 54-58, Seattle, Washington, May 1994.

285. R. Gupta and M. Spezialetti, "Towards a Non-Intrusive Approach for Monitoring Distributed Computations through Perturbation Analysis," *6th Annual Workshop on Languages and Compilers for Parallel Computing* (LCPC), *LNCS 768 Springer Verlag*, pages 586-601, Portland, Oregon, August 1993.

286. P. Gopinath, T. Bihari, and R. Gupta, "Supporting Real-Time Software Integrated Circuits," *IEEE Workshop on Imprecise and Approximate Computation*, pages 55-61, Phoenix, Arizona, December 1992.

287. E. Duesterwald, R. Gupta, and M.L. Soffa, "Register Pipelining: An Integrated Approach to Register Allocation for Scalar and Subscripted Variables," *International Workshop on Compiler Construction* (CC), *LNCS 641 Springer Verlag*, pages 192-206, Paderborn, Germany, October 1992.

288. E. Duesterwald, R. Gupta, and M.L. Soffa, "Distributed Slicing and Partial Re-execution for Distributed Programs," *5th Workshop on Languages and Compilers for Parallel Computing* (LCPC), *LNCS 757 Springer Verlag*, pages 497-511, Yale University, New Haven, Connecticut, August 1992.

289. P. Gopinath, T. Bihari, and R. Gupta, "Compiler Techniques for Generating Predictable Object-Oriented Real-Time Software," *IEEE 9th Workshop on Real-Time Operating Systems and Software* (RTOSS), Pittsburgh, May 1992.

290. R. Gupta, "A Fine-grained MIMD Architecture based upon Register Channels," *IEEE/ACM 23rd Workshop on Microprogramming and Microarchitecture* (MICRO), pages 28-37, Orlando, Florida, Dec. 1990.

291. R. Gupta, L. Pollock, and M.L. Soffa, "Parallelizing Data Flow Analysis," *Workshop on Parallel Compilation*, Kingston, Ontario, May 1990.

292. P. Gopinath and R. Gupta, "Compiler Assisted Adaptive Scheduling in Real-time Systems," *IEEE Workshop on Real-Time Operating Systems and Software* (RTOSS), *Real-Time Systems Newsletter*, Vol. 6, No. 2, pages 62-69, Univ. of Virginia, Charlottesville, VA, May 1990.

BOOK CONTRIBUTIONS

293. C. Tian, M. Feng, and R. Gupta, "Software Based Speculative Parallelization For Multicore/Manycore Architecture," In *Programming Multi-core and Many-core Computing Systems*, John Wiley & Sons, Chapter 10, pages 205-225, Edited by S. Pllana & F. Xhafa, Jan. 2017.

294. X. Zhang, N. Gupta, and R. Gupta, "Whole Execution Profiles and their Use in Debugging," *The Compiler Design Handbook: Optimizations and Machine Code Generation*, 2nd Edition, Chapter 4, CRC Press, pages 4-1–4-17, Editors: Y.N. Srikant & P. Shankar, Dec. 2007.

295. Y. Zhang and R. Gupta, "Enabling Partial Cache Line Prefetching Through Data Compression," *High Performance Computing: Paradigm and Infrastructure*, pages 183-200, John Wiley & Sons, Edited by L.T. Yang and M. Guo, October 2005.

296. N. Gupta and R. Gupta, "Data Flow Testing," *The Compiler Design Handbook: Optimizations and Machine Code Generation*, First Edition, Chapter 7, pages 247-267, CRC Press, Edited by Y.N. Srikant and P. Shankar, September 2002.

297. R. Gupta, E. Mehofer, and Y. Zhang, "Profile Guided Compiler Optimizations," *The Compiler Design Handbook: Optimizations and Machine Code Generation*, First Edition, Chapter 4, pages 143-174, CRC Press, Edited by Y.N. Srikant and P. Shankar, September 2002.

