

Sudipta Chattopadhyay

PERSONAL PARTICULARS

Tel: (+65) 6834-8214

Office: 8 Somapah Road, Singapore University of Technol-
ogy and Design (SUTD), Singapore 485996

E-mail: sudipta_chattopadhyay@sutd.edu.sg

Web: <https://asset-group.github.io/>

RESEARCH INTERESTS

In general, my research seeks to understand the influence of hardware execution platform on critical software properties, such as performance, energy, robustness and security. My expertise covers embedded systems, operating systems, program analysis, software testing and compilers. I am primarily interested in the analysis, verification, debugging and optimization of programs, with a specific focus on its non-functional requirements, such as performance, energy, security and reliability.

EDUCATION

National University of Singapore (NUS)

Jan 2009 - Jan 2013

Ph.D. Computer Science, *Department of Computer Science, NUS School of Computing*

- Thesis title: “Time-predictable Execution of Embedded Software on Multi-core Platforms”
- web: https://sudiptac.bitbucket.io/papers/sudiptac_dissertation.pdf
- Advisor: Professor Abhik Roychoudhury

Indian Institute of Science

July 2005 - July 2007

M.E. Internet Science and Engineering, *Department of Computer Science and Automation, Indian Institute of Science, Bangalore, India*

- GPA: 6.6/8.0
- Thesis title: “Cluster Detection for Efficient Garbage Collection in C#”
- Advisor: Professor Y.N. Srikant

Jadavpur University

Aug 2001 - Jul 2005

Bachelor of Engineering, *Department of Computer Science and Engineering*

- Overall percentage: 85.56, Department rank: 6/57

EMPLOYMENT

Assistant Professor,

**Information Systems Technology and
Design (ISTD) and Singapore University of
Technology and Design (SUTD)**

Singapore

Jan 2017–till date

My duties include the regular duties for a tenure-track assistant professor in a research-intensive university. Apart from research and teaching in computer science, I serve in the undergraduate committee to take part in matters related to undergraduate curriculum development.

Postdoctoral Researcher,

**Center for IT Security, Privacy and
Accountability (CISPA) and Saarland
University**

Saarbrücken

Oct 2015–Dec 2016

Apart from independent research, my duties included supervising bachelor and master thesis students, co-advising PhD students and teaching graduate (or senior undergraduate) level courses.

Postdoctoral Researcher,
Linköping

Linköping University
Oct 2013–Sept 2015

Since my employment, I had explored different ideas for the performance testing and performance debugging of software in complex multi-core systems. Apart from independent research, my duties include supervising bachelor and master thesis students, co-advising PhD students and teaching graduate (or senior undergraduate) level courses.

Research Staff,
Singapore

School of Computing (NUS)
Sep 2012–Sept 2013

I had worked on the testing and verification of extra-functional properties (*e.g.* time and energy) for embedded software.

Research and Development Engineer,
Bangalore, India

Synopsys (NASDAQ: SNPS)
Aug 2007–Dec 2008

I was part of the VCS functional verification group. I worked in the domain of mixed language (VHDL and Verilog) compilation and simulation for VCS-MX verification tool, which is used by major manufacturers designing system-on-a-chip (SoC). In particular, during the major part of my employment, I worked in VCS-MX performance issues for a major design house, which lead to a significant improvement at both compiling and running industry-strength system-on-chip (SoC) modules.

RESEARCH FUNDING

- **Automated Analysis and Validation of Micro-architectural Timing-channel Freedom (Role: PI)**
Funding agency: Ministry of Education (MOE), Singapore
Grant amount: 540,000 SGD
The goal of this project was to develop automated analysis and validation methods to check the presence of timing channels in arbitrary program binaries.
- **Testing and Monitoring Security of Industrial IoT (Role: PI)**
Funding agency: Keysight Technologies
Grant amount: 332,000 SGD
The goal of this project is to develop automated testing methods to discover security methods for industrial IoT devices. The project then proceeds to develop defense mechanisms for the discovered attack scenarios.
- **Securing Embedded Systems against Information Leakage (Role: PI)**
Funding agency: Singapore University of Technology and Design
Grant amount: 100,000 SGD
The goal of this project is to secure low-end embedded systems against information leakage, with a specific focus on leakage via side channels.
- **A Self-reconfigurable Class of Maintenance Robots (Role: co-PI)**
Funding agency: National Research Foundation (NRF), Singapore
Grant amount: 4,728,000 SGD
My goal in this project is to verify the safety and security properties for single as well as a swarm of robots.

