Abhik ROYCHOUDHURY

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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 Projects and Initiatives

- 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, 2020-22, SGD 1.8 M.
- National Satellite of Excellence on Trustworthy Software Systems, Lead PI, 2019-23, SGD 12M.
- Trustworthy Systems from Un-trusted Component Amalgamations, Lead PI, funded by National Research Foundation Singapore, 2015 – 2020, SGD 6.1M.
- Self-Healing Software, Funded by Office of Naval Research, USA, PI, 2018-20, USD 120K.

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.

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 to large cross-sections of students in India, in collaboration with Indian Institute of Technology (IIT) Kanpur.
- 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.

Professional Service (Selected)

- Program Co-Chair, International Conference on Software Engineering (ICSE) 2024.
- Chair of Foundational Research Capability in Security and Privacy study from NRF 2021-22.
- 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.

- Foundations of Software Engineering: Teaching of foundations and project on intelligent tutoring system with the goal of deploying for teaching programming.
- Software Testing: Compare test-driven development with requirements driven development via hands-on projects
- Software Security: Introduce fuzzing, hardening and related topics.
- 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
- Automated Software Validation: Testing, Verification, Requirements check, Self-Healing.
- Authored a textbook “Embedded Systems and Software Validation” under Elsevier in 2009. Translated by Tsinghua University Press in 2011-12.

Placement of Doctoral Students (Selected)

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

Other Data: Singapore Citizen, Married, One son.