298. R. Gupta, "SPMD Execution in Presence of Dynamic Data Structures," *Compiler Optimizations for Scalable Parallel Systems: Languages, Compilation Techniques and Run Time Systems, LNCS 1808, Springer*, pages 683-706, Editors: S. Pande and D.P. Agrawal, 2001.

299. T.S. Anand and R. Gupta, "A Tool for Evaluating Compiler-based Parallelization Strategies," *Intelligent Mathematical Software Systems*, pages 103-110, Edited by E.N. Houstis, J.R. Rice, and R. Vichnevetsky, North Holland, 1990.

INVITED PRESENTATIONS

1. *Virginia Tech*, Blacksburg, **Distinguished Lecture Series Speaker**, "Parallel Graph Processing on Clusters, Multicores, and GPUs," November 2018.
2. *University of Southern California*, Los Angeles, "Parallel Graph Processing on GPUs, Clusters, and Multicores," September 2016.
3. *University of California*, Irvine, **EECS Distinguished Seminar Series Speaker**, "Parallel Graph Processing on GPUs and Clusters," March 2016.
4. *University of California*, Irvine, "Exploiting Parallelism on Multicores Via SpiceC," April 2013.
5. *4th Compiler Assisted SoC Assembly Workshop* (CASA'08 - held at ESWEEK), "Speculative Parallelization of Applications on Multicores," October 2008.
6. *Google*, Mountain View, "Speculative Parallelization of Applications on Multicores," October 2008.
7. *Workshop on Dynamic Analysis* (WODA'07 - held at ICSE), **Keynote Speaker**, "Scalable Dynamic Analysis for Automated Fault Location and Avoidance," May 2007.
8. *University of California*, Davis, "Delievering Processor Performance with Limited Energy and Memory Resources," April 2007.
9. *Microsoft Research*, Redmond, " Scalable Dynamic Analysis for Automated Fault Location," March 2007.
10. *University of Colorado*, Boulder, "Reliable and Optimized Embedded Systems," March 2007.
11. *The College of William and Mary*, Williamsburg, VA, "Safety and Optimization of Embedded Systems," Jan. 2007.
12. *University of California*, Riverside, "Safety and Optimization of Embedded Systems," December 2006.
13. *Massachusetts Institute of Technology*, "Safety and Optimization of Embedded Systems," Joint EECS and Aeronautics & Astronautics Seminar, May 2006.
14. Taught a course on "Compiling for Embedded Processors," First HiPEAC Summer School on *Advanced Computer Architectures and Compilation for Embedded Systems* (ACACES), L'Aquila, Italy, July 2005.
15. *Microsoft Research Faculty Summit*, "Using Phoenix for Exploring Whole Execution Traces," Redmond, Washington, July 2005.