PUBLICATIONS

SUMMARY:

- Publications where I am the corresponding and the main author are labeled with “***”.
- Publications where I have supervised students/postdocs are labeled with “++”.
- Virtually, for all papers, I have made significant contributions to the research, discussions and the writing. In particular, I am the corresponding and the main author of the following

papers: [TECS-journal-19], [TCAD-journal-18] [TECS-journal-14a], [TECS-journal-14b], [RTS-journal-13] [TACAS-17], [MEMOCODE-17], [SPIN-15], [EMSOFT-14], [LCTES-13], [RTAS-12], [RTSS-11b], [LCTES-11], [SCOPES-10], [RTSS-09] and the book [FnTEDA-14]

- These papers that have resulted from students/postdocs whom I have supervised: [DATE-19], [DAC-18], [ASE-18], [DSD-18], [ESSoS-18], [EMSOFT-WiP-18], [CODES/ISSS - WiP-18], [ICSTW-17], [JSA-journal-16], [FSE-14], [RTSS-13a], [RTSS-13b], [RTAS-13], [ADCOM-16]
- Overall, I have co-authored papers with researchers from more than 6 different internationally renowned institutes and currently, I collaborate with 4 internationally renowned research institute and one industrial partner (General Motors Research: <http://www.gm.com>).
- Note that the tradition of publication in Computer Science, and my field in particular, is mainly to publish full papers in peer-reviewed conference proceedings. ASE, FSE, RTAS, RTSS, ECRTS, DAC, TACAS and EMSOFT are fiercely competitive and widely accepted as the top tier conferences in our field, whereas SPIN, LCTES, ESSoS, DSD and SCOPES are considered to be among the reputed venues. Top-tier conferences have a typical acceptance rate around 20% and often lower than for the corresponding journals. For all conferences I have published, each paper is reviewed by atleast 3 reviewers, and acceptance of papers is decided at PC-meetings after discussion based on reviews for each paper.

AUTHOR ORDERING:

Our research community *does not follow* alphabetical author listing. In general, the ordering of authors is according to the level of contribution in the paper.

PUBLIC PROFILE:

- DBLP: http://dblp.uni-trier.de/pers/hd/c/Chattopadhyay_0001:Sudipta.html
- Google Scholar: <https://scholar.google.de/citations?hl=en&user=ngOBIZAAAAAJ>
- Personal Web: <https://asset-group.github.io/publications.html>

LIST OF PUBLICATIONS:

International journals (Peer-reviewed)

- (**) [TECS-journal-19] **Sudipta Chattopadhyay**, Moritz Beck, Ahmed Rezine and Andreas Zeller. *Quantifying the Information Leakage in Cache Attacks via Symbolic Execution*. ACM Transactions on Embedded Computing Systems, 2019
(Special issue for the selected papers from MEMOCODE 2017)
- (**) [TCAD-journal-18] **Sudipta Chattopadhyay** and Abhik Roychoudhury. *Symbolic Verification of Cache Side-channel Freedom*. IEEE Transactions on Computer-aided Design of Circuits and Systems (TCAD), 2018
(Also presented in the International Conference on Embedded Software, EMSOFT 2018, held as part of Embedded Systems Week)
- (++) [JSA-journal-16] Adrian Horga, **Sudipta Chattopadhyay**, Petru Eles and Zebo Peng. *Systematic Detection of Memory-related Bottlenecks in GPGPU Programs*. Elsevier Journal of System Architecture, **(accepted with revision)**

- (**) [TECS-journal-14a] **Sudipta Chattopadhyay** and Abhik Roychoudhury. *Cache Related Preemption Delay Analysis for Multi-level Non-inclusive Caches*. ACM Transactions on Embedded Computing Systems, 13(5s): 147:1-147:29, 2014
- (**) [TECS-journal-14b] **Sudipta Chattopadhyay**, Lee Kee Chong, Abhik Roychoudhury, Timon Kelter, Peter Marwedel and Heiko Falk. *A Unified WCET Analysis Framework for Multi-core Platforms*. ACM Transactions on Embedded Computing Systems, 13(4s): 124:1-124:29, 2014
(Special issue for the selected papers from RTAS 2012)
- [RTS-journal-14] Timon Kelter, Heiko Falk, Peter Marwedel, **Sudipta Chattopadhyay** and Abhik Roychoudhury. *Static analysis of multi-core TDMA resource arbitration delays*. Springer Real-time Systems Journal, 50(2):185-229, 2014
(Expanded version of our ECRTS 2011 paper)
- (**) [RTS-journal-13] **Sudipta Chattopadhyay** and Abhik Roychoudhury. *Scalable and Precise Refinement of Cache Timing Analysis via Path-sensitive Verification*. Springer Real-time Systems Journal, 49(4):517-562, 2013
(Special issue for the selected papers from RTSS 2011)

