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Research Interests

My research interest lies in the intersections between Software Engineering,Nature-inspired Artificial Intelligence Algorithms (including genetic algorithm and evolutionary algorithm), and Software Security. Specifically, it includes:

- **Software Engineering:** automated program repair, software testing, mobile app analysis, program synthesis
- **Nature-inspired Artificial Intelligence Algorithms:** genetic improvement, search-based software engineering, self-healing software system
- **Software Security:** finding and fixing security vulnerabilities

Education

National University of Singapore, Singapore
Ph.D., School of Computing, August 2012-March 2018 **CAP: 4.38/5.00**
Thesis Topic: Design of Repair Operators for Automated Program Repair
Adviser: Abhik Roychoudhury

University of Illinois at Urbana-Champaign, Champaign, IL
M.S., Computer Science, May 2012 **GPA: 3.91/4.00**
Thesis Topic: @tComment: Testing Javadoc Comments to Detect Comment-Code Inconsistencies
Advisers: Darko Marinov, Lin Tan
B.S. (Hons), Computer Science, May 2010 **GPA: 3.68/4.00**
Thesis Topic: Theories/Parameterized tests for JUnit
Adviser: Darko Marinov

Grants

- "Research on patch generation algorithm and automated repair system for Android apps", Young Researcher Fund 2019, *National Natural Science Foundation of China*, Grant No. 61902170, $270k
- "Automated Testing and Repair for Android Apps", PI for General Program 2020, *Natural Science Foundation of Guangdong Province*, $100k

Awards and Honors

- Participants of Heidelberg Laureate Forum 2019, Nominated by Joseph Sifakis
- SIGSOFT Caps for attending ASE 2019
- Finalist for Human Competitive Awards @ GECCO 2018
- Dean's Graduate Research Excellence Award (2016)
- Google Anita Borg Memorial Scholarship (2015) for encouraging female presence in computing and technology.
- Research Achievement Award (2015)
- David J. Kuck Outstanding MS Thesis Award (2013)
- Singapore International Graduate Award (2012-2015)
- ACM-W Scholarship (2012) for attendance of conference for female researchers
- Malaysian Government Scholarship (2006-2010)
- Rockwell Collins Scholarship (2009)
- Motorola Academic Scholarship (2008)

Services

- Founder and Advisor for Women in Engineering in SUSTech
- Maintainer of a blog, https://cstrigirls.blogspot.sg/ , that focuses on giving academic

advice to female computing students in Asia-Pacific countries.
- Mentor in Women in Engineering in University of Illinois at Urbana-Champaign
- ACM Student Research Competition @ICSE 2019
    - My student won bronze metal in the competition
- Coach for National Student Contest for Software Testing Competition in China
    - My student won first prize in the contest

Conference Publications

1. S. H. Tan, Z. Li. ,*Collaborative Bug Finding for Android Apps*. In: International Conference on Software Engineering (ICSE 2020). Accepted.
2. M. Wu, L. Zhang, C. Liu, S. H. Tan, Y. Zhang. *Automating CUDA Synchronization via Program Transformation* In: Automated Software Engineering (ASE 2019), Nov 2019. (acceptance: 20.9%)
3. Y. Wang, M. Wen, R. Wu, Z. Liu, S.H. Tan, Z. Zhu, H. Yu and S.C Cheung. *Can I Have a Stack Trace to Examine the Dependency Conflict Issue?* In: International Conference on Software Engineering (ICSE 2019), May 2019. (acceptance: 20.6%)
4. X. Gao, S.H. Tan, Z. Dong, and A. Roychoudhury. *Android Testing via Synthetic Symbolic Execution.* In 33rd IEEE/ACM International Conference on Automated Software Engineering (ASE 2018). (acceptance: 19.9%)
5. S. H. Tan, Z. Dong. X. Gao, A. Roychoudhury. *Repairing Crashes in Android Apps*. In: International Conference on Software Engineering (ICSE 2018), May 2018. (acceptance: 20.9%)
6. J. Yi, U.Z. Ahmed, A. Karkare, S.H. Tan, A.Roychoudhury. *A Feasibility Study of Using Automated Program Repair for Introductory Programming Assignments*. In: Foundations of Software Engineering (FSE 2017), Sept 2017. (acceptance: 24.4%)
7. S. H. Tan, H. Yoshida, M. Prasad and A. Roychoudhury. *Anti-patterns in Search-based Program Repair*, In:Foundations of Software Engineering (FSE 2016), Nov 2016 (acceptance: 27.1%)
8. S. H. Tan, A. Roychoudhury. *Relifix: Automated Repair of Software Regressions*. In: International Conference on Software Engineering (ICSE 2015), May 2015 (acceptance: 18.5%)
9. J. Yi, D. Qi, S. H. Tan, A. Roychoudhury. Expressing and Checking Intended Changes via Software Change Contracts. In: International Symposium on Software Testing and Analysis (ISSTA 2013), Lugano, Switzerland, July 2013. (acceptance: 26%)
10. S. H. Tan, D. Marinov, L. Tan, and G. T. Leavens. *@tComment: Testing Javadoc Comments to Detect Comment-Code Inconsistencies*. In: International Conference on Software Testing, Verification, and Validation (ICST 2012), pages 260-269, Montreal, Canada, April 2012. (acceptance: 27%)

