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Professor
Department of Computer Science
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Research Interests

- Software Testing and Analysis, Software Security, Trustworthy Systems.

Education

- Ph.D. in Computer Science, State University of New York at Stony Brook, 2000.
    - PhD Thesis: Program Transformations for Verifying Parameterized Systems.

Employment National University of Singapore, School of Computing, since 2001.

- Provost's Chair Professor (2020 – now).
- Professor, Computer Science Department (2014 - now).
- Associate Professor, Computer Science Department (2007-2014).
- Assistant Professor, Computer Science Department (2001-2007).

Current Research Projects

- Fuzz Testing, Lead PI, 2023-27, NRF National Cybersecurity R&D, SGD ~6.7M.
- Automated Program Repair, Lead PI, 2022-27, Ministry of Education Tier 3 grant, SGD ~7.5M.
- Descartes: Intelligent Modeling for Decision-Making in Critical Urban Systems, 2021-26. CREATE program with CNRS, Co-director, funded by NRF, SGD 25M.
- Software Recovery using Semantic Program Repair, Lead PI, DSO Labs, 2020-23, SGD 1.8 M.
- National Satellite of Excellence on Trustworthy Software Systems, Lead PI, 2019-23, SGD 12M.

Selected Publications

- SemFix: Program Repair via Semantic Analysis, by HDT Nguyen, D Qi, A Roychoudhury, S Chandra, ICSE 2013.
- Angelix: Scalable Multi-line Program Patch Synthesis via Symbolic Analysis, by S Mechtaev, J Yi and A Roychoudhury, ICSE 2016.
- Coverage-based Greybox Fuzzing as Markov Chain, by M Böhme, VT Pham, A Roychoudhury, CCS 2016.
- Automated Repair of Programs from Large Language Models, Z Fan, X Gao, M Mirchev, A Roychoudhury, S H Tan, ICSE 2023.
- Automated Program Repair, *Review article* by C Le Goues, M Pradel and A Roychoudhury, Communications of the ACM, December 2019.

Recent Awards (Selected)

- ICSE 2023 Most Influential Paper Award for ICSE 2013 paper "SemFix: Program Repair via Semantic Analysis". This a test-of-time award for one paper published 10 years ago.
- IEEE TCSE New Directions Award 2022 (awarded jointly with Cristian Cadar) for contributions to symbolic execution.
- Best paper or Distinguished Paper Award from several top conferences, most recently ASE 2022.

Translational Impact

- [AFLFast](#) and AFLGo as extended grey-box fuzzing tools, for detecting program vulnerabilities. AFLFast has been integrated to the AFL distribution. AFL is a popular security testing tool.
- [Angelix](#) tool for automated repair of C programs using symbolic execution, has been used for intelligent tutoring systems to teach programming (intelligent tutoring system) to large cross-sections of students in India and Malaysia, in coordination with IIT Kanpur and Monash Malaysia.
- [Corebench](#), a benchmark suite of realistic regression errors has been widely used by the software engineering community for studying real-life complex regression errors.
- Set up Singapore Cybersecurity Consortium in 2016, the first industry Consortium in Computer Science in Singapore, consisting of 25 companies collaborating with academia in cyber-security.

Conference / Journal Leadership Roles

- Program Co-Chair, International Conference on Software Engineering (ICSE) 2024.
- General Chair ACM SIGSOFT Foundations of Software Engineering (FSE) 2022.
- Program Chair Intl Symposium on Software Testing and Analysis (ISSTA) 2016.
- Associate Editor, IEEE Transactions on Software Engineering, 2014-18.
- Associate Editor, IEEE Transactions on Dependable and Secure Computing, 2019-23.
- Associate Editor, ACM Transactions on Software Engineering and Methodology, current.
- Associate Editor, Communications of the ACM (Contributed Articles / Reviews), from 2023.
- Co-chair, Communications of ACM Special Section on East Asia and Oceania, April 2020.
- Co-chair Dagstuhl Seminar on Program Repair 2017, Shonan Meeting on Fuzzing and Symbolic Execution, 2019.

Teaching   Introduced / taught several courses at NUS, authored a textbook on software validation.

- [*Introduced*] Foundations of Software Engineering: Teaching of foundations and project on intelligent tutoring system with the goal of deploying for teaching programming. Intelligent tutoring system built in this course has been licensed by other universities for their teaching.
- [*Introduced*] Software Testing: Compare test-driven development with requirements driven development via hands-on projects
- [*Introduced*] Software Security: Introduce fuzzing, hardening and related topics.
- [Taught] Art of Computer Science Research: Course to introduce PhD students to planning of PhD studies, how to choose a topic, how to evaluate contributions of papers
- [*Introduced*] Automated Software Validation: Testing, Verification, Requirements, Self-Healing software systems.
- [*Textbook*] Authored a textbook "Embedded Systems and Software Validation" under Elsevier in 2009. Translated by Tsinghua University Press in 2011-12.

Doctoral Student Placement (Reverse Chronological)

- Xiang Gao, PhD NUS, Associate Professor, Beihang University, CN.
- Sergey Mechtaev, PhD NUS, winner of ACM SIGSOFT Outstanding Doctoral Dissertation Award in 2019, Lecturer (Asst Prof) University College London, UK.
- Shin Hwei Tan, PhD NUS, Associate Professor (Gina Cody Research Chair), Concordia University, CA.
- Van Thuan Pham, PhD NUS, Lecturer (Asst Prof), University of Melbourne, AU.
- Marcel Böhme, PhD NUS, Faculty Member, Max-Planck Institute for Security and Privacy, DE.
- Sudipta Chattopadhyay, PhD NUS, Assistant Professor, Singapore University of Technology and Design (SUTD), SG.
- Lei Ju, PhD NUS, Associate Professor, Shandong University, CN.
- Vivy Suhendra, PhD NUS, Associate Professor of Practice, National University of Singapore, SG.

Professional Service

- [2023 -] Member of SE3 Committee (elected from ICSE Steering committee members), which coordinates the Steering Committees of all the three major software engineering conferences: ICSE, FSE and ASE.
- [2021-26] Co-director in Singapore-France interdisciplinary Collaboration program (25M funding) on using AI to serve complex decision making in smart cities. As co-director, I am responsible for the entire contingent of NUS researchers including 15 professors from Engineering and Computer Science. The program also involves significant collaboration with industry.
- [2021-22] Lead of Task force to study Foundational Research Capabilities in Security and Data Privacy for Singapore (appointed by National Research Foundation). Led a team of researchers from Singapore universities, research institutes and agencies with the goal of planning broad research directions in the area of security and privacy. The effort was conducted over a one-year period Dec 2021 – Dec 2022.
- [2016-22] Director Singapore Cybersecurity Consortium. Initiated and helped to set up a consortium of 25 companies to collaborate with academia and agencies. The work of the Consortium involved training, cyber-camps, awareness and discussions, apart from fostering industry academia collaboration via paired research projects. The Consortium helped set up an engagement platform between academia, industry and agencies.
- [2011-16] Assistant Dean (2011-13) and Vice Dean (2013-16) of Graduate Studies at NUS School of Computing in charge of 500 graduate students (Masters and PhD). Involved in restructuring PhD curriculum (for more research based Qualifying Exam), and restructuring the Masters of Computing in Information Security program with more research project experience.

Other Data

- Singapore Citizen, Married, One son.