Reviewed international conferences

- (++) [DATE-19] Arian Maghazeh, **Sudipta Chattopadhyay**, Petru Eles and Zebo Peng. *Cache-aware Kernel Tiling: An Approach for System-level Performance Optimization of GPU-based Applications..* Design, Automation and Test in Europe Conference and Exhibition, (DATE), 2019.
- (++) [DAC-18] Chundong Wang and **Sudipta Chattopadhyay**. *LAWN: boosting the performance of NVMM file system through reducing write amplification*. Design Automation Conference (DAC), 2018:6:1-6:6.
- (++) [ASE-18] Sakshi Udeshi, Pryanshu Arora and **Sudipta Chattopadhyay**. *Automated Directed Fairness Testing*. 33rd International Conference on Automated Software Engineering (ASE), 2018:98-108.
- (++) [DSD-18] Adrian Horga, **Sudipta Chattopadhyay**, Petru Eles and Zebo Peng. *Measurement Based Execution Time Analysis of GPGPU Programs via SE+GA*. 21st Euromicro Conference on Digital System Design (DSD), 2018:30-37.
- (++) [ESSoS-18] Eyasu Getahun Chekole, **Sudipta Chattopadhyay**, Martn Ochoa and Huaqun Guo. *Enforcing Full-Stack Memory-Safety in Cyber-Physical Systems*. 10th International Symposium on Engineering Secure Software and Systems (ESSoS), 2018:9-26.
- (**) [MEMOCODE-17] **Sudipta Chattopadhyay**, Moritz Beck, Ahmed Rezine and Andreas Zeller. *Quantifying the Information Leak in Cache Attacks via Symbolic Execution*. 15th ACM-IEEE International Conference on Formal Methods and Models for System Design, MEMOCODE, 2017: 25-35
(Selected as best papers and invited to a special issue of ACM Transactions on Embedded Computing Systems)
- [ESEC-FSE17] Marcel Boehme, Ezekiel O. Soremekun, **Sudipta Chattopadhyay**, Emaurho Ugherughe, and Andreas Zeller. *Where is the bug and how is it fixed? an experiment with practitioners..* 11th Joint Meeting on Foundations of Software Engineering, (ESEC/FSE), 2017: 117-128