16. *University of California*, San Diego, "Dynamic Execution Histories and their Applications," May 2005.
17. *Arizona State University*, Tempe, Arizona, "Whole Execution Trace and its Applications," December 2004.
18. *The College of William and Mary*, Williamsburg, VA, **Distinguished Lecture Series Speaker**, "Enabling the Design of Compilers and Architectures for Emerging Applications," October 2004.
19. *Microsoft Research Faculty Summit*, "Using Phoenix for Profiling Research," Redmond, August 2004.
20. *Infrastructure 2004: NSF CISE/EIA RI and MII PI's Workshop*, *Panelist:* "Research Challenges in Programming Languages: From Agendas To Impact," Snowbird, Utah, July 2004.
21. *University of Maryland*, College Park, "Enabling the Design of Compilers and Architectures for Emerging Applications," June 2004.
22. *University of California*, Irvine, Center for Embedded Computer Systems, "Frequent Value Locality and its Applications," May 2004.
23. *Arizona State University*, Tempe, Arizona, **CEINT Distinguished Seminar Series Speaker**, "Frequent Value Locality and its Applications," April 2004.
24. *Florida State University*, Tallahassee, FL, "Precise Dynamic Program Slicing Algorithms," April 2004.
25. *Intel Corporation*, Microcomputer Research Lab, Santa Clara, California, "Compiler and Architectural Support for Embedded Processors," March 2003.
26. *Penn State University*, State College, Pennsylvania, "Supporting Bit Section Addressing for Embedded Applications," December 2002.
27. *Purdue University*, West Lafayette, Indiana, "Supporting Bit Section Addressing for Embedded Applications," December 2002.
28. *Georgia Tech*, Atlanta, Georgia, "Architectural and Compiler Support for Performance Optimization Under Limited Power and Memory Resources," November 2002.
29. *Univ. of Texas at Austin*, Texas, "Frequent Value Locality and its Applications," Feb. 2002.
30. *Intel Corporation*, Microcomputer Research Lab, Santa Clara, California, "Frequent Values and their Applications," August 2001.
31. *Intel Corporation*, Microcomputer Research Lab, Santa Clara, California, "Optimizing Static Power Dissipation by Functional Units," August 2001.
32. *University of Alberta*, Edmonton, Canada, **Distinguished Lecture Series Speaker**, "Frequent Value Locality and its Applications," June 2001.
33. *University of Nevada at Reno*, Reno, Nevada, **IEEE Distinguished Speaker**, "Frequent Value Locality and its Applications," April 2001.
34. *Compaq*, Marlborough, MA, "Frequent Value Locality and its Applications," November 2000.
35. *Lucent Technologies*, Allentown, PA, "Path Sensitive Code Optimizations," June 1999.
36. *Georgia Tech*, Atlanta, Georgia, "Path Sensitive Code Optimizations," May 1999.
37. *Univ. of Maryland*, College Park, Maryland, "Path Sensitive Code Optimizations," April 1999.
38. *The Univ. of Arizona*, Tucson, Arizona, "Path Sensitive Code Optimizations," March 1999.
39. *Univ. of California, Los Angeles*, California, "Path Sensitive Code Optimizations," Jan. 1999.
40. *Florida State University*, Tallahassee, FL, "Path Sensitive Code Optimizations," Jan. 1999.

41. *IBM T.J. Watson Research Center*, Hawthorne, NY, "Profile Guided Redundancy and Dead Code Elimination," October 1998.
42. *Hewlett-Packard Labs*, Palo Alto, CA, "Path Profile Guided PRE and PDE," July 1997.
43. *Intel Seminar*, Santa Clara, CA, "A Demand-driven Framework for Interprocedural Data Flow Analysis," December 1996.
44. *Intel University Research Forum*, Santa Clara, CA, "Analysis and Optimization in an ILP Environment," November 1996.
45. *Hewlett-Packard Laboratories*, Palo Alto, CA, "Array Data Flow Analysis for Load-Store Optimizations in Superscalar Architectures," July 1995.
46. *Intel Corporation*, Santa Clara, CA, "Array Data Flow Analysis for Load-Store Optimizations in Superscalar Architectures," July 1995.
47. *Tartan, Inc.*, Pittsburgh, PA, "Demand-Driven Computation of Interprocedural Data Flow," June 1995.
48. *Tartan, Inc.*, Pittsburgh, PA, "Array Data Flow Analysis for Load-Store Optimizations in Superscalar Architectures," April 1995.
49. *Panelist:* "Program Transformations and Analysis for Real-Time Systems," *ACM SIGPLAN Workshop on Language, Compiler, and Tool Support for Real-Time Systems*, Orlando, FL, June 1994.
50. *Clemson University*, Clemson, South Carolina, "SPMD Execution of Programs on Distributed-Memory Machines," October 1993.
51. *Carnegie Mellon University*, Pittsburgh, PA, "A Practical Data Flow Framework for Array Reference Analysis and its Use in Optimizations," May 1993.
52. *University of Delaware*, Newark, Delaware, "SPMD Execution of Programs on Distributed-Memory Machines," December 1992.
53. *West Virginia University*, Morgantown, WV, "SPMD Execution of Programs on Distributed-Memory Machines," December 1992.
54. *NASA Ames Research Center*, Moffett Field, CA, "SPMD Execution of Programs on Distributed-Memory Machines," April 1992.
55. *IBM T.J. Watson Research Center*, Hawthorne, New York, "Fine-Grained Parallel Processing," April 1990.