Journal Publications

1. S. Mechtaev, X. Gao, S. H. Tan, A. Roychoudhury. *Test-equivalence Analysis for Automatic Patch Generation*. In ACM Transactions on Software Engineering and Methodology (TOSEM), To appear, July 2018
2. J. Yi, S.H. Tan, S. Mechtaev, M. Boehme, A.Roychoudhury. A correlation study between automated program repair and test-suite metrics. In: Empirical Software Journal (EMSE 2018).
3. J. Yi, D. Qi, S. H. Tan, A. Roychoudhury. *Software Change Contracts*. In ACM Transactions on Software Engineering and Methodology (TOSEM), pages 18:1-18:43, May 2015.

Workshop/ Poster Publications

1. B. Baudry, N. Harrand, E. Schulte, C. Timperley, S. H. Tan, M. Selakovic, E. Ugherughe. *A spoonful of DevOps helps the GI go down.* In 4th International Genetic Improvement Workshop, May 2018.
2. S. H. Tan, J. Yi, Yulis, S. Mechtaev, A. Roychoudhury. *Codeflaws: A Programming*

Competition Benchmark for Evaluating Automated Program Repair Tools. In: International Conference on Software Engineering (ICSE 2017 Poster), May 2017.

3. B. Daniel, D. Dig, T. Gvero, V. Jagannath, J. Jiaa, D. Mitchell, J. Nogiec, S. H. Tan, and D. Marinov. *ReAssert: A Tool for Repairing Broken Unit Tests*. In: International Conference on Software Engineering, Demonstrations Track (ICSE Demo 2011), pages 1010-1012, Honolulu, HI, May 2011. (acceptance: 37%)

Patents

- Software program repair, H. Yoshida, S. H. Tan, M. R. Prasad, US20170060735A1

Professional Activities

- International Workshop for Automated Program Repair @ ICSE 2020, Co-Organizer
- ISSTA 2020, Student Volunteer Co-Chair
- FSE 2020, Program Committee
- Genetic Improvement Workshop (GI 2019) @ ICSE 2019, Co-organizer
- International Workshop on Software Engineering Intelligence 2019, PC
- Workshop on Intelligent Bug Fixing @ SANER 2019, PC
- ASE 2019, Configuration and Variability, Session Chair
- Empirical Software Engineering Journal (EMSE), Member of Review Board
- ICSE 2020, Program Committee
- ASE 2019, Program Committee
- ESEC/FSE 2019, Tool Demo Program Committee
- ICSE 2019, PC for Student Research Competition
- IEEE Transactions on Evolutionary Computation 2018, Reviewer
- GECCO 2018, PC for Genetic Improvement Workshop
- ISSTA 2014, Artifact Evaluation Committee
- ICSE 2015 (NIER), Co-reviewer
- Transactions on Software Engineering and Methodology (TOSEM), Reviewer
- Empirical Software Engineering Journal (EMSE), Reviewer
- Transactions on Software Engineering (TSE), Reviewer

Teaching Experience

Southern University of Science and Technology, China

Sole Instructor for *CS 304 Software Engineering* **Feb. 2019 to . June 2019**

- Conducted lectures and labs for 156 students
- Prepared teaching materials for 2 hours weekly lectures and 2 hours weekly labs

Design course project for finding bugs in open-source Android apps

Sole Instructor for *CS 409 Software Testing* **