- (**) [TACAS-17] **Sudipta Chattopadhyay**. *Directed Automated Memory Performance Testing*. 23rd International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS), 2017: 38-55.
- [ASP-DAC-16] Ke Jiang, Petru Eles, Zebo Peng, **Sudipta Chattopadhyay** and Lejla Batina. *SPARTA: A Scheduling Policy for Thwarting Differential Power Analysis Attacks*. 21st Asia and South Pacific Design Automation Conference (ASP-DAC), 2016: 667-672.
- (**) [SPIN-15] **Sudipta Chattopadhyay**. *MESS: Memory Performance Debugging on Embedded Multi-core Systems*. 22nd International SPIN Symposium on Model Checking of Software (SPIN), 2015: 105-125.
- (**) [EMSOFT-14] **Sudipta Chattopadhyay**, Petru Eles and Zebo Peng. *Automated Software Testing of Memory Performance in Embedded GPUs*. 14th International Conference on Embedded Software (EMSOFT), 2014: 17:1-17:10.
- (++) [FSE-14] Abhijeet Banerjee, Lee Kee Chong, **Sudipta Chattopadhyay** and Abhik Roychoudhury. *Detecting Energy Bugs and Hotspots in Mobile Apps*. 22nd ACM SIGSOFT International Symposium on the Foundations of Software Engineering (FSE), 2014:588-598.
(A patent has been published for the invention)
- (++) [RTSS-13a] Abhijeet Banerjee, **Sudipta Chattopadhyay** and Abhik Roychoudhury. *Static Analysis Driven Cache Performance Testing*. 34th IEEE Real-time System Symposium (RTSS), 2013:319-329.
(Nominated for the best paper award)
(Invited for special issue in Real-time Systems Journal)
- (++) [RTSS-13b] Lee Kee Chong, Clément Ballabriga, Van-Thuan Pham, **Sudipta Chattopadhyay** and Abhik Roychoudhury. *Integrated Timing Analysis of Application and Operating Systems Code*. 34th IEEE Real-time System Symposium (RTSS), 2013:128-139.
- (**) [LCTES-13] **Sudipta Chattopadhyay**, Lee Kee Chong and Abhik Roychoudhury. *Program Performance Spectrum*. 14th ACM SIGPLAN/SIGBED Conference on Languages, Compilers, Tools and Theory for Embedded Systems (LCTES), 2013:65-76.
- (++) [RTAS-13] Abhijeet Banerjee, **Sudipta Chattopadhyay** and Abhik Roychoudhury. *Precise Micro-architectural modeling for WCET analysis via AI+SAT*. 19th IEEE Real-time and Embedded Technology and Applications Symposium (RTAS), 2013:87-96.
- (**) [RTAS-12] **Sudipta Chattopadhyay**, Lee Kee Chong, Abhik Roychoudhury, Timon Kelter, Peter Marwedel and Heiko Falk. *A Unified WCET Analysis Framework for Multi-core Platforms*. 18th IEEE Real-time and Embedded Technology and Applications Symposium (RTAS), 2012:99-108.
(Selected as best papers and invited to a special issue of ACM Transactions on Embedded Computing Systems)
- [RTSS-11a] Bernard Blackham, Yao Shi, **Sudipta Chattopadhyay**, Abhik Roychoudhury and Gernot Heiser *Timing Analysis of a Protected Operating System Kernel*. 32nd IEEE Real-time System Symposium (RTSS), 2011:339-348.
- (**) [RTSS-11b] **Sudipta Chattopadhyay** and Abhik Roychoudhury. *Scalable and Precise Refinement of Cache Timing Analysis via Model Checking*. IEEE Real-time Systems Symposium (RTSS), 2011:193-203.
(Nominated for the best paper award)
(Invited for special issue in Real-time Systems Journal)
- [ECRTS-11] Timon Kelter, Heiko Falk, Peter Marwedel, **Sudipta Chattopadhyay** and Abhik Roychoudhury *Bus-aware Multicore WCET Analysis through TDMA Offset Bounds*. 23rd Euromicro Conference on Real-time Systems (ECRTS), 2011:3-12.
- (**) [LCTES-11] **Sudipta Chattopadhyay** and Abhik Roychoudhury. *Static Bus Schedule aware Scratchpad Allocation in Multiprocessors*. 12th ACM SIGPLAN/SIGBED Conference on Languages, Compilers, Tools and Theory for Embedded Systems (LCTES), 2011:11-20.

- (**) [SCOPES-10] **Sudipta Chattopadhyay**, Abhik Roychoudhury and Tulika Mitra. *Modeling Shared Cache and Bus in Multi-core Platforms for Timing Analysis*. 13th International Workshop on Software and Compilers for Embedded Systems (SCOPES), 2010: 6:1-6:10.
- (**) [RTSS-09] **Sudipta Chattopadhyay** and Abhik Roychoudhury. *Unified Cache Modeling for WCET Analysis and Layout Optimizations*. IEEE Real-time Systems Symposium (RTSS), 2009:47-56.

Workshop and Short Papers

- (++) [EMSOFT-WiP-18] Tanya Srivastava, Pryanishu Arora, Chundong Wang and **Sudipta Chattopadhyay**. *Work-in-Progress: Road Context-aware Intrusion Detection System for Autonomous Cars..* Proceedings of the International Conference on Embedded Software (EMSOFT), 2018.
- (++) [CODES/ISSS-WiP-18] Stefano Spellini, Michele Lora, **Sudipta Chattopadhyay** and Franco Fummi. *Work-in-Progress: Introducing Assume-Guarantee Contracts for Verifying Robotic Applications..* Proceedings of the International Conference on Hardware/Software Codesign and System Synthesis (CODES+ISSS), 2018.
- (++) [ICSTW-17] Tiyash Basu and **Sudipta Chattopadhyay**. *Testing Cache Side-channel Leakage..* IEEE International Conference on Software Testing, Verification and Validation Workshops (ICSTW), 2017: 51-60.
Best Paper Award and invited to a special issue of Software Testing, Verification and Reliability journal (STVR)

Books and book chapters (Peer-reviewed)

- (**) [FnTEDA-14] **Sudipta Chattopadhyay**, Abhik Roychoudhury, Jakob Rosén, Petru Eles and Zebo Peng. *Time-Predictable Embedded Software on Multi-Core Platforms: Analysis and Optimization*. Foundations and Trends in Electronic Design Automation, 8(3-4):199-356, 2014, ISBN: 978-1-60198-794-5, now publishers, <http://www.nowpublishers.com/>
(This is a monograph discussing advances in the area)
- (++) [ADCOM-16] Abhijeet Banerjee, **Sudipta Chattopadhyay** and Abhik Roychoudhury. *On Testing Embedded Software*. Advances in Computers, Elsevier, Volume 101:121-153, 2016, ISBN: 978-0-12-805158-0,
<http://www.elsevier.com/books/book-series/advances-in-computers>
(This is a survey article describing unique challenges of validating embedded software)

PATENT

Software Productivity Tool To Detect Power Inefficiencies Caused By a Software Program.
PCT/SG2015/050418, published May 6, 2016
with Abhijeet Banerjee, Lee Kee Chong and Abhik Roychoudhury.