PhDs In Progress

- (Expected 2019) Arash Alavi;
- (Started Spring 2015) Bryan Duane Rowe II; (Fall 2015) Gurneet Kaur; (Fall 2016) Abbas Mazloumi and Chengshuo (Bruce) Xu; (Fall 2017) Xiaolin Jiang.

PhDs Completed

1. Zachary Benavides, *Declarative Profiling for Parallel Systems*, September 2018. *Software Engineer, PushFor* (Current).
2. Hongbo Li, *Pre- and Post-Deployment Dynamic Bug Detection Techniques for MPI Programs*, September 2018. *Research Engineer II, TuSimple* (Current).
3. Keval Vora, *Exploiting Asynchrony for Performance and Fault Tolerance in Distributed Graph Processing*, completed June 2017. *Assistant Professor, Simon Fraser University* (Current).
4. Farzad Khorasani, *High Performance Vertex-Centric Graph Analytics on GPUs*, completed September 2016. *Senior Machine Learning Scientist, Tesla, Palo Alto, CA* (Current).

5. Vineet Singh, *User Assisted Data Structure Debugging and Verification*, completed September 2016. *Memory & Storage Tools Software Engineer, Intel, Hillsboro, OR* (Current).

6. Amlan Kusum, *Adapting Data Representations for Optimizing Data-Intensive Applications*, completed September 2016. *Member Technical Staff, Oracle, Denver, CO* (Current).

7. Bo Zhou, *Extracting Actionable Information From Bug Reports*, completed August 2016. *Java Engineer, WANdisco Inc., San Ramon, CA* (Current).

8. Sai Charan Koduru, *Size Oblivious Programming of Clusters for Irregular Parallelism*, completed September 2015. *Software Engineer, Microsoft, Redmond, WA* (Current).

9. Yan Wang, *Dynamic Analysis Techniques for Effective and Efficient Debugging*, completed August 2014. *Software Engineer, Google, Mountain View, CA* (Current).

10. Changhui Lin, *Imposing Minimal Memory Ordering on Multiprocessors*, completed August 2013. *Software Engineer, Google, Mountain View, CA* (Current).

11. Min Feng, *The SpiceC Parallel Programming System*, completed August 2012. *Research Staff Member, NEC Labs, Princeton, NJ* (Current).

12. Kishore Kumar Pusukuri, *Runtime Support for Exploiting Multicore Systems*, completed August 2012. *Staff Software Engineer, NetApp, Sunnyvale, CA* (Current).

13. Chen Tian, *Speculative Parallelization on Multicore Processors*, completed May 2010. *Principal Researcher, Huawei R&D Center, Santa Clara, CA* (Current).

14. Vijayanand Nagarajan, *IMPRESS: Improving Multicore Performance and Reliability via Efficient Support for Software Monitoring*, completed August 2009. *Associate Professor, University of Edinburgh, Edinburgh, UK* (Current).

15. Dennis Jeffrey, *Dynamic State Alteration Techniques for Automatically Locating Software Errors*, completed August 2009. *Senior Software Engineer in Test, Google, Mountain View, CA* (Current).

16. Sriraman Tallam, *Fault Location and Avoidance in Long-Running Multithreaded Applications*, completed October 2007. *Staff Engineer, Google, Mountain View, CA* (Current).

17. Xiangyu Zhang, *Fault Location Via Precise Dynamic Slicing*, completed September 2006. **Recipient of SIGPLAN Outstanding Doctoral Dissertation Award**, 2006. **NSF CAREER Award**, 2009. *Full Professor, Purdue University* (Current).

18. Bengu Li, *Efficient Handling of Narrow Width and Streaming Data in Embedded Applications*, completed May 2006. *Software Engineer, Tableau Software, Seattle* (Current).

19. Arvind Krishnaswamy, *Microarchitectural and Compiler Techniques for Dual-Width ISA Processors*, completed May 2006. *Senior Staff Engineer, Qualcomm, San Jose, CA* (Current).

