Sibin Mohan

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Current Position

2008 – curr. **University of Illinois at Urbana-Champaign (UIUC).**
Visiting Research Scientist (current); Postdoctoral Research Associate.
Working with: **Prof. Lui Sha**, Donald B. Gillies Professor, Dept. of Computer Science

Education

2008	**PhD**	North Carolina State University. *Major:* **Computer Science**. Dissertation Title: *"Exploiting Hardware/Software Interactions for Analyzing Embedded Processors"*. *Advisor:* **Prof. Frank Mueller**.
2004	**MS**	North Carolina State University. *Major:* Computer Science
2001	**BE**	PES Institute of Technology, Bangalore University, India. *Major:* Computer Science and Engineering.

Professional Experience

2009 – curr	Visiting Research Scientist. **University of Illinois at Urbana-Champaign (UIUC)**.
2008 – 2009	PostDoctoral Research Associate. **University of Illinois at Urbana-Champaign (UIUC)**.
2003 – 2008	Research Assistant. **North Carolina State University**.
Summer 2007	Research Intern, Embedded Systems team. **Microsoft Research**, Redmond.
Summer 2004	Engineering Intern, CPU Design team. **Qualcomm**, Raleigh.
2001 – 2002	Software Engineer, India Software Operations (ISO). **Hewlett Packard**, Bangalore, India.

Research Interests — Systems

Embedded Systems, Security, Cyber-Physical and Real-Time Systems, System Composition, Computer Architecture, Avionics

- ***Embedded Systems***: worst-case execution time (WCET) analysis, scheduling, power savings and DVS, deeply embedded systems, compiler and operating system support.
- ***Security***: integration of security in embedded systems, intrusion detection in embedded systems, security for safety-critical control systems, security vulnerabilities in multicore processors for embedded systems.
- ***Cyber-Physical Systems*** (CPS): real-time guarantees, interoperability of medical devices, avionics.
- ***Computer Architecture***: architectures for safety-critical embedded systems, multicore processors for embedded systems.
- ***Virtual System Integration***: system composition techniques, analysis of COTS components, complexity reduction techniques, analysis of avionics architecture platforms.

Fellowships and Awards

2007 *Preparing the Professoriate* (PtP). North Carolina State University Graduate School **fellowship**. Only **10 Ph.D. students** are chosen every year from a **university-wide** competitive application process.
2007 *Mentored Teaching Assistantship* (MTA) awarded by the College of Engineering, NCSU.
2003 *Virtual Teaching Assistantship* awarded by the NCSU Department of Computer Science for three years. This is a competitive award vied for by all Graduate students in the Computer Science dept.

Grants/Proposals

Funded Proposals/Projects

Oct. 2010 Department of Energy. **Senior Investigator** *Using Analytic Redundancy for Intrusion Mitigation and Detection in SCADA Systems*. Collaborative proposal between UIUC and Software Engineering Institute (SEI), CMU. **Lead in Writing and Proposal Preparation**.

Aug 2010 Rockwell Collins: *Adapting Multicore Processors for use in Real-Time Avionics Systems*. **Significantly contributed to proposal writing**

July 2007 Checker: CSR-EHS: Collaborative Research: *Hybrid Timing Analysis via Multi-Mode Execution*. **Significantly contributed to proposal writing**. NSF grant no. *0720496*.

Nov. 2006 NSF Nugget: *ParaScale: Exploiting Parametric Timing Analysis for Real-Time Schedulers and Dynamic Voltage Scaling*. **Actively involved in writing NSF Nugget**

2005 – 2007 *Virtual Simple Architecture (VISA): Exceeding the Complexity Limit in Safe Real-Time Systems*. Involved in research, writing progress reports and updates. NSF grant no. *0310860*.

2003 – 2007 ITR: Collaborative Research: SPARTA: *Static Parametric Timing Analysis to Support Dynamic Decisions in Embedded Systems*. Involved in research, writing progress reports and updates. NSF grant no. *0312695*.

Current Proposals/In Submission

June 2011 **Senior Investigator**. Dept. of Homeland Security. *Resilient SCADA Systems: Composable Security Techniques for Safety-Critical Systems using Hardware Methods and Physical Communication Channels*. Collaborative proposal between UIUC Computer Science and ECE departments. **Lead in Writing and Proposal Preparation**
Oct. 2011 **Senior Investigator** for Air Force Office of Scientific Research (AFOSR) BAA program: *Ensuring Safety and Security in use of Multicore Processors in Cyber-Physical Systems*. Collaborative proposal between UIUC and U. of Waterloo. **Lead in Writing and Proposal Preparation** (*in preparation*).

Significant experience in writing and preparation for other proposals:

Aug. 2009 **Senior Investigator** for BAA ONR program: *Mission capability-driven end-to-end resource management*. Collaborative proposal between CMU, UIUC and SEI. **Significant contributions in proposal writing.**

Jul. 2009 **Senior Investigator** for BAA ONR program: *Co-Design of Cyber-Physical Systems*. Collaborative proposal between UIUC and North Carolina State University. **Co-lead in writing and proposal preparation.**

Nov. 2008 **Senior Investigator** for CISE: NetSE: Collaborative Research: *Medical-Grade Wireless Networks and Workflow-level QoS*. Collaborative proposal between UIUC, Massachusetts General Hospital, Boston and Univeristy of Houston. **Co-lead in writing and proposal preparation.**

Publications

Refereed Journals

1. **[TECS '07]** "*Parametric Timing Analysis and its Application to DVS*" by **S. Mohan**, F. Mueller, W. Hawkins, M. Root, C. Healy, D. Whalley and E. Vivancos. Published (2007) in the ACM journal *Transactions in Embedded Computing Systems* (TECS), Vol. 10, No. 2, Dec 2010 (accepted 2007).

In Submission:

2. **[TECS '10]** "*Virtual Integration for Early Analysis of Safety-Critical Avionics Systems* " by **S. Mohan**, M. Nam, R. Pellizoni, L. Sha, R. Bradford and S. Fliginger. Submitted to the ACM journal *Transactions in Embedded Computing Systems* (TECS) in 2010.
3. **[TII '10]** "*Medical Device Suprevision Framework Providing Network Fail-Safe Operations*" by C. Kim, M. Sun, **S. Mohan**, H. Yun, L. Sha and T. Abdelzaher. Submitted to the IEEE journal *Transactions on Industrial Informatics* (TII) in 2010.
4. **[TC '09]** "*Model-based Description and Analysis for the Design of Real-Time Wireless System Architectures*" by K. Kang, W. Jeon, M. Nam, M. Yoon, **S. Mohan**, J. Kim and L. Sha. Submitted to the IEEE journal *Transactions on Computers* in 2009.
5. **[Systems '09]** "*Design of Wireless E-healthcare Systems with Medical-grade QoS*" by K. Kang, **S. Mohan**, K. Park, C. Kim, and L. Sha. Submitted to the IEEE *Systems Journal* in 2009.
6. **[TECS '11]** "*Fixed Point Loop Analysis for Complex Embedded Processors* " by **S. Mohan**, R. Raghavendra and F. Mueller. To be submitted to the ACM journal *Transactions in Embedded Computing Systems* (TECS) in 2010.

Refereed Conferences

1. **[DASC '10]** "*Exploring the Design Space of of IMA Architectures*" by R. Bradford, S. Fliginger, M. Nam, **S. Mohan**, R. Pellizzoni, C. Kim, M. Caccamo and L. Sha. Published in the 29th *Digital Avionics Systems Conference* (DASC), Oct. 2010.
2. **[ICCPS '10-1]** "*Time-Based Intrusion Detection in Cyber-Physical Systems*" by C. Zimmer, B. Bhatt, F. Mueller and **S. Mohan**. Published in the ACM/IEEE *International Conference on Cyber-Physical Systems* (ICCPS), Apr. 2010. [Acceptance Rate: **28%**]
3. **[ICCPS '10-2]** "*A Safety Assurance Framework for Interoperable Real-Time Medical Systems over Wireless*" by C. Kim, H. Yun, M. Sun, **S. Mohan**, A. Nayeem, L. Sha and T. Abdelzaher. Published in the ACM/IEEE *International Conference on Cyber-Physical Systems* (ICCPS), Apr. 2010.[Acceptance Rate: **28%**]
4. **[RTSS '09-1]** "*Rapid Early-Phase Virtual Integration*" by **S. Mohan**, M. Nam, R. Pellizoni, L. Sha, R. Bradford and S. Fliginger. Published in the IEEE conference *Real-Time Systems Symposium* (RTSS), Dec. 2009. [Acceptance Rate: **21%**]

5. **[CASES '09]** "*CheckerCore: Enhancing an FPGA Soft Core to Capture Worst-Case Execution Times*" by J. Ouyang, R. Raghavendra, **S. Mohan**, T. Zhang, Y. Xie and F. Mueller. Published in *Compilers, Architectures, and Systems for Embedded Systems* (CASES) conference, Oct. 2009. [Acceptance Rate $<$ **30%**]
6. **[LCTES '09]** "*Push-Assisted Migration of Real-Time Tasks in Multi-Core Processors* " by A. Sarkar, F. Mueller, H. Ramaprasad and **S. Mohan**. Published in the *ACM Conference on Languages, Compilers and Tools for Embedded Systems* (LCTES), June 2009. [Acceptance Rate: **22%**]
7. **[RTSS '08]** "*Merging State and Preserving Anomalies in Pipelines of High-End Processors*" by **S. Mohan** and F. Mueller. Published in the IEEE conference *Real-Time Systems Symposium* (RTSS), pages 467-477, Dec. 2008. [Acceptance Rate: **23%**]
8. **[ECRTS '08]** "*Temporal Analysis for Adapting Concurrent Applications to Embedded Systems*" by **S. Mohan** and J. Helander. Published in the *EUROMICRO Conference on Real-Time Systems* (ECRTS), pages 71-82, July 2008. [Acceptance Rate: **30%**]
9. **[RTAS '08]** "*Hybrid Timing Analysis of Modern Processor Pipelines via Hardware/Software Interactions*" by **S. Mohan** and F. Mueller. Published in the IEEE conference *Real-Time and Embedded Technology and Applications Symposium* (RTAS), pages 285-294, April 2008. [Acceptance Rate: **25%**]
10. **[RTSS '05]** "*ParaScale: Exploiting Parametric Timing Analysis for Real-Time Schedulers and Dynamic Voltage Scaling*" by **S. Mohan**, F. Mueller, W. Hawkins, M. Root, C. Healy and D. Whalley. Published in the IEEE conference *Real-Time Systems Symposium* (RTSS), pages 233-242, December 2005. [Acceptance Rate: **21%**]
11. **[RTAS '05]** "*Timing Analysis for Sensor Nodes of the Atmega Processor Family*" by **S. Mohan**, F. Mueller, D. Whalley and C. Healy. Published in the IEEE conference *Real-Time and Embedded Technology and Applications Symposium* (RTAS), pages 405-414, March 2005. [Acceptance Rate: **33%**]

In Submission:

12. **[Oakland '12]** "*S3A: Secure System Simplex Architecture for Safety-Critical Supervisory Control Systems*" by **S. Mohan**, S. Bak, E. Betti, H. Yun, L. Sha and M. Caccamo. Submitted to the IEEE *Symposium on Security and Privacy* (Oakland) to be held in May. 2012.
13. **[DAC'12]** "*Toward the Auto-Generation of Robust Tree-shaped I/O Architectures*" by M. Nam, R. Pellizzoni, **S. Mohan**, R. Bradford and L. Sha. Submitted to *Design Automation Conference* (DAC) to be held in June. 2012.

Refereed Workshops/Work-in-progress

1. **[ECRTS '10]** "*Anytime Algorithms for Multi-core Architectures*" by A. Saba, **S. Mohan** and R. Mangharam. Published in the Work in Progress session of *EUROMICRO Conference on Real-Time Systems* (ECRTS) held in Brussels, Jul 2010.
2. **[RTSS '09-2]** "*Time-Based Intrusion Detection in Cyber-Physical Systems*" by C. Zimmer, B. Bhatt, F. Mueller and **S. Mohan**. Published in the Work in Progress session of IEEE conference *Real-Time Systems Symposium* (RTSS) held in Washington DC, Dec 2009.
3. **[CPS '09]** "*Addressing Safety and Security Contradictions in Cyber-Physical Systems*" by M. Sun, **S. Mohan**, L. Sha and C. Gunter. Presented at the **First Workshop Workshop on Future Directions in Cyber-physical Systems Security** held in Newark, New Jersey, July 2009.
4. **[ECRTS '09]** "*Time-Based Intrusion Detection in Cyber-Physical Systems*" by C. Zimmer, B. Bhatt, F. Mueller and **S. Mohan**. Published in the Work in Progress session of *EUROMICRO Conference on Real-Time Systems* held in Dublin, July 2009.

5. **[CPS '08]** "*Building Robust Automotive Systems through Separation of Concerns*" by **S. Mohan** and J. Helander. Presented at the **NITRD National Workshop on High-Confidence Automotive Cyber-Physical Systems** held in Troy, Michigan, April 2008.
6. **[RTSS '07]** "*Worst-Case Execution Time Analysis of Security Policies for Deeply Embedded Real-Time Systems*" by **S. Mohan**. PhD students forum on Deeply Embedded Real-Time Computing at the IEEE conference *Real-Time Systems Symposium* (RTSS), December 2007. Published in *ACM SIGBED Review Vol 5, Number 1 – Special issue on the RTSS Forum on Deeply Embedded Real-Time Computing*, January 2008.
7. **[RTAS '07]** "*CheckerMode: A Hybrid Scheme for Timing Analysis of Modern Processor Pipelines involving Hardware/Software Interactions*" by **S. Mohan** and F. Mueller. Published in the Work-In-Progress section at the IEEE conference *Real-Time and Embedded Technology and Applications Symposium* (RTAS), March 2007.

Technical Reports

1. **[NCSU '08]** "*Preserving Timing Anomalies in Pipelines of High-End Processors*" by **S. Mohan** and F. Mueller. *North Carolina State University Dept. of Computer Science Technical Report, TR-2008-13*, July 2008.
2. **[MSR '08]** "*Temporal Analysis for Adapting Concurrent Applications to Embedded Systems*" by **S. Mohan** and J. Helander. *Microsoft Research Technical Report MSR-TR-2008-37*, March 2008.
3. **[MSR '07-1]** "*Embedded Systems Research at DemoFest '07*" by O. Almeida, A. Forin, P. Garcia, J. Helander, N. Khantal, H. Lu, K. Meier, **S. Mohan**, H. Nielsen, R. Pittman, R. Serg, B. Sukhwani, M. Veanes, B. Zorn, S. Berry, C. Boyce, D. Chaszar, B. Culrich, M. Khisin, G. Knezeck, W. Linam-Church, S. Liu, M. Stewart and D. Toney. Published as the *Microsoft Research Technical Report MSR-TR-2007-94*, July 2007.

Posters

1. **[RTSS '07-2]** "*Scalable Embedded Systems*" by J. Helander, R. Serg, **S. Mohan**, M. Veanes and P. Garcia at the IEEE conference *Real-Time Systems Symposium*, December 2007.
2. **[MSR '07-2]** "*Scalable Embedded Systems*" by J. Helander, R. Serg, **S. Mohan**, M. Veanes and P. Garcia at the *Microsoft Research Faculty Summit*, July 2007.
3. **[LCTES '04]** "*Static Timing Analysis for Sensor Nodes*" by **S. Mohan** and F. Mueller in the ACM SIGBED-SIGPLAN conference on *Languages, Compilers and Tools for Embedded Systems* (LCTES), June 2004.

Research Projects

2008 – curr. ***Embedded Systems Security***. Detecting intrusions and system protection in safety-critical systems (*e.g. protecting against Stuxnet-type Attacks*); using worst-case timing information for intrustion detection in real-time systems; analyzing security vulnerabilities due to use of multicore processors in safety-critical systems – shared resources such as caches, interconnects, buses, *etc.* lead to security holes that compromise the safety of the system; analysis of avionics, medical and power systems to study security and privacy requirements; studying trade-offs in safety resulting from the integration of security policies for such systems. Recently submitted multiple proposals (DOE and AFOSR) on these topics.
Work conducted at UIUC, NCSU and collaboration with SEI.
Related publications : [Oakland '12, ICCPS '10-1, CPS '09, ECRTS '09, RTSS '07]

2008 – curr. ***Virtual Integration***. Development of System Composition techniques for complex safety-critical systems. Analysis of complex platform platform architectures (such as avionics), created from Commercial Off-the-Shelf components, to adjust to changing customer demands. I led the development of an integrated analysis framework that includes worst-case execution behavior, schedulability analysis, bus flows/delays analy sis, hardware resource requirements analysis and high level functional modeling (using Simulink) to create an "end-to-end" framework to aid designers of such systems. The framework obviates the need for an actual implementation (hardware or software) for performing comprehensive analysis. Used the integration of a "Stall Warning System Application" (SWSA) and a "Color Weather Radar Application" (CWRA) into an existing flight guidance system (FGS) as an example.
Work conducted at UIUC (with Dr. Lui Sha) in collaboration with Rockwell Collins.
Related publications : [RTSS '09, DASC '10, TECS '10, DAC '12]

2008 – curr. ***System Integration for Plug-n-Play Medical Devices***. Proposed and designing a set of supervisories that will facilitate the development of "Plug-n-Play" medical devices and a "medical-grade" wireless network to inter-operate with safety interlocks. The intent is also to facilitate proper medical workflow and provide generalized QoS guarantees along with auditing abilities with the larger goal of reducing/tracking medical errors.
Work conducted at UIUC (with Dr. Lui Sha) and with Massachusetts General Hospital, Boston.
Related publications : [TII '10, ICCPS '10-2, TC '09, Systems '09]

2008 – curr. ***Timing Analysis for Modern Multicore Processors***. Studying interference effects in caches and task migration among cores to bound accurate worst-case execution time (WCET) values for modern multicore architectures.
Work conducted in collaboration with NCSU (with Dr. Frank Mueller).
Related publications : [LCTES '09]

2008 – 2010. ***CheckerCore***: Using an FPGA platform to obtain accurate worst-case execution times for modern processing platforms. The FPGA contains a processor core attached to which is a "Checker Core" that provides the ability to obtain execution times for code segments and also transmit processor information back to a software static analyzer.
Work in collaboration with NCSU (with Dr. Frank Mueller) and Penn State (Dr. Yuan Xie).
Related publications : [CASES '09]

2006 – 2010 ***CheckerMode***: Proposed and implemented timing analysis techniques for modern processors with the latest architectural features (out-of-order pipelines, branch predictors, *etc.*) using hardware/ software interactions. I also proposed minor modifications to the design of processor pipelines to enhance the process of calculating accurate worst-case execution times. Currently analyzing loops to capture a "multi-dimensional" fixed point state.
Continuing work from North Carolina State University (with Dr. Frank Mueller).
Related publications : [TECS '11, RTSS '08, NCSU '08, RTAS '08, RTAS '07]

2007 – 2009 ***Temporal Analysis for Distributed Embedded Systems***: proposed, analyzed and modeled temporal behavior and dependencies in distributed embedded applications using colored graphs. Created a graph-transformation algorithm to extract the "meaning" of concurrency within applications.
Work conducted at Microsoft Research, Redmond (with Dr. Johannes Helander).
Related publications : [ECRTS '08, MSR '08, RTSS '07-2, MSR '07-1, MSR '07-2]

2004 – 2006 ***ParaScale***: Proposed and implemented a Parametric Timing analysis scheme, which works in conjunction with dynamic real-time schedulers, to handle statically unknown loop bounds. I also

assessed the potential for power conservation by exploiting dynamically known parametric loop bounds coupled with known and innovative dynamic voltage scaling (DVS) techniques.
Work conducted at North Carolina State University (with Dr. Frank Mueller).
Related publications : [TECS '07, RTSS '05]

Fall 2004 ***WaveScalar Timing Analysis***: I proposed and implemented techniques for performing static timing analysis for determining WCETs on the WaveScalar architecture, which is essentially a dataflow architecture.
Work conducted at North Carolina State University for an advanced computer architecture course.

Summer 2004 ***DVS Evaluation for ARM boards***: I performed the evaluation of the ARM dynamic voltage scaling (DVS) board. I also developed soft real-time algorithms for use with DVS on embedded processors.
Work conducted at Qualcomm's CPU Design team in Raleigh (with Steve Geist and Gary Yurcak).

2003 – 2004 ***Timing Analysis for Sensor Network Nodes***: I proposed and performed timing analysis to obtain the worst-case execution times (WCETs) for the Atmel (AVR) family of embedded processors, used on the Berkeley motes. Timing analysis was performed on both – C as well as NesC code.
Work conducted at North Carolina State University (with Dr. Frank Mueller).
Related publications : [RTAS '05, LCTES '04]

2003 – 2005 ***VISA***: Virtual Simple architecture. Incorporating advanced architectural features and dynamic voltage scaling (DVS) in real-time systems. Processors are designed with dual execution modes – simple and complex. I performed the timing analysis for the benchmarks used for this project.
Work conducted at NCSU (with Dr. Frank Mueller and Dr. Eric Rotenberg).

2002 – 2003 ***Bounding the Blocking time for EDF-DVS***: Working with another student, I proposed techniques to estimate the resource contention in dynamic voltage scaling (DVS) systems.
Work conducted at North Carolina State University (with Dr. Frank Mueller).

Teaching

Spring 2011 *Guest lecturer* for graduate course, *Embedded Systems Architecture and Software* (CS 431).
Spring 2010 *Guest lecturer* for graduate course, *Embedded Systems Architecture and Software* (CS 431).
Spring 2008 I **taught** an undergraduate programming course (CSC 230) in *Spring 2008*. Responsibilities: course design, preparation of lecture materials and assignments, teaching and preparing exams/quizzes.
In collaboration with the NCSU Computer Science department and Dr. Matt Stallmann
2007 – 2008 Selected for the *Preparing the Professoriate* (PtP) fellowship. Selected doctoral candidates are mentored through the processes involved in a faculty career, in designing and teaching courses, and on improving their teaching skills. Also entails attendance at various seminars that focus on teaching and course preparation. Culminates in designing and teaching a complete course.
Program conducted by the Graduate School at North Carolina State University
2006 – 2008 *Certificate of Accomplishment in Teaching* (CoAT). Program that provides guidance to students who wish to teach, with comprehensive seminars, mentoring and classroom evaluation.
Program conducted by the NCSU Faculty Center for Teaching and Learning
Fall 2007 *Preparing for a Faculty Career*: workshop on preparation for a faculty career. Topics covered: teaching techniques, active learning, Bloom's taxonomy, course design & objectives, ABET, *etc.*.
Program conducted by the College of Engineering at North Carolina State University
Fall 2007 *Guest lecturer* for undergraduate course, *Operating Systems* (CSC 246).
Spring 2007 *Guest lecturer* for *graduate* course, *Operating Systems* (CSC 501).

Fall 2006	*Guest lecturer* for *graduate* course, *Parallel Systems* (CSC 548).
Fall 2005	*Teaching Assistant* for *advanced graduate* course, *Real-Time Systems* (CSC 714). Responsibilities involved occasionally teaching classes, grading, creating assignments, *etc.*
Summer 2003	*Teaching Assistant* for *graduate* course, *Operating Systems* (CSC 501). Responsibilities involved grading, creating assignments, *etc.*
2002 – 2003	*Tutor* for undergraduate students. Subjects: Advanced and basic Java, Object-oriented Design, Fortran90 and Physics for Engineers.
Spring 2003	*Advanced Tutoring Course*, conducted by the NCSU Undergraduate Tutoring center.
Fall 2002	*Basic Tutoring Course*, conducted by the NCSU Undergraduate Tutoring center.
2000 – 2001	*Teaching Assistant* for undergraduate course on C++, Object-oriented programming and operating systems principles.

Graduate Student Advising

2008 – curr	Advising **Graduate** student on effects on worst-case execution time due to security violations.
2008 – 2010	Advising **Graduate** student on timing analysis for multicore architectures.
2007 – 2009	Advising **Graduate** student on Hybrid Timing Analysis via Multi-Mode Execution.
2005 – 2006	Mentored **three Graduate** students in their independent study/research projects. *Topics*: timing analysis for the IBM PowerPC, analysis of voltage and frequency switching on a DVS board and evaluation of the SimpleScalar processor simulator for multi-mode implementation.

Invited and Conference Talks

Jul. 2011	**Microprocessor Research Labs, Intel**, Santa Clara. *Analysis Techniques for Cyber-Physical Systems*. Invited Talk.
Jun. 2011	**Intel Labs**, Pittsburgh. *Analysis Techniques for Cyber-Physical Systems*. Invited Talk.
Jan. 2011	**Adobe Labs**, Bangalore. *Analysis Techniques for Cyber-Physical Systems*. Invited Talk.
Feb. 2010	**Virginia Tech**, Blacksburg. *Analysis Techniques for Cyber-Physical Systems*. ECE Faculty Search Series.
Dec. 2009	**IEEE conference** on Real-Time Systems Symposium (RTSS) 2009, Washington DC. *Rapid Early-Phase Virtual Integration*.
Nov. 2009	**Bell Labs**, Bangalore. *Analysis Techniques for Cyber-Physical Systems*. Invited Talk.
Nov. 2009	**Indian Institute of Science (IISC)**, Bangalore. *Analysis Techniques for Cyber-Physical Systems*. Invited Talk.
Nov. 2009	**General Motors Labs**, Bangalore. *Analysis Techniques for Cyber-Physical Systems*. Invited Talk.
Oct. 2009	**Indian Institute of Technology (IIT)**, Madras. *Analysis Techniques for Cyber-Physical Systems*. Invited Talk.
Oct. 2009	**HP Labs**, Bangalore. *Analysis Techniques for Cyber-Physical Systems*. Invited Talk.
Jul. 2009	**Simon Fraser University**, Vancouver. *Exploiting Hardware/Software Interactions for Embedded Systems Design*. Computer Science Faculty Search series.
Dec. 2008	**IEEE conference** on Real-Time Systems Symposium (RTSS) 2008, Barcelona, Spain. *Merging State and Preserving Anomalies in Pipelines of High-End Processors*.
Jul. 2008	**EUROMICRO conference** on Real-Time Systems (ECRTS) 2008, Prague, Czech Republic. *Temporal Analysis for Adapting Concurrent Applications to Embedded systems*.
June 2008	**European Microsoft Innovation Center (EMIC)**, Aachen, Germany. *Exploiting Hardware/Software Interactions for Embedded Systems Design*
Apr. 2008	**Southern Illinois University**, Carbondale. *Exploiting Hardware/Software Interactions for Embedded Systems Design*. ECE Faculty Search series.
Apr. 2008	**IEEE conference** Real-Time and Embedded Applications Symposium (RTAS) 2008, St. Louis. *Hybrid Timing Analysis of Modern Processor Pipelines via Hardware/Software Interactions*.

Apr. 2008 **Virginia Tech**, Blacksburg. *Exploiting Hardware/Software Interactions for Embedded Systems Design*. ECE Research Seminar series.

Feb 2008 **George Mason University**, Virginia. *Exploiting Hardware/Software Interactions for Embedded Systems Design*. Computer Science Research Seminar series.

Feb. 2008 **University of Washington**, Seattle. *Exploiting Hardware/Software Interactions for Embedded Systems Design*.

Feb 2008 **University of British Columbia**, Vancouver. *Exploiting Hardware/Software Interactions for Embedded Systems Design*.

Feb. 2008 **Microsoft Research**, Redmond. *Exploiting Hardware/Software Interactions for Embedded Systems Design*.

Jan 2008 **Duke University**, Durham. *Exploiting Hardware/Software Interactions for Embedded Systems Design*. Computer Architecture Research seminar series.

Jan. 2008 **University of North Carolina**, Chapel Hill. *Exploiting Hardware/Software Interactions for Embedded Systems Design*. "Systems Tea" Research Seminar series.

Dec. 2007 **IEEE conference** *Real-Time Systems Symposium* (RTSS), Tucson. *Integrating Security Policies with Deeply Embedded Real-Time Systems*. **NSF** planning workshop on ***"Cyber Physical Challenges in the Automotive domain"***.

Dec. 2007 **IEEE conference** *Real-Time Systems Symposium* (RTSS), Tucson. *Worst-Case Execution Time Analysis of Security Policies for Deeply Embedded Real-Time Systems*. PhD students forum on Deeply Embedded Real-Time Computing.

Jul. 2007 **Microsoft Research**, Redmond. *Reliable Distributed Embedded Systems*.

Mar. 2007 **IEEE conference** RTAS 2007 Work-in-progress session, Seattle. *CheckerMode: A Hybrid Scheme for Timing Analysis of Modern Processor Pipelines Involving Hardware/Software Interactions*.

Dec. 2005 **IEEE conference** Real-Time Systems Symposium (RTSS) 2005, Miami. *ParaScale: Exploiting Parametric Timing Analysis for Real-Time Schedulers and Dynamic Voltage Scaling*.

Mar. 2005 **IEEE conference** Real-Time and Embedded Applications Symposium (RTAS) 2005, San Francisco. *Timing Analysis for Sensor Network Nodes of the Atmega Processor Family*.

Professional Activities

Technical Program Committee Member

Aug. 2012 17th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2012) , Seoul, Korea.

Apr. 2012 18th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS) Work in Progress session, Beijing, China.

Dec. 2011 Analytical Virtual Composition of Real-Time Systems, Vienna, Austria.

Aug. 2011 IEEE Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA), Japan.

Jul. 2011 EUROMICRO Workshop on Worst-Case Execution Time (WCET) Analysis), Portugal.

Jun. 2011 International Workshop on Safety and Security in Cyber-Physical Systems, Korea.

Apr. 2011 Workshop on Energy Aware Design and Analysis of Cyber Physical Systems (WEA-CPS), Chicago.

Apr. 2011 IEEE Conference Real-Time and Embedded Applications Symposium (RTAS), Chicago.

Dec. 2010 Analytical Virtual Composition of Real-Time Systems, San Diego, CA. **Co-chair** of workshop.

Apr. 2010 Work in Progress (WIP) Session of the IEEE Conference Real-Time and Embedded Applications Symposium (RTAS), Stockholm, Sweden.

Jun. 2009 International Workshop on Cyber-Physical Systems (WCPS), Montreal, Canada.

May. 2009 International Workshop on Wireless-Grade Medical Devices (WiMD), New Orleans.

Apr. 2009 IEEE Conference Real-Time and Embedded Applications Symposium (RTAS), San Francisco.

Mar. 2008 Symposium for Graduate Research in Computer Science, Raleigh North Carolina.

Workshops

Jul. 2009	*First Workshop Workshop on Future Directions in Cyber-physical Systems Security*. Attended **by-invitation-only** workshop organized by the Dept. of Homeland Security held in Newark, New Jersey.
Apr. 2008	*National Workshop on High-Confidence Automotive Cyber-Physical Systems*. Attended **by-invitation-only** NITRD workshop held in Troy, Michigan.
Feb. 2008	*CRA Academic Careers workshop*. Workshop held in Washington DC.
Dec. 2007	*Cyber Physical challenges in the Automotive domain*. **NSF** Planning workshop held in conjunction with IEEE RTSS 2007 at Tucson.
Nov. 2007	*Effective Job Talks*. *Proposed and organized* the workshop for the Computer Science department at North Carolina State University.
Nov. 2007	*Preparing for a Faculty Career workshop*. *Proposed and organized* the workshop and panel discussions for the Computer Science department at North Carolina State University.
Feb. 2007	**ESNS 2007**. **Attended the by-invitation-only** Army Research Office (ARO) planning workshop on Embedded Systems and Network Security.

Reviewer

RTCSA	IEEE International Conference on Embedded and Real-Time Computing Systems/Applications. [2012,2011,2006]
RTAS	IEEE Real-Time and Embedded Technology and Applications. [2011, 2010, 2009, 2005]
IEEE TC	IEEE Journal, Transactions on Computers. [2011, 2010, 2009]
LCTES	ACM SIGPLAN/SIGBED conference, Languages, Compilers and Tools for Embedded Systems. [2011, 2010, 2008, 2007, 2005, 2004]
RTS	Springer Journal, Real-Time Systems. [2011,2010, 2009]
IEEE Systems	IEEE Systems Journal. [2011]
CASES	International Conference on Compilers, Architecture and Synthesis for Embedded Systems. [2011,2004]
ESL	IEEE Embedded Systems Letters. [2011,2009]
ACM TECS	ACM Journal, Transactions in Embedded Computing Systems. [2010, 2009]
IEEE TPDS	IEEE Journal, Transactions on Parallel and Distributed Systems. [2010, 2009]
SPE	Software: Practice and Experience Journal. [2010]
JSA	Elsevier Journal of Systems Architecture. [2010]
ECRTS	Euromicro Conference on Real-Time Systems. [2010, 2008, 2006, 2005, 2004, 2003]
EURASIP JES	Journal on Embedded Systems. [2010, 2009]
IEEE TII	IEEE Journal, Transactions on Industrial Informatics. [2010, 2009, 2008, 2007]
RTSS	IEEE Real-Time Systems Symposium. [2008, 2006, 2005]
ISMM	ACM SIGPLAN International Symposium on Memory Management. [2008]
ICPP	International Conference on Parallel Processing. [2007]
ICPADS	International Conference on Parallel and Distributed Systems. [2006]
WCET	Annual Conference on Worst-Case Execution Time. [2006]
HIPEAC	European Network of Excellence on High-Performance Embedded Architecture and Compilation. [2006]
EMSOFT	ACM SIGBED Embedded Software Conference.[2005, 2004]
CTCES	Workshop on Compilers and Tools for Constrained Embedded Systems. [2004]

Professional Licenses, Society Memberships, Miscellaneous

2007 –	Member, Association of Computing Machinery (ACM)
2007 –	Member, ACM Special Interest Group on Embedded Systems (SIGBED)
2004 –	Member, Institute of Electrical and Electronic Engineers (IEEE)

2004 –	Member, Institute of Electrical and Electronic Engineers Computer Society (IEEE-CS)
2006 – 2007	Science and Technology Correspondent, Technician (Student Newspaper), NC State University
2004 – 2006	Executive board member, University Graduate Students Association, NC State University
2003 – 2004	Executive board member, Computer Science Graduate Students Association, NC State University
1999 – 2000	Student Body President, PES Institute of Technology, Bangalore, India
1998 – 2000	Editor, "Clarion" (College Magazine), PES Institute of Technology, Bangalore, India

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