OPEN-SOURCE SOFTWARE PROTOTYPES

- **Cache Side-channel Leakage Testing and Debugging:** This tool was developed to test the cache side-channel leakage of program and further to quantify the amount of information leaked via such channel. This is developed on top of KLEE symbolic execution engine. The testing and debugging tools are available here:
<https://bitbucket.org/sudiptac/chalice/src/default/>

<https://bitbucket.org/sudiptac/catapult/src/default/>

Related Major Publications: [TACAS-17], [TECS-journal-19]

- **Chronos for multi-core platforms:** A Worst-case Execution Time (WCET) Analysis tool for multi-core platforms – this tool was developed as part of my PhD dissertation.

Project website: <http://www.comp.nus.edu.sg/~rpembed/chronos-multi-core.html>

Source code: <https://bitbucket.org/sudiptac/multi-core-chronos>

Description: This software was developed as part of my PhD dissertation. The software is distributed open-source and its main purpose is to advance the research in execution-time predictability on multi-core platforms. The software has been developed on top of a stand-alone software **Chronos**: <http://www.comp.nus.edu.sg/~rpembed/chronos/>, which is also distributed open-source and it has been used both in research and teaching, by several research groups worldwide.

The software is developed in C and C++, having more than 10,000 lines of code. I was the primary and major contributor in writing the aforementioned software, along with two other contributors Lee Kee Chong (from National University of Singapore) and Dr. Timon Kelter (from Technical University Dortmund) involved in two different projects.

I believe that the software will have its primary use in research, especially comparing the implemented approaches with new techniques developed for execution-time analysis.

Related Major Publications: [RTAS-12], [TECS-journal-14b], [RTS-journal-14]

- **MESS:** A Memory Performance Checker for Embedded Multi-core Systems.

Tool and Source code: <https://bitbucket.org/sudiptac/mess>

Description: The software targets discovering memory performance bugs in multi-core systems. This is a software implemented within Z3 constraint solver: <https://github.com/Z3Prover/z3> and **simplescalar** simulator: <http://www.simplescalar.com/>. The software is written in C and C++, having more than 1500 lines of code. I was the primary and the only contributor in writing this software.

The software is distributed open-source, primarily targeting advancement of research in performance testing and debugging. In particular, the software provides a baseline to develop techniques, which aim to detect and localize performance bugs in concurrent software.

Related Major Publications: [SPIN-15]

SELECTED TALKS/SEMINAR

- Testing and Quantifying Cache Side-channel Leakage, Nov 2016, TU Munich, Germany (**Invited Talk**).
- Dagstuhl Seminar on Adaptive Isolation for Predictability and Security <http://www.dagstuhl.de/de/programm/kalender/semhp/?semnr=16441>, October 2016.
- Analyzing and Testing Next Generation of Embedded Systems, August 2016, ADSC Research Center, Singapore (**Invited Talk**).
- Analyzing and Testing Next Generation of Embedded Systems, August 2016, Nanyang Technological University, Singapore (**Invited Talk**).
- Analyzing and Testing Next Generation of Embedded Systems, August 2016, Singapore University of Technology and Design, Singapore (**Invited Talk**).
- Analyzing and Testing Next Generation of Embedded Systems, August 2016, Indian Institute of Science, Bangalore, India (**Invited Talk**).
- On Testing Embedded Software for its Performance and Security, *INRIA Grenoble*, May 2016, Rennes, France. (**Invited Talk**)
- On Testing Embedded Software for its Performance and Security, *INRIA Rennes*, April 2016, Rennes, France. (**Invited Talk**)
- On Testing Embedded Software for its Performance and Security, *INRIA Grenoble, SPADES Research Group*, March 2016, Grenoble, France. (**Invited Talk**)