20. Jun Yang, *Frequent Value Locality and its Application to Energy Efficient Memory Design*, completed September 2002. **NSF CAREER Award**, 2008. *Associate Professor, Univ. of Pittsburgh, PA* (Current).

21. Youtao Zhang, *The Design and Implementation of Compression Techniques for Profile Guided Compilation*, completed August 2002. **NSF CAREER Award**, 2005. *Associate Professor, Univ. of Pittsburgh, PA* (Current).

22. Clara Jaramillo, *Source Level Debugging Techniques and Tools for Optimized Code*, completed August 2000. *Chatam College, Pittsburgh, PA* (First Employment).

23. Ras Bodik, *Path and Value Sensitive Code Optimizations*, completed November 1999. **Recipient of SIGPLAN Outstanding Doctoral Dissertation Award**, 2001. **NSF CAREER Award**, 2001. **ACM Fellow**, 2018. *Full Professor, Univ. of Washington, Seattle* (Current).

24. Soner Onder, *Scalable Superscalar Processor Design*, completed July 1999.
NSF CAREER Award, 2004. *Full Professor, Michigan Tech. University* (Current).

25. Xin Yuan, *Dynamic and Compiled Communication in Optical Time-Division-Multiplexed Point-to-Point Networks*, completed August 1998. *Full Professor and* **Department Chair**, *Florida State University* (Current).

26. Jodi Tims, *Integrating Automatic Data Distribution and Communication Optimization*, completed July 1998. *Full Professor and* **Department Chair**, *Baldwin Wallace College, Ohio* (Current).

27. Wanqing Wu, *On-line Avoidance of the Intrusive Effects of Monitoring of Distributed Applications*, completed July 1998. *SAP Labs, Palo Alto, CA* (Current).

28. Tia Watts, *MIST: An Approach to Integrating Restructuring Transformations and Multiple Scheduling Techniques*, completed December 1997. *Full Professor, Sonoma State University, CA* (Current).

29. David Berson, *Unification of Register Allocation and Instruction Scheduling in Compilers for Fine-Grain Parallel Architectures*, completed November 1996. *Senior Compiler Engineer, NVIDIA, Portland* (Current).

30. Evelyn Duesterwald, *A Demand Driven Approach for Efficient Interprocedural Data Flow Analysis*, completed July 1996.
ACM Distinguished Scientist, 2010. *Senior Manager, IBM Research, New York* (Current).

31. Chun Gong, *Fault Tolerant Computing on Distributed-Memory Systems: A Compiler Assisted Approach*, completed September 1995. *Microsoft Corporation, WA* (First Employment).

MS, UG, HS Student Supervision

1. (UG) Shawn Lee, *Efficient Parallel Sudoku Solver via Thread Management & Data Sharing Methods*, June 2017.

2. (UG) Andy Thio, *High Performance Parallel Sokoban Solver*, June 2017.

3. (HS) Jason Lai, Alta Loma High School, Rancho Cucamonga, Summer 2016.

4. (MS) Bin Wu, *Distributed Out-of-Core Graph Processing*, August 2015.

5. (UG) Sihan He, *TIGRAPH - A Tiny Graph Processing System*, June 2015.

6. (UG) Zhongqi Wang, *TIGRAPH - A Tiny Graph Processing System*, June 2015.

7. (MS) Bryan Duane Rowe II, *An Evaluation of Graph Processing Frameworks*, February 2015.

8. (UG) Joshua Giem, *Hybrid Parallel/Serial Loseless Data Compression on a GPU*, June 2014.

9. (MS) Pengcheng Zhao, *Reducing the Overhead of Dynamic Slicing*, August 2013.

10. (MS) Anton Jouline, *Dynamic Dispatching in Java Programs*, December 1999.

11. (MS) Jun Xu, *Implementation of Branch Sequence Prediction Techniques*, December 1998.

12. (MS) Aston AuYeung, *Extending UPFAST to Support VLIW Architectures*, August 1998.

