Sibin Mohan

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Professional Experience

2022 – curr	**The George Washington University (GWU)**, Washington, DC. Associate Professor [untenured], Department of Computer Science.
2021 – 2022	**Oregon State University (OSU)**, Corvallis, OR. Associate Professor [untenured], Electrical Engineering and Computer Science.
2021 – curr	Research Assistant Professor (Adjunct), Computer Science, University of Illinois.
2015 – 2021	**University of Illinois at Urbana-Champaign (UIUC)**, Urbana, IL. Research Assistant Professor, Computer Science. Research Assistant Professor, Electrical and Computer Engineering. Research Assistant Professor, Information Trust Institute.
2012 – 2015	**University of Illinois at Urbana-Champaign (UIUC)**, Urbana, IL. Research Scientist. Information Trust Institute.
2009 – 2011	**University of Illinois at Urbana-Champaign (UIUC)**, Urbana, IL. Visiting Research Scientist, Computer Science.
2008 – 2009	**University of Illinois at Urbana-Champaign (UIUC)**, Urbana, IL. PostDoctoral Research Associate, Computer Science.
2001 – 2002	**Hewlett Packard**, Bangalore, India. Software Engineer.

Education

2008	**PhD**	North Carolina State University. Computer Science.
2004	**MS**	North Carolina State University. Computer Science
2001	**BE**	PES Institute of Technology, Bangalore University, India. Computer Science and Engineering.

Research and Teaching Interests — Systems, Resiliency for Systems

Cyber-Physical and Real-Time Systems, Embedded Systems, Internet-of-Things (IoT), Security, Resilient Platforms and Networking, Resiliency in Cloud Computing, Operating Systems.

Development of analysis and system composition techniques for Cyber-Physical, Embedded and Real-Time Systems communities. Significant contributions include methods to improve the resiliency of such systems (integrating security, robust network systems and resilient platforms).

Hightlights

Publications	**50+** peer-reviewed papers in top conferences and journals [*e.g.* CCS, INFOCOM, RTSS, RTAS, S&P, SIGMETRICS, TECS, ACM Research Highlights].
Funding	**$ 17 M** in funding as PI. [NSF SaTC, NSF CPS Frontiers, ONR, DoE, Industry (Gifts from Boeing, Toyota Research)].
Impact	Pioneered a new research area — **security for real-time systems**.

After I published the first few papers on this topic (circa 2013, 2014) this has now become a mainstream area in the field with security being listed as a prominent topic in the CFPs for RTSS, RTAS and ICCPS (the top conferences in the fields of real-time, embedded and cyber-physical systems). These conferences now include multiple papers on this topic every year.

Impact in avionics industry, embedded intrusion detection used in Android, OS code debloating framework being used by embedded/automotive companies, and resilient networking being considered by power grid utilities.

Awards **NSF CAREER** (2022).
Best Paper Award (BuildSys '21) and **Best Student Paper Award** (IEEE RTSS [1]).

Projects Current projects include **security and resiliency** for Autonomous/CPS/Real-Time/IoT Systems and Operating Systems and Networks

Service 45 TPCs and chaired 19 conference tracks/workshops — all in top real-time systems, embedded systems, cyber-physical systems and Internet-of-Things conferences.
Reviewer for multiple top-tier ACM and IEEE journals (*e.g.* Computer, TC, TPDS, TDSC, TII, TECS, *etc.*).

Teaching Course on cyber-physical systems was *twice* listed in the "**Highest Rated Courses**" in UIUC.

Collaborations Multiple ongoing collaborations with industry (Boeing, Toyota, Visa Research) and universities (University of Illinois at Urbana-Champaign, University of Wisconsin, University of Toronto, University of Waterloo, University of Michigan).

Publications

[Key for First Authors: Name highlights students who I advise/co-advise. *Name*: students/postdocs who I collaborate closely with (and the work was carried out, at least partially, under my supervision). Other first authors are either faculty or industry collaborators.]

Refereed Conference and Journal Papers

1. Journal [Access '23] "*IOSPReD: I/O Specialized Packaging of Reduced Datasets and Data-Intensive Applications for Efficient Reproducibility*" by C. Niddodi, A. Gehani, T. Malik, **S. Mohan** and M. Rilee. Published in the IEEE Access Journal, Vol. 11, 2023.
2. Journal [TCPS '22-1] "*SchedGuard++: Protecting against Schedule Leaks Using Linux Containers On Multicore Processors*" by *J. Chen*, T. Kloda, A. Bansal, R. Tabish, C.Y. Chen, B. Liu, **S. Mohan**, M. Caccamo and L. Sha. Accepted for publication in the ACM Transactions on Cyber-Physical Systems (TCPS), 2022.
3. Conference [ESORICS '22] "*Towards Efficient Auditing for Real-Time Systems*" by *Ayoosh Bansal*, Anant Kandiguppa, Monowar Hasan, Chien-Ying Chen and **S. Mohan**. Published in the 27th European Symposium on Research in Computer Security (ESORICS), 2022.
4. Journal [CACM-RH '22] "*Set the Configuration for the Heart of the OS: On the Practicality of Operating System Kernel Debloating*" by H. Kuo, J. Chen, **S. Mohan** and T. Xu. Published in Communications of the ACM (CACM) Research Highlights, Vol. 65, 5, pages 101–109, May 2022.
5. Journal [TCPS '22] "*Beyond Just Safety: Delay-Aware Security Monitoring for Real-Time Control Systems*" M. Hasan, **S. Mohan**, R. Pellizzoni and R. Bobba. Published in the ACM Transactions on Cyber-Physical Systems (TCPS), 2022.
6. Conference [EuroSys '22] "*Verified Programs Can Party: Optimizing Kernel Extensions via Post-Verification In-Kernel Merging*" by Hsuan-Chi Chen, Kai-Hsun Chen, Yicheng Lu, Daniel Williams, Tianyin Xu and **S. Mohan**. Published in the 17th European Conference on Computer Systems (EuroSys), 2022.