- Understanding Validation for Complex Software Systems, *KTH Royal Institute of Technology, Theoretical Computer Science Group*, November 2015, Stockholm, Sweden. **(Invited Talk)**
- MESS: Memory Performance Debugging on Embedded Multi-core Systems, *22nd International SPIN Symposium on Model Checking of Software (SPIN), 2015*, August 2015, Stellenbosch, South Africa.
- The Curse of Non-functional Software Properties, *Software Engineering Chair, Saarland University*, July 2015, Saarbrücken, Germany **(Invited Talk)**
- Analysis, Testing and Perils of Non-functional Software Properties, *ENTRA (EU FP7) Project Workshop*, May 2015, Málaga, Spain **(Invited Talk)**.
- Automated Software Testing to Discover Energy Inefficiencies in Mobile Apps, *39th CREST Open Workshop on Measuring, Testing and Optimizing Computational Energy Consumption*, February 2015, University College of London, London, United Kingdom **(Invited Talk)**.
- Automated Software Testing of Memory Performance in Embedded GPUs, *14th International Conference on Embedded Software (EMSOFT)*, October 2014, New Delhi, India.
- Performance Validation of Embedded Software, *Ericsson*, February 2014, Linköping, Sweden.
- Program Performance Spectrum, *ACM SIGPLAN/SIGBED Conference on Languages, Compilers, Tools and Theory for Embedded Systems (LCTES)*, June 2013, Seattle, USA.
- Scalable and Precise Refinement of Cache Timing Analysis via Model Checking, *IMPECS Workshop on Program Analysis*, September 2012, Indian Institute of Science, Bangalore, India **(Invited Talk)**.
- A Unified WCET Analysis Framework for Multi-core Platforms, *18th IEEE Real-time and Embedded Technology and Applications Symposium (RTAS)*, April 2012, Beijing, China.
- Scalable and Precise Refinement of Cache Timing Analysis via Model Checking, *32nd IEEE Real-time System Symposium (RTSS)*, December 2011, Vienna, Austria.
- Static Bus Schedule aware Scratchpad Allocation in Multiprocessors, *ACM SIGPLAN/SIGBED Conference on Languages, Compilers, Tools and Theory for Embedded Systems (LCTES)*, April 2011, Chicago, USA.
- Modeling Shared Cache and Bus in Multi-core Platforms for Timing Analysis, *13th International Workshop on Software and Compilers for Embedded Systems (SCOPES)*, June 2010, St. Goar, Germany.

HONORS AND AWARDS

- Our recent work on detecting Spectre vulnerabilities (<https://arxiv.org/abs/1807.05843>) featured in the register UK news: https://www.theregister.co.uk/2018/07/17/spectre_protectors/
- Selected best papers, International Conference on Formal Methods and Models for System Design (MEMOCODE), 2017.
- Best paper award, International Conference on Software Testing, Validation and Verification Workshop (ICSTW), 2017.
- Best paper award Nomination, IEEE Real-time System Symposium, 2013.
- Best paper award Nomination, IEEE Real-time System Symposium, 2011.
- The paper titled “Scalable and Precise Refinement of Cache Timing Analysis via Model Checking” was invited for the special issue of Springer Real-time Systems (RTS) Journal.
- The paper titled “A Unified WCET Analysis Framework for Multi-core Platforms” was invited for the special issue of ACM Transaction on Embedded Computing Systems (TECS).
- The paper titled “Static Analysis Driven Cache Performance Testing” was invited for the special issue of Springer Real-time Systems (RTS) Journal. **(declined the invitation)**

- Our work on execution-time analysis for multi-core platforms was invited to be showcased in Design Automation and Test in Europe (DATE) conference 2012.
- Invited by Prof. Radu Marculescu: <http://www.ece.cmu.edu/~sld>, Editor-in-Chief of Foundation and Trends in Electronic Design Automation (FnTEDA), to write a book on execution-time predictability for multi-core platforms.
- National University of Singapore (NUS) Presidential Graduate Fellowship (2009 - 2012).
- Research Achievement Award for outstanding research performance in the academic year 2009-2010.
- Dean's Graduate Research Excellence Award for significant research achievements during PhD.
- CUGS (Swedish Graduate School in Computer Science) Post-doctoral Fellowship for an invited researcher in Linköping University, Sweden.
- Microsoft Research Asia Fellowship Finalist, 2010.
- Awarded twice in Synopsys for providing in-depth analysis and rectifying performance issues for a major design house.