13. (MS) Vishal Jain, *An Approach for Monitoring Intrusion Removal in Real-Time Systems*, 1997.

14. (MS) Philip Kamp, *Language and Compile-time Analysis Support for Dynamic Data Structures*, December 1995.

15. (MS) Xin Yuan, *Timestamp-based Selective Invalidation Scheme for Multiprocessor Cache Coherence*, August 1995.

16. (MS) Meena Krishnan, *Implementation of Array Data Flow Analysis in the PDGCC Compiler*, December 1994.

17. (MS) Wanqing Wu, *A Simulator for the PDGCC Compiler*, December 1994.

18. (MS) Ed Kuzemchak, *Automatic Test Generation for Testing Ada Compilers*, December 1994.

19. (MS) Ras Bodik, *Optimal Placement of Load-Store Operations for Array Accesses in Loops*, December 1994.

20. (MS) Kishore Karnam, *Automatic Distribution of Data on Distributed Memory Machines*, April 1994.

21. (MS) Radha Sivaramakrishnan, *Static Analysis of Distributed Memory Programs*, Dec. 1993.

22. (MS) Michael Bigrigg, *An Integrated Database Programming Environment for Parallel Applications*, August 1993.

23. (MS) Padmavathi Vallabhaneni, *Analysis and Transformation of Programs for SPMD execution on Distributed-Memory Multiprocessors*, December 1992.

24. (MS) Sunah Lee, *Executing Loops on a Fine-Grained MIMD Architecture*, August 1991.

25. (MS) Robert Kramer, *The Combining DAG: A Technique for Parallel Data Flow Analysis*, 1991.

DISSERTATION COMMITTEE MEMBER

UCR, CSE Department: Prerna Budhkar (2018); Kenneth O'Neal (2018); Yongjian Hu (2017); Panruo Wu (2016); Mehmet E. Belviranli (2016); Tanzirul Azim (2016); Mohammad Shokoohi-Yekta (2015); Dung Vu (2014); Teresa Davies (2014); Pamela Bhattacharya (2012); Guangdeng Liao (2011); Danhua Guo (2010); Min Wan (2008).

Georgia Tech., College of Computing: Xiaotong Zhuang (2006).

University of Arizona, ECE Dept.: Haibo Wang (2002); Daler Rakhmatov (2002).

Univ. of Pittsburgh, CS Dept.: Atif Memon (2001); Chuck Salisbury (1998); Chyi-Ren Dow (1994).

Carnegie Mellon University, CS Dept.: Chris Newburn (1997); Herman Schmit (1995).

New Jersey Institute of Technology, CS Dept.: Mohamed Younis (1996).

TEACHING EXPERIENCE

University of California, Riverside

CS 152: *Compiler Design* – Fall'08; Winter'10,'11,'12,'13,'14,'15,'16,'17,'18.

CS 203A: *Advanced Computer Architecture* – Winter'09.

CS 206: *Testing and Verification Techniques in Software Engineering* – Fall'09,'11,'12,'15.

CS 201: *Compiler Construction* – Winter'08; Spring'09,'10,'11,'12,'13,'14,'15,'16,'18; Fall'16,'18.

CS 260: Seminar: *Parallel Computing* – Spring'15.

CS 260: Seminar: *Multicore Systems* – Winter'11.

CS 260: Seminar: *Advanced Execution Systems for Reliable High-Perf. Computing* – Spring'08.

CS 270: *Special Topics in Advanced CS* – Spring'09,'17; Winter'10,'12,'13,'14,'16; Fall'18.

The University of Arizona

CSc 453: *Compilers and System Software*, Fall'99,'03.

CSc 553: *Principles of Compilation*, Spring'01,'02,'05,'07.

CSc 576: *Computer Architecture*, Fall'00,'01,'02,'03,'04.

CSc 620: *Microarchitecture and Compiler Support for Instruction Level Parallelism*, Spring'00.

CSc 620: *Embedded Systems*, Fall'02.

CSc 620: *Advanced Execution Systems for Reliable Computing*, Fall'06.