[1] Flagship conference in Real-Time and Embedded Systems.

7. Conference [CCS '21] "*Indistinguishability Prevents Scheduler Side-Channels in Real-Time Systems*" by C. Y. Chen, D. Sanyal and **S. Mohan**. Published in the ACM Conference on Computer and Communications Security (CCS), 2021.
8. Conference [BuildSys '21] "*PIRMedic: A Physics-based Fault Diagnosis for Passive Infra-Red (PIR) Sensors*" by A. Kashinath, **S. Mohan**, Akshay Nambi and Sumukh Marathe. Published in the ACM International Conference on Systems for Energy-Efficient Buildings, Cities and Transportation (BuildSys), 2021. BEST PAPER AWARD
9. Conference [RTAS '21] "*SchedGuard: Protecting against Schedule Leaks Using Linux Containers*" by *J. Chen*, T. Kloda, A. Bansal, R. Tabish, C.Y. Chen, B. Liu, **S. Mohan**, M. Caccamo and L. Sha. Published in the IEEE conference *Real-Time and Embedded Technology and Applications Symposium* (RTAS), May 2021.
10. Conference [INFOCOM '21] "*Safety Critical Networks using Commodity SDNs*" by A. Kashinath, M. Hasan, R. Kumar, **S. Mohan**, R. Kumar and S. Padhy. Accepted for publication in the IEEE International Conference on Computer Communications (INFOCOM), May 2021.
11. Journal [TIV '20] "*Securing vehicle-to-everything (V2X) communication platforms*" M. Hasan, **S. Mohan**, T. Shimizu, H. Lu. Published in the IEEE Transactions on Intelligent Vehicles (TIV), 2020.
12. Conference [EuroSys '20] "*A Linux in Unikernel Clothing*" by H. Kuo, D. Williams, R. Koller and **S. Mohan**. Published in the European Conference on Computer Systems (EuroSys), 2020.
13. Conference [SIGMETRICS '20] "*Set the Configuration for the Heart of the OS: On the Practicality of Operating System Kernel Debloating*" by H. Kuo, J. Chen, **S. Mohan** and T. Xu. Published in the ACM SIGMETRICS conference, 2020.
14. Conference [DATE '20] "*Period Adaptation for Continuous Security Monitoring in Multicore Systems*" by M. Hasan, **S. Mohan**, R. Pellizzoni and R. Bobba. Published in the Design, Automation and Test in Europe (DATE) conference, 2020.
15. Conference [SmartGridComm '19] "*Secure Integration of Electric Vehicles with the Power Grid*" by C. Niddodi, S. Lin, **S. Mohan** and H. Zhu. Published in the IEEE International Conference on Communications, Control, and Computing Technologies for Smart Grids (SmartGridComm), October 2019.
16. Conference [CASE '19] "*A Unified Digital Twin Frmework for Real-Time Monitoring and Evaluation of Smart Manufacturing Systems*" by *Y. Qamsane*, C. Y. Chen, E. Balta, B. Kou, **S. Mohan**, J. Moyne, D. Tilbury and K. Barton. Published in the IEEE *15th Conference on Automation Science and Engineering* (CASE), August 2019.
17. Conference [IEEE S&P '19] "*Towards Automated Safety Vetting of PLC Code in Real-World Plants*" by *M. Zhang*, C. Y. Chen, B. Kou, Y. Qamsane, Y. Shao, Y. Lin, E. Shi, **S. Mohan**, K. Barton, J. Moyne and Z. Mao. Published in the IEEE *Symposium on Security and Privacy* (IEEE S&P), May 2019.
18. Conference [RTAS '19] "*A Novel Side-Channel in Real-Time Schdulers*" by C. Y. Chen, A. Ghassami, **S. Mohan**, N. Kiyavash, R. Bobba and R. Pellizzoni. Published in the IEEE conference *Real-Time and Embedded Technology and Applications Symposium* (RTAS), April 2019.
19. Journal [IoT '19] "*Preserving Physical Safety Under Cyber Attacks*" F. Abdi, M. Hasan, C. Y. Chen, **S. Mohan** and M. Caccamo. Published in the IEEE Internet-of-Things Journal, 2019.
20. Journal [SENSORS '18] "*Securing Real-Time Internet-of-Things*" C. Y. Chen, M. Hasan and **S. Mohan**. Published in the the SENSORS Journal, special issue on Design and Implementation of Future CPS, 2018.
21. Conference [EMSOFT '18] "*Special Session: The Future of IoT Security*" by **S. Mohan**, M. Asplund, G. Bloom, A. Sadeghi, A. Ibrahim, N. Salajageh, P. Griffioen and B. Sinopili. Published in the International Conference on Embedded Software (EMSOFT), October 2018.
22. Conference [ICCPS '18-2] "*Guaranteed Physical Security with Restart-Based Design for Cyber-Physical Systems*" by F. Abdi, C. Y. Chen, M. Hasan, S. Liu, **S. Mohan** and M. Caccamo. Published in the ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS), April 2018.