SERVICE

University

- Member of undergraduate committee
- Member of Capstone committee to scope final year undergraduate projects
- Member of undergraduate admission interview board

Program Committee

- IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS), 2019
- Innovation in Software Engineering Conference (ISEC), 2019
- IEEE/IFIP Workshop on Security for Emerging Distributed Network Technologies (DISSECT), 2019
- 19th Asia and South Pacific Design Automation Conference (ASP-DAC), 2014, 2019
- ACM Cyber-Physical System Security Workshop (CPSS) 2018
- Design Automation and Test in Europe (DATE), 2018
- International Conference on Formal Methods and Models for System Design (MEMOCODE), 2017
- IEEE Real-time System Symposium (RTSS), 2017, 2018
- 17th International Conference on Embedded Software (EMSOFT), 2016, 2017
- 27th International Conference on VLSI Design (VLSID), 2014
- 9th Junior Researcher Workshop on Real-Time Computing (JRWRTC 2015)

Review Board

IEEE Transactions on Software Engineering (TSE)

External Review Committee

- 14th International Conference on Embedded Software (EMSOFT), 2014
- Design Automation Conference, 2014, 2015, 2016

Book Review

- Springer Handbook of Hardware/Software Codesign

Journal Review (selected)

- ACM Transactions on Compiler Optimizations (TACO)
- Concurrency and Computations: Practice and Experience (CPE)
- Journal of Software Practice and Experience (SPE)
- Journal of System Architecture (JSA)
- Journal of Software Testing, Verification and Reliability (STVR)
- IEEE Transaction of Software Engineering (TSE)
- IEEE Transaction on Computers (TC)
- Springer Real-time Systems Journal (RTS)
- Springer Design Automation for Embedded Systems (DAES)
- IEEE Computer Architecture Letters (CAL)
- ACM Transactions on Design Automation of Electronic Systems (TODAES)
- IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems (TCAD)

TEACHING EXPERIENCE

Singapore University of Technology and Design

Foundations of Distributed Autonomous Systems

May, 2018-Aug, 2018

Role: *Lecturer and examiner*

Number of lecturers and examiners: One (1)

Singapore University of Technology and Design

Elements of Software Construction

Jan, 2018-Apr, 2018

Role: *Lecturer and examiner*

Number of lecturers and examiners: Two (2)

Singapore University of Technology and Design

Elements of Software Construction

Jan, 2017-Apr, 2017

Role: *Lecturer and examiner*

Number of lecturers and examiners: Two (2)

Saarland University

Analyzing and Testing Non-functional Software Properties

Nov, 2015-Feb, 2016

Course webpage: <https://www.st.cs.uni-saarland.de/edu/nfswprop/2015/>

Role: *Organizer and examiner*

(I have proposed and designed this course. This course was offered by the Software Engineering Chair at Saarland University)

Course evaluation: <http://www.st.cs.uni-saarland.de/~sudiptac/teaching/ws15.pdf>

(Lecturer Grade: 1.66, Overall Grade: 2.23 – Best possible 1.0, Worst possible 5.0)

Saarland University

Software Engineering

Nov, 2015-Feb, 2016

Course webpage: <https://www.st.cs.uni-saarland.de/edu/se/2015/index.php>

Role: *Guest Lecturer*

(This course was offered by the Software Engineering Chair at Saarland University)

(Lecturer Grade: 1.6, Overall Grade: 2.05 – Best possible 1.0, Worst possible 5.0)

Linköping University

Introduction to Performance Validation of Embedded Software

Sept-Oct, 2014

Course webpage: <http://www.ida.liu.se/~sudch88/RA/teaching.html>

Role: *Lecturer and Examiner*

(I have proposed and designed this course. This course was offered in the Swedish National Graduate School on Computer Science).

Linköping University

Advanced Compiler Construction

Sept-Oct, 2014

Course webpage: <http://www.ida.liu.se/~chrke/courses/ACC/ACC.shtml>

Role: *Guest Lecturer*

(offered in the Swedish National Graduate School on Computer Science)

Linköping University

Computer Architecture

Nov-Dec, 2014

Role: *Teaching Assistant* (grading, conducting tutorials)

Linköping University

Operating Systems

Jan-Feb, 2015

Role: *Co-lecturer and examiner*

National University of Singapore

CS4271 Critical system and their verification

2010 - 2012

Role: *Teaching Assistant* (preparing lab assignments, grading, giving tutorials)

POSTDOC
SUPERVISION

- Chundong Wang (PhD from National University of Singapore, sole supervision).
- Unnikrishnan Cheramangalath (PhD from Indian Institute of Science, sole supervision).
- Michele Lora (PhD from University of Verona, sole supervision).

STUDENT
SUPERVISION

Current:

- Sakshi Udeshi: Validation and Verification of AI-based Systems (Phd student, SUTD, sole supervision).
- Yee Ching Tok: Security Certification of IoTs (Phd student, SUTD, sole supervision).
- Eyasu Getahun Chekole: Memory-safety Attack Detection and Mitigation in CPS (Phd student, SUTD, sole supervision).
- Xingbin Jiang: Attack vectors and attack detection in Industrial IoTs (Research assistant, SUTD, sole supervision).
- Rohini Poolat: Robotics Security (Research assistant, SUTD, sole supervision).
- Muhammad Baqer: Secure Software Update for IoTs (Research assistant, SUTD, sole supervision).