University of Pittsburgh

CS2210: *Compiler Design*, Fall'91,'92,'93,'94,'95,'97.

CS2212: *Advanced Compiler Design*, Winter'93,'94,'95.

CS2230: *Compiling Techniques for Parallel Systems*, Fall'93, Winter'96.

CS3210: *Advanced Topics in Programming Languages*, Winter'98,'99.

CS3220: *Seminar on Fine-Grained Parallel Processing Systems*, Winter'91.

CS1622: *Compiler Design*, Winter'91-96, Winter'98,'99.

CS1621: *Structure of Programming Languages*, Fall'90.

CS1520: *Programming Languages*, Fall'98.

CS0441: *Discrete Structures for Computer Science*, Winter'92.

UNIVERSITY SERVICE

University of California, Riverside

UCR Executive Council, 09/01/2018 – 08/30/2019.

University Committee on Academic Personnel (UCAP), 09/01/2017 – 08/30/2018.

UCR Committee on Academic Personnel (CAP), 09/01/2016 – 08/30/2019:
Member 09/2016 – 08/2017;
Vice-Chair 09/2017 – 08/2018;
Chair 09/2018 – 08/2019.

UCR Grievance Consultation Panel (GCP), 09/01/2016 – 08/30/2019.

UCR Privelage and Tenure Committee (P&T), 2011 – 2013.

UCMEXUS Review Panel, 2012.

UC Discovery Review Panel, 2011.

Chair, Research Committee, Bourns College of Engineering Retreat, 2008.

Retreat Oversight Committee, Bourns College of Engineering, 2008 – 2009.

Chair, CSE Recruiting Committee, 2012 – 2014.

CSE Recruiting Committee, 2008 – 2012, 2015.

Chair, CEN Strategic Plan Committee, Fall 2018.

Ad hoc CSE Graduate Curriculum Review Committee, Winter 2019.

CEN Recruiting Committee, 2013 – 2015.

Graduate Admissions Committee, 2010 – 2012.

Graduate Program, 2015 – 2018.

Graduate Advisory Committee, 2015.

Executive Committee, CSE Department, 2007 – present.

University and Department Level AdHoc Committees for Peer Evaluations, 2007 – present.

Research Committee, 2007 – 2008.

Resource/Publicity Committee, 2008 – 2009.

The University of Arizona

Self-Study Team for Academic Program Review, *Member*, 2006 – 2007

Advisory Committee, *Member Elected by the Faculty*, 2006 – 2007.

Five Year Review Committee of Department Head, *Member Appointed by the Dean*, 2003.

Steering Committee, Research Infrastructure Grant: **Chair**, 2003-2005; *Member*, 2001 – 2002.

Graduate Admissions Committee: **Chair**, 2000 – 05/2005, 09/2006 – 2007; and *Member*, 1999.

Graduate Affairs Committee, *Member*, 2006 – 2007.

Space Planning Committee, *Member*, 2004.

Colloquium Czar, 2001 – 2002.

Human Subjects Review Committee, *Chair*, 2003 – 2005.

Promotion and Tenure Committee, *Member*, 1999 – 2001 and 2002 – 2005.

PhD Qualifiers Committee, 2001 – 2002.

University of Pittsburgh

Computer Engineering Program Proposal Committee, *Member*, 1995.

Committee on the University of Pittsburgh's Presentation on the Internet, 1995.

Faculty of Arts and Sciences Tenure Review Committees, **Chair** & *Member*, 1998 & 1999.

Faculty of Arts and Sciences Tenure Council, *Member*, 1994, 1995 and 1998

Faculty Recruiting Committee, *Member*, 1990 – 1991.

Graduate Programs and Exams Committee, *Member*, 1991 – 1993.

Graduate Admissions and Financial Aid Committee, *Member*, 1992 – 1993 and 1998 – 1999.

TA/TF Training and Evaluation Committee, *Member*, 1994 – 1995.

Computing and Communications Committee, *Member*, 1994 – 1999.

Web Administrator for the Computer Science Department, 1994 – 1999