23. Conference [ICCPS '18-1] "*SDCWorks: A Formal Framework for Software Defined Control of Smart Manufacturing Systems*" by *M. Potok*, C.Y. Chen, S. Mitra and **S. Mohan**. Published in the ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS), April 2018.
24. Conference [IC2E '18] "*Scheduling, Isolation, and Cache Allocation: A Side-Channel Defense*" by *R. Sprabery*, K. Evchenko, A. Raj, R. Bobba, **S. Mohan** and R. Campbell. Published in the IEEE International Conference on Cloud Engineering (IC2E), April 2018.
25. Conference [DATE '18] "*A Design-Space Exploration for Allocating Security Tasks in Multicore Real-Time Systems*" by M. Hasan, **S. Mohan**, R. Pellizzoni and R. Bobba. Published in the *Design Automation and Test in Europe* (DATE) conference, March 2018.
26. Conference [RTSS '17] "*End-to-End Network Delay Guarantees for Real-Time Systems using SDN*" by *R. Kumar*, M. Hassan, S. Padhy, K. Evchenko, L. Piramanayagam, **S. Mohan** and R. Bobba. Published in the IEEE *Real-Time Systems Symposium* (RTSS), December 2017.
27. Conference [ECRTS '17] "*Contego: An Adaptive Framework for Integrating Security Tasks in Real-Time Systems*" by M. Hassan, **S. Mohan**, R. Bobba and R. Pellizzoni. Published in the *EUROMICRO Conference on Real-Time Systems* (ECRTS), June 2017.
28. Conference [IoTDI '17] "*Learning Execution Contexts from System Call Distribution for Anomaly Detection in Smart Embedded System*" by M. K. Yoon, **S. Mohan**, J. Choi, M. Christodorescu and L. Sha. Published in the *ACM/IEEE International Conference on Internet-Of-Things Design and Implementation* (IoTDI), April 2017.
29. Journal [RTS '16] "*Integrating Security Constraints into Fixed Priority Real-Time Schedulers*" by **S. Mohan**, M. K. Yoon, R. Pellizzoni and R. Bobba. *Real-Time Systems* (RTS) Journal 52(5).
30. Conference [RTSS '16] "*Exploring Opportunistic Execution for Integrating Security into Legacy Hard Real-Time Systems*" by M. Hassan, **S. Mohan**, R. Bobba and R. Pellizzoni. Published in the IEEE Real-Time Systems Symposium (RTSS), December 2016. BEST STUDENT PAPER AWARD
31. Conference [SYSTOR '16] "*The DragonBeam Framework: Hardware-Protected Security Modules for In-Place Intrusion Detection*" by M. K. Yoon, M. Christodorescu, L. Sha and **S. Mohan**. Published in the ACM International Systems and Storage Conference (SYSTOR), June 2016.
32. Conference [RTAS '16] "*TaskShuffler: A Schedule Randomization Protocol for Obfuscation Against Timing Inference Attacks in Real-Time Systems*" by M. K. Yoon, **S. Mohan**, C. Y. Chen and L. Sha. Published in the IEEE conference *Real-Time and Embedded Systems and Applications Symposium* (RTAS), April 2016.
33. Conference [CNS '15] "*Inter-Flow Consistency: A Novel SDN Update Abstraction for Supporting Inter-Flow Constraints* by *W. Liu*, R. Bobba, **S. Mohan** and R. Campbell. Published in the IEEE Conference on Communications and Network Security (CNS), September 2015.
34. Conference [DAC '15] "*Memory Heat Map: Anomaly Detection in Real-Time Systems Using Memory Behavior*" by M. K. Yoon, **S. Mohan**, J. Choi and L. Sha. Published in the *Design Automation Conference* (DAC), June 2015.
35. Conference [RTAS '15] "*A Generalized Model for Preventing Information Leakage in Hard Real-Time Systems*" R. Pellizzoni, N. Paryab, M. K.Yoon, S. Bak, **S. Mohan** and R. Bobba. Published in the IEEE conference *Real-Time and Embedded Systems and Applications Symposium* (RTAS), April 2015.
36. Journal [CPS-SEPG '14] "*Intrusion Detection for CPS Real-Time Controllers*" by *C. Zimmer*, B. Bhatt, F. Mueller and **S. Mohan**. Published in the Springer-Verlag book *Cyber Physical Systems Approach to Smart Electric Power Grid Book Series: Understanding Complex Systems*, November 2014.
37. Conference [ECRTS '14] "*Real-Time Systems Security Through Scheduler Constraints*" by **S. Mohan**, M. K. Yoon, R. Pellizzoni and R. Bobba. Published in the *EUROMICRO Conference in Real-Time Systems* (ECRTS), July 2014.

38. Conference [CPSNA '13] "*On-Chip Control Flow Integrity Check for Real-Time Embedded Systems*" by F. A. T. Abad, J. Van der Woude, Y. Lu, S. Bak, M. Caccamo, L. Sha, R. Mancuso and **S. Mohan**. Published in the IEEE conference on *Cyber-Physical Systems, Networks and Applications* (CPSNA), August 2013.
39. Conference [RTAS '13] "*SecureCore: A Multicore based Intrusion Detection Architecture for Real-time Embedded Systems*" by M. K. Yoon, **S. Mohan**, Jaesik Choi, Jung-Eun Kim and L. Sha. Published in the IEEE conference *Real-Time and Embedded Technology and Applications Symposium* (RTAS), April 2013.
40. Conference [HiCons'13] "*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. Published in the ACM/IEEE conference on *High Confidence Networked Systems*, April 2012.
41. Conference [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.
42. Conference [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.
43. Conference [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.
44. Conference [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.
45. Conference [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.
46. Conference [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.
47. Conference [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.
48. Conference [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.
49. Conference [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.
50. Journal [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).
51. Conference [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.
52. Conference [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.

Refereed Workshops/Work-in-progress

1. [SEC-SDN '20] "*Improving Dependability via Deadline Guarantees in Commodity Real-time Networks* by A. Kashinath, M. Hasan, **S. Mohan**, R. Bobba and R. Mittal. Published in the IEEE International Workshop on Secure and Dependable Software-defined Networking for Sustainable Smart Communities (SecSDN), Taipei, 2020.
2. [P-RECS '20] "*MiDas: Containerizing Data-Intensive Applications with I/O Specialization* by C. Niddodi, A. Gehani, T. Malik, J. A. Navas and **S. Mohan**. Published in the 3rd International Workshop on Practical Reproducible Evaluation of Systems (P-RECS'20), affiliated with the 29th International Symposium on High-Performance Parallel and Distributed Computing (HPDC), Stockholm 2020.
3. [IOT S&P '19] "*Protecting Actuators in Safety-Critical Systems from Control Spoofing Attacks* by M. Hasan and **S. Mohan**. Published in the ACM CCS Workshop on the Internet-of-Things Security and Privacy (IOT S&P), London 2019.
4. [FEAST '17] "*New Directions for Container Debloating* by *V. Rastogi*, C. Niddodi, S. Jha and **S. Mohan**. Published in the ACM CCS Workshop on *Forming an Ecosystem around Software Transformation* (FEAST) (RTN) held in Dallas, November 2017.
5. [RTN '17] "*Dependable End-to-End Delay Constraints for Real-Time Systems using SDN* by *R. Kumar*, M. Hasan, S. Padhy, K. Evchenko, L. Piramanayagam, **S. Mohan** and R. Bobba. Published in the ECRTS Workshop on *Real-Time Networks* (RTN) held in Dubrovnik, Croatia, June 2017.
6. [ECRTS '17] "*Securing Electric Vehicles in the Power Grid*" by C. Niddodi, **S. Mohan** and T. Yardley. Published in the Work in Progress session of *EUROMICRO Conference on Real-Time Systems* (ECRTS) held in Dubrovnik, Croatia, June 2017.
7. [CERTS '16-3] "*ScheduLeak: An Algorithm for Reconstructing Task Schedules in Fixed-Priority Hard Real-Time Systems* by C.Y. Chen, A. Ghassami, **S. Mohan**, N. Kiyavash, R. Bobba and R. Pellizzoni. Published in the IEEE RTSS Workshop on *Security and Dependability of Critical Embedded Real-Time Systems* (CERTS) held in Porto, Portugal, Nov. 2016.
8. [CERTS '16-2] "*ReSecure: A Restart-Based Security Protocol for Tightly Actuated Hard Real-Time Systems* by F. Abdi, C.Y. Chen, M. Hasan, **S. Mohan**, D. Agarwal and M. Caccamo. Published in the IEEE RTSS Workshop on *Security and Dependability of Critical Embedded Real-Time Systems* (CERTS) held in Porto, Portugal, Nov. 2016.
9. [CERTS '16-1] "*A Server Model to Integrate Security Tasks into Fixed-Priority Real-Time Systems* by M. Hasan, **S. Mohan**, R. Bobba and R. Pellizzoni. Published in the IEEE RTSS Workshop on *Security and Dependability of Critical Embedded Real-Time Systems* (CERTS) held in Porto, Portugal, Nov. 2016.
10. [SENT '15] "*Inter-Flow Consistency: Novel SDN Update Abstraction for Supporting Inter-Flow Constraints* by *W. Liu*, R. Bobba, **S. Mohan** and R. Campbell. Published in the NDSS Workshop on *Security of Emerging Networking Technologies* (SENT) held in San Diego, Feb. 2015.
11. [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.
12. [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.
13. [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.
14. [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.

15. [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.
16. [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.
17. [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.

Funding Experience

Funding Totals **$17 million**. My Share: **$ 6.6 million**.

May 2022	**co-PI**. Department of Energy. *Physics-Aware and AI-Enabled Cyber-Physical Intrusion Response for the Power Grid* **$2 M**.
Mar. 2022	**PI**. National Science Foundation (NSF). *CAREER: Indistinguishability Prevents Information Leakage in Real-Time Schedulers.* **$523 K**.
Feb. 2021	**co-PI**. Office of Naval Research (ONR). *Accelerated Learning and Engineering Research Training (ALERT) Program in Cyber and Electronic Warfare for Undergraduate Midshipmen and Cadets.* **$314K**.
Jan. 2019	**PI**. Toyota Research. *Security of V2X Systems.* **$85K**.
Aug. 2018	**PI**. Boeing Research. *Machine Learning-Based Communication and Anomaly Detection in Distributed Autonomous UAV Swarms.* **$300K**.
Oct. 2017	**PI** (at UIUC). Office of Naval Research (ONR). *Tools and Techniques for de-Bloating Containers.* **$6.3 M** (UIUC Share: $1.2M).
Aug. 2017	**PI**. National Science Foundation (NSF). *SaTC: CORE: Small: An Exploration of Schedule-Based Vulnerabilities In Real-Time Embedded Systems.* **$500 K**.
Sept. 2016	**PI** (at UIUC). National Science Foundation (NSF). *CPS: Frontiers: Collaborative Research: Software Defined Control for Smart Manufacturing Systems.* **$4.25 M** (UIUC Share: $1.25M).
Aug. 2016	**PI**. Department of Energy (DoE). *INGRESS: Advanced Cybersecurity Platform for Distributed Energy Resources.* **$900 K**.
July 2016	**co-PI**. National Science Foundation (NSF). *CyPhyHouse: A Laboratory for Evolving Distributed and Mobile Cyber-Physical Systems Research* **$626 K**.
July 2014	**PI**. National Science Foundation (NSF). *Behavior-based Zero-Day Intrusion Detection for Real-Time Cyber-Physical Systems.* **$500 K**.
Aug. 2013	**PI**. Office of Naval Research (ONR). *Integration of Security in Real-Time Systems.* **$600 K**.
Sept. 2012	**Co-PI**. National Security Agency Science of Security Lablet. *Classification of Cyber-Physical Systems Adversaries*. **$100 K**.

My salary for the 2014 – 2021 period was based on soft money. The grants listed above include costs for multiple graduate students equipment, travel, *etc.* and my complete salary.

Graduated Students

2022	**PhD**	Hsuan-Chi Kuo. Current position: Anyscale Inc. Thesis title: "*Attack Surface Reduction in Contemporary Operating Systems via Practical Kernel Debloating*"
2021	**MS**	Vishakh Suresh.

Thesis title: "*Forecasting Resource Availability for Supporting Real-Time Container Migration*"

2021 **MS** Debopam Sanyal. Current position: Ph.D. student at Georgia Tech.
Thesis title: "*Attacking Schedule Indistinguishability in Real-Time Systems*"

2021 **MS** Disha Awarwala. Current position: Splunk Inc.
Thesis title: "*Reboot-Based Framework for High Threshold Cryptosystems*"

2021 **MS** Denizhan Kara. Current Position: Prometeia Inc.

2020 **PhD** Monowar Hasan. Current position: Wichita State University.
Thesis title: "*Integrating Security into Real-Time Cyber-Physical Systems.*"

2020 **PhD** Chien-Ying Chen. Current position: NVidia Research.
Thesis title: "*Scheduler Side-Channels in Preemptive Real-Time Systems.*"

2019 **PhD** Fardin Abdi (co-advised). Current position: Uber.
Thesis title: "*Safety and Security of Cyber-Physical Systems.*"

2019 **ME** Arvind Kamal. Current Position: Jump Trading LLC.

2018 **MS** XuanYao Zhang. Current Position: Cisco.

2017 **PhD** Man-Ki Yoon (co-advised). Current position: Yale University.
Thesis title: "*Secure and Dependable Cyber-Physical System Architectures.*"

2018 **MS** Chaitra Prasad Niddodi. Current Position: Ph.D. candidate at UIUC.

2018 **MS** Kyo-Hyun Kim. Current Position: Ph.D. candidate at UIUC.

2017 **MS** Konstantin Evchenko (co-advised). Current position: Facebook.

2008 – 2013 **PhD/MS** advised multiple graduate (MS/PhD) in unofficial capacity.

Current Students with Expected Dates

2023 **PhD** Ashish Kashinath.

2024 **PhD** Chaitra Prasad Niddodi.

2024 **PhD** Kyo-Hyun Kim.

2025 **PhD** Bin-Chou Kao.

2027 **PhD** Shahab Nikhoo.

2027 **PhD** Vineetha Paruchuri.

2023 **MS** Devikrishna Radhakrishnan.

Dissertation and Thesis Committees

Avesta Hojjati University of Illinois at Urbana-Champaign.

Jiyang Chen University of Illinois at Urbana-Champaign.

Leni Halaapiapi Oregon State University

Jose Rodrigo Sanchez Vicarte University of Illinois at Urbana-Champaign.

Teaching

Fall 2022 *Secure Autonomous Systems* (CSCI 6097/3097).

Spring 2022 *Operating Systems II* (CS 544/44).

Winter 2022 *Secure Autonomous and Cyber-Physical Systems* (CS/ECE 599).

Fall 2019 *Autonomous Systems Reading Seminar* (CS591CAS).

Spring 2019 *Autonomous Systems Reading Seminar* (CS591CAS).

Fall 2017 Taught programming using the Scratch programming language to **middle school students** at Urbana Middle School.

Summer 2017 Taught a course on Systems and Security for undergraduate students at PES University, Bangalore.

Summer 2016	Developed and taught a course on Systems and Security for undergraduate students at PES University, Bangalore.
Fall 2014	I *co-taught* the graduate course, *Cyber-Physical Systems* (CS 598). It was **listed among the highest rated courses on campus**.
Fall 2013	*Guest lecturer* for graduate/undergraduate course, *Computer Security I* (ECE 422).
Spring 2012	I *co-taught* the graduate course, *Cyber-Physical Systems* (CS 598). It was **listed among the highest rated courses on campus**.
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*.
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.

Professional Activities

Funding Agency Review Panels

Apr. 2022	National Science Foundation (NSF). Directorate for Computer and Information Science and Engineering (CISE).
Jul. 2020	National Science Foundation (NSF). Directorate of Engineering (ENG).
Jul. 2018	National Science Foundation (NSF). Directorate for Computer and Information Science and Engineering (CISE).
Jul. 2015	National Science Foundation (NSF). Directorate for Computer and Information Science and Engineering (CISE).
Jun. 2014	National Science Foundation (NSF). Directorate for Computer and Information Science and Engineering (CISE).
Mar. 2013	Research Grants Council (RGC) of Hong Kong.
Feb. 2015	National Science Foundation (NSF). Directorate for Computer and Information Science and Engineering (CISE).

Jun. 2014 National Science Foundation (NSF). Directorate for Computer and Information Science and Engineering (CISE).

Apr. 2013 Research Grants Council (RGC) of Hong Kong.

Apr. 2012 National Science Foundation (NSF). Directorate for Computer and Information Science and Engineering (CISE).

Journal Editor

2020 –	Area Chair/Editor for Real-Time and Cyber-Physical Systems. "Journal of Systems Research".
2015	Guest Editor. "Advanced Technologies on Mobile IoT and Cyber-Physical Systems", Special Issue, Hindawi Press.

Conference/Workshop Organization

Apr. 2023	**Brief Presentations Chair**, IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), USA.
Dec. 2022	**Industry Chair**, IEEE Real-Time Systems Symposium (RTSS), Houston, USA.
Nov. 2021	**Steering Committee**, Joint Workshop on CPS & IoT Security and Privacy (CPSIoTSec), Seoul, South Korea.
Nov. 2020	**Steering Committee**, Joint Workshop on CPS & IoT Security and Privacy (CPSIoTSec), Orlando, USA.
Apr. 2019	**Web Chair**, 4th ACM/IEEE Conference on Internet of Things Design and Implementation (IoTDI), Montreal, Canada.
Apr. 2019	**Co-Chair**, 1st International Workshop on Smart Manufacturing Modeling and Analysis (SM2N), Montreal, Canada.
Nov. 2018	**Co-Chair**, NSF Mini Workshop on Digital Twins for Smart Manufacturing, Washington, DC.
Oct. 2018	**Chair**, ESWEEK Special Session on the Future of IoT Security, Turin, Italy.
Jun. 2018	**Co-Chair**, Workshop on Security and Dependability of Critical Embedded Real-Time Systems (CERTS), Luxembourg.
Apr. 2018	**Co-Chair**, 1st International Workshop on Security and Privacy for the Internet-of-Things (IoT-Sec), Orlando, USA.
Dec. 2017	**Co-Chair**, Workshop on Security and Dependability of Critical Embedded Real-Time Systems (CERTS), Paris, France.
Dec. 2017	**Publication Chair**, IEEE Real-Time Systems Symposium (RTSS), Paris, France.
Aug. 2017	**Track Chair** Cognitive, Cellular and Mobile Networks (CCN) Track, 26th International Conference on Computer Communication and Networks (ICCCN), Vancouver, Canada.
Dec. 2016	**CPS Track Chair**, IEEE Real-Time Systems Symposium (RTSS), Porto, Portugal.
Dec. 2016	**Publication Chair**, IEEE Real-Time Systems Symposium (RTSS), Porto, Portugal.
Jun. 2016	**Co-chair**, Workshop on Science of Security for Software Defined Networks (SoSSDN), Chicago, USA.
Dec. 2015	**Publication Chair**, IEEE Real-Time Systems Symposium (RTSS), San Antonio, TX.
Dec. 2014	**Co-Chair**, Analytical Virtual Composition of Real-Time Systems, Rome, Italy.
Dec. 2010	**Co-Chair**, Analytical Virtual Composition of Real-Time Systems, San Diego, CA.

Technical Program Committees

Apr. 2023	IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), USA.
Sep. 2022	27th European Symposium on Research in Computer Security (ESORICS), Copenhagen, Denmark.
Jul. 2022	59th Design Automation Conference (DAC), San Francisco, USA.
Apr. 2022	28th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), Milan, Italy.
Aug. 2021	27th IEEE International Conference on Embedded and Real-Time Computing Systems/Applications (RTCSA), Online.
Jul. 2021	58th Design Automation Conference (DAC), San Francisco, USA.
Jun. 2021	24th IEEE International Symposium on Real-Time Distributed Computing (ISORC), Daegu, South Korea.

May. 2021	2nd IEEE Workshop on the Internet of Safe Things (co-located with IEEE S&P), San Francisco, USA.
Apr. 2021	ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS), Nashville, USA.
Nov. 2020	Joint Workshop on CPS & IoT Security and Privacy (CPSIoTSec), Orlando, USA.
Apr. 2020	26th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), Sydney, Australia.
Apr. 2020	ACM/IEEE International Conference on Cyber-Physical Systems (ICCPS), Sydney, Australia.
Apr. 2020	22nd ACM International Conference on Hybrid Systems: Computation and Control (HSCC), Repeatability Evaluation, Sydney, Australia.
July. 2019	4th International Workshop on Security and Dependability of Critical Embedded Real-Time Systems (CERTS), Stuttgart, Germany.
May. 2019	22nd IEEE International Symposium on Real-Time Distributed Computing (ISORC), Valencia, Spain.
Apr. 2018	2nd International Workshop on Security and Privacy for the Internet-of-Things (IoTSec), Montreal, Canada.
Dec. 2018	IEEE Real-Time Systems Symposium (RTSS), Nashville, USA.
Dec. 2018	24th IEEE International Conference on Parallel and Distributed Systems (ICPADS), Singapore.
Apr. 2018	23rd IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), Porto, Portugal.
Jan. 2017	IEEE Consumer Communications and Networking Conference (CCNC)), Las Vegas, NV.
Oct. 2016	IEEE International Conference on Cyber-Physical Systems, Networks, and Applications (CPSNA), Nagoya, Japan.
Aug. 2015	21st IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2015) , Hong Kong.
Aug. 2015	12th International Conference on Embedded Software and Systems (ICESS), New York, NY.
Aug. 2015	EUROMICRO Conference on Real-time Systems (ECRTS) Work-in-progress, Lund, Sweden.
Apr. 2015	20th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), Seattle, WA.
Dec. 2014	20th IEEE International Conference on Parallel and Distributed Systems (ICPADS), Hsinchu, Taiwan.
Dec. 2014	Work in Progress (WIP) Session of the IEEE Real-Time Systems Symposium (RTSS), Rome, Italy.
Dec. 2014	35th IEEE Real-Time Systems Symposium (RTSS) Demo Session. RTSS@Work, Rome, Italy.
Apr. 2014	19th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), Berlin, Germany.
Dec. 2013	19th IEEE International Conference on Parallel and Distributed Systems (ICPADS), Seoul, Korea.
Apr. 2013	18th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), Philadelphia, PA.
Dec. 2012	33rd IEEE Real-Time Systems Symposium (RTSS) Demo Session. RTSS@Work, San Juan, Puerto Rico.
Aug. 2012	17th IEEE International Conference on Embedded and Real-Time Computing Systems and Applications (RTCSA 2012) , Seoul, Korea.
Aug. 2012	2nd Workshop on Cyber-Physical Systems, Networks, and Applications (CPSNA), Seoul, South 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.
Aug. 2011	First Workshop on Cyber-Physical Systems, Networks, and Applications (CPSNA), 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 (SSCPS), Korea.
Apr. 2011	17th IEEE Conference Real-Time and Embedded Applications Symposium (RTAS), Chicago.
Apr. 2011	Workshop on Energy Aware Design and Analysis of Cyber Physical Systems (WEA-CPS), Chicago.
Apr. 2011	First International Workshop on Cyber-Physical Networking Systems (CPNS), Shanghai, China.
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.

Reviewer

IEEE TC	IEEE Journal, Transactions on Computers.
IEEE TPDS	IEEE Journal, Transactions on Parallel and Distributed Systems.
IEEE TDSC	IEEE Journal, Transactions on Dependable and Secure Computing.
IEEE Systems	IEEE Systems Journal.
IEEE TII	IEEE Journal, Transactions on Industrial Informatics.
IEEE TCPS	IEEE Journal, Transactions on Cyber-Physical Systems.
IEEE TKDE	IEEE Journal, Transactions on Knowledge and Data Engineering.
ACM TECS	ACM Journal, Transactions in Embedded Computing Systems.
ACM JEA	ACM Journal Experimental Algorithmics.
RTS	Springer Journal, Real-Time Systems.
LITES	Leibniz Transactions on Embedded Systems.
ESL	IEEE Embedded Systems Letters.
SPE	Software: Practice and Experience Journal.
JSA	Elsevier Journal of Systems Architecture.
EURASIP JES	Journal on Embedded Systems.
LCTES	ACM SIGPLAN/SIGBED conference, Languages, Compilers and Tools for Embedded Systems.
RTCSA	IEEE International Conference on Embedded and Real-Time Computing Systems/Applications.
CASES	International Conference on Compilers, Architecture and Synthesis for Embedded Systems.
ECRTS	Euromicro Conference on Real-Time Systems.
RTSS	IEEE Real-Time Systems Symposium.
ISMM	ACM SIGPLAN International Symposium on Memory Management.
ICPP	International Conference on Parallel Processing.
ICPADS	International Conference on Parallel and Distributed Systems.
WCET	Annual Conference on Worst-Case Execution Time.
HIPEAC	European Network of Excellence on High-Performance Embedded Architecture and Compilation.
EMSOFT	ACM SIGBED Embedded Software Conference.
CTCES	Workshop on Compilers and Tools for Constrained Embedded Systems.

Professional Licenses, Society Memberships, Miscellaneous

2021 – curr	Member [Invited], Sigma Xi Scientific Research Honor Society
2007 – curr	Member, Association of Computing Machinery (ACM)
2007 – curr	Member, ACM Special Interest Group on Embedded Systems (SIGBED)
2004 – curr	Member, Institute of Electrical and Electronic Engineers (IEEE)
2004 – curr	Member, Institute of Electrical and Electronic Engineers Computer Society (IEEE-CS)

Current/Ongoing Research Projects

2021 – curr. ***System Indistingishability*** to prevent attacks against autonomous, cyber-physical and real-time systems; applying techniques gleaned from **differential privacy** to improve the security and resiliency of these domains.
Work conducted at GWU and UIUC.
Related publications : [CCS '21]

2008 – curr. ***Security for Embedded and Real-Time Systems***. Integration of security in real-time systems at the design/conceptual level; detecting intrusions and system protection in safety-critical systems; using behavior of real-time systems to detect intrusions; 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.
Work conducted at GWU, OSU and UIUC.
Related publications: [TCPS '22-1, ESORICS '22, TCPS '22, BuildSys '21, RTAS '21, DATE '20, IoT S&P '19, RTAS '19, IoT '19, EMSOFT '18, SENSORS '18, TC '18, ICCPS '18-2, DATE '18, ECRTS '17, IoTDI '17, RTSS '16, CERTS '16-1, CERTS '16-2, CERTS 16'-3, SYSTOR '16, RTAS '16, RTS '16, RTAS '15, DAC '15, CRTS '14, RTAS '13, HiCons '13, ICCPS '10-1, CPS '09, ECRTS '09, RTSS '07]

2014 – curr. ***Security and Debloating for Contemporary Operating Systems***. Analysis of security issues for cloud computing systems; development of security mechanisms for co-located applications in public clouds; code debloating for improved performance and security in container systems.
Work conducted at GWU and UIUC.
Related publications : [Access, '22, EuroSys '22, CACM-RH '22, P-RECS '20, EuroSys '20, SIGMETRICS '20, IC2E '18, FEAST '17]

2014 – curr. ***Software Defined Networks in Safety-Critical Systems***. Developing methods for using SDNs in real-time systems and critical infrastructures such as power grids; analysis and synthesis for guaranteeing end-to-end timing; preventing failures; consistency of updates in SDN rules and controllers; use of SDNs in manufacturing control systems.
Work conducted at GWU and UIUC.
Related publications : [INFOCOM '21, SEC-SDN '20, TDSC '18, RTSS '17, RTN '17, CNS '15, SENT '15]

Completed Research Projects

2016 – 2022 ***Software-Defined Control for Smart Manufacturing Systems***. Developing future manufacturing systems that are resilient and secure based on concepts from software-defined networking.
Work conducted at UIUC in collaboration with Univ. of Michigan and Cornell University.
Related publications : [CASE '19, IEEE S&P '19, ICCPS '18-1]

2016 – 2020 ***Advanced Cyberescurity Platforms for Distributed Energy Resources***. Developing methods for detecting anomalous behaviors in (and preventing harm to) distributed energy resources such as pluggable electric vehicles (PEVs), solar farms and smart buildings.
Work conducted at UIUC in collaboration with UTRC and PNNL.
Related publications : [SmartGridComm 19, ECRTS '17]

2008 – 2013 ***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. Led to the development of an integrated 'end-to-end" analysis framework that obviates the need for an actual implementation (hardware or software) for performing comprehensive analysis.
Work conducted at UIUC in collaboration with Rockwell Collins.
Related publications : [RTSS '09, DASC '10, TC '12, DAC '12]

2008 – 2011. ***System Integration for Plug-n-Play Medical Devices***. Design of 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, provide generalized QoS guarantees along with auditing abilities. Reduce the effect of medical errors and overall safety of medical devices in hospitals.
Work conducted at UIUC and with Massachusetts General Hospital, Boston.
Related publications : [ICCPS '10-2]

2008 – 2011. ***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. Designers of safety-critical CPS can now use multicore processors.
Work conducted in collaboration with NCSU.
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 and Penn State.
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. Real-time systems can be avail themselves of modern processors with advanced achitectural and power management features.
Continuing work from North Carolina State University.
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.
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 in collaboration with Florida State Univ.
Related publications : [TECS '07, RTSS '05]

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.
Related publications : [RTAS '05, LCTES '04]

Invited and Conference Talks

Feb. 2022	The George Washington University, Washington, Dc. *"The intersection of Security and Resiliency in Modern Cyber-Physical Systems"*. Invited Talk [virtual].
Oct. 2021	Oregon State University, Corvallis, OR. *"Resilient Operating Systems via Code Debloating"*. EECS Tech Talk Tuesdays [virtual].
Apr. 2020	Iowa State University, Ames, IA. *"How Security and Resiliency intersect in Cyber-Physical Systems"*. Invited Talk [virtual].
Mar. 2020	University of Waterloo, Waterloo, Canada. *"How Security and Resiliency intersect in Cyber-Physical Systems"*. Invited Talk [virtual].
Mar. 2020	George Washington University, Washington, DC. *"How Security And Resiliency Intersect in Cyber-Physical Systems"*. Invited Talk.
Feb. 2020	University of Pittsburgh, Pittsburgh, PA. *"How Security and Resiliency intersect in Cyber-Physical Systems"*. Invited Talk.
Feb. 2020	New York University, New York, NY. *"How Security and Resiliency intersect in Cyber-Physical Systems"*. Invited Talk.
Feb. 2020	Oregon State University, Corvallis, OR. *"How Security and Resiliency intersect in Cyber-Physical Systems"*. Invited Talk.
Jan. 2020	University of Colorado, Colorado Springs, CO. *A Novel Side-Channel in Real-Time Cyber-Physical Systems: Attacks and Defenses*. Distinguished Speaker Series.
Jan. 2020	Consumer Electronics Show (CES), Las Vegas, Nevada. *Resiliency and security for UAVs and V2X Systems*. Dept. of Homeland Security (DHS) Speaker Series.
Oct. 2019	University of Texas at Austin, Austin, TX. *Resiliency for Contemporary Operating Systems through Code Debloating*. Invited Talk.
May. 2019	Visa Research, Palo Alto, CA. *Resiliency for Lightweight Cloud Computing Systems through Code Debloating*. Invited Talk.
Apr. 2019	IBM Research, New York. *Resiliency for Lightweight Cloud Computing Systems through Code Debloating*. Invited Talk.
Jan. 2019	Microsoft Research, Bangalore, India. *Security for CPS, IoT and Real-Time Systems*. Invited Talk.
Aug. 2018	Intel Labs, Hillsboro, Oregon. *Security for CPS, IoT and Real-Time Systems*. Invited Talk.
May 2018	Visa Research, San Jose, California. *Timing-Infused Resiliency for Real-Time IoT Systems*. Invited Talk.
Apr. 2018	University of British Columbia (UBC), Vancouver, Canada. *Timing-Infused Resiliency for Cyber-Physical Systems*. Invited Talk.
Mar. 2018	New York University (NYU), New York, New York. *Using Time as a Security Measure in Cyber-Physical Systems*. Invited Talk.
Aug. 2017	Air Force Research Labs (AFRL), Columbus, Ohio. *Integrating Security in Real-Time Cyber-Physical Systems*. Invited Talk.
Nov. 2016	Dagstuhl Seminar on Adaptive Isolation for Predictability and Security, Dagstuhl, Germany. *Bringing Real-Time Systems into a Secure World*. Invited Talk.
Jan. 2016	Indian Institute of Science (IISC), Bangalore, India. *Bringing Real-Time Systems into a Secure World*. Invited Talk.
Dec. 2015	United Technologies Research Center (UTRC), Hartford, CT. *Bringing Real-Time Systems into a Secure World*. Invited Talk.

Aug. 2015	Rockwell Collins Inc., Webinar. *Bringing Real-Time Systems into a Secure World*. Invited Talk.
Jun. 2015	Qualcomm Research Silicon Valley, Santa Clara, CA. *Behavior-based Intrusion Detection for Cyber-Physical Systems with Real-Time Constraints*. Invited Talk.
Apr. 2015	Oregon State University, Corvallis, OR. *Behavior-based Intrusion Detection for Cyber-Physical Systems*. Invited Talk.
Mar. 2015	University of Illinois, Urbana-Champaign. *Integrating Security in Cyber-Physical Systems with Real-Time Constraints*. ITI Trust and Security Seminar Series.
Nov. 2014	University of Washington, Seattle. *Integrating Security in Cyber-Physical Systems with Real-Time Constraints*. Invited Talk.
Aug. 2013	McAfee, Bangalore, India. *Behavior-based Intrusion Detection for Cyber-Physical Systems*. Invited Talk.
Aug. 2013	ABB Research, Bangalore, India. *Behavior-based Intrusion Detection for Cyber-Physical Systems*. Invited Talk.
Aug. 2013	Indian Institute of Science, Bangalore, India. *Behavior-based Intrusion Detection for Cyber-Physical Systems*. Invited Talk.
Apr. 2013	IEEE/ACM Conference on High Confidence Networked Systems (HiCONS). *S3A: Secure System Simplex Architecture for Safety-Critical Supervisory Control Systems*. Philadelphia, PA.
Apr. 2013	UIUC Information Trust Institute. *Behavior-based Intrusion Detection for Cyber-Physical Systems*. Trust and Security Seminar Series.
Jan. 2012	Rockwell Collins Inc., Cedar Rapids IA. *Secure Architectures for Safety-Critical Cyber-Physical Systems*. Invited Talk.
Aug. 2011	Information Trust Institute, UIUC, Urbana. *Secure Architectures for Cyber-Physical Systems*. Invited Talk.
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*.