- Amit Behal: Verification of Robotics Safety Properties (Visiting PhD student, IIT Ropar, sole supervision).
- Jingxuan Jiang: Context-aware Intrusion Detection in Autonomous Cars (Visiting Masters student, Shandong University, sole supervision).
- Gunawaran Brihadiswaran: Fast File Systems in Non-volatile Memory (Visiting UG student, University of Moratuwa, sole supervision).
- Adrian Horga: Detecting and localizing performance bugs in concurrent programs (Phd student, Linköping University, co-supervision, co-supervision percentage: 33%).

Past Mentoring:

- Kartik Aggarwal: Cache side-channel leakage testing (Visiting UG Student, BITS Pilani, sole-supervision).
- Rishabh Singhal: Verification of Robotics Safety Properties (Visiting UG Student, IIT Ropar, sole-supervision).
- Mehak Aggarwal: Detecting Spectre Vulnerabilities (Visiting UG Student, IIT Delhi, sole-supervision).
- Tanya Srivastav: Context-aware Intrusion Detection in Autonomous Cars (Visiting UG Student, BITS Pilani, sole-supervision).
- Pryanhu Arora: Fairness Testing (Visiting UG Student, BITS Pilani, sole-supervision).
- Ezekiel Soremekun: Towards New Approaches for Explicit and Automated Program Debugging (Phd student, Saarland University, co-supervision, co-supervision percentage: 33%).
- Emamurho Juliet Ugherughe: Towards New Approaches for Explicit Program Debugging (Master student, Saarland University, co-supervision, co-supervision percentage: 50%).
- Hema Sekhar Reddy Rajula: Test Oracles for Bioinformatics and Genomic Software (Master student, Saarland University, sole supervision).
- Waqas Durrani: Testing Genomic Software (Master student, Saarland University, sole supervision).
- Ahmad Taie: Learning Correlation between Secrets and Side-channel Observations (Master student, Saarland University, sole supervision).
- Tiyash Basu: Coverage Directed Test Generation to Detect Cache Side Channels (Master student, Saarland University, sole supervision).
- Satabdi Ganguli: Test Input Generation to Detect Software Performance Bugs in Modern Execution Platforms (Master student, Saarland University, sole supervision).
- Joris Nix: Automatically Generating Oracles to Detect Performance Bugs (Bachelor student, Saarland University, sole supervision).
- Moritz Beck: Provably correct translation of binary code to LLVM code, with application to detect side-channel attacks (Bachelor student, Saarland University, sole supervision).
- Jonas Holl: Schedule generation to expose worst-case execution time in multi-threaded applications (Bachelor student, Saarland University, sole supervision).
- Julian Sehner: Test input generation to discover worst-case memory consumption (Bachelor student, Saarland University, co-supervision, co-supervision percentage: 50%).
- Simon Lindgren: Building and Testing an Embedded Linux System (Industrial masters' student, Linköping University, co-supervision, co-supervision percentage: 50%).
- Niketan Chandra Muthegowda: Exposing concurrency bugs with probabilistic guarantee (Masters' student, Linköping University, co-supervision, co-supervision percentage: 50%).
- Lee Kee Chong: Worst-case Execution Time Analysis on Multi-core Platforms (Bachelor student, National University of Singapore, May, 2011 - Sept, 2011)

- Abhijeet Banerjee: Static Analysis Driven Performance and Energy Testing (PhD student, National University of Singapore, Jan, 2012 - Sept, 2013)
(Received Research Achievement Award, National University of Singapore)
(Received Research Excellence Award, National University of Singapore)
- Lee Kee Chong: Execution Time Analysis in the Presence of Supervisory Software (Master student, National University of Singapore)
- Anders Lingfors: DoIP implementation in Android (Industrial masters' student, Linköping University, co-supervision, co-supervision percentage: 50%).
- Yunsheng Kong: Assessing the feasibility of cache side-channel attacks (Masters' student, Linköping University, co-supervision, co-supervision percentage: 50%).
- Viktor Lövgren: Reducing Regression Testing Feedback Cycle Times through Improved Testing Techniques (Industrial masters' student, Linköping University, co-supervision, co-supervision percentage: 50%).
(Awarded best thesis of the year of 2014)

REFERENCES

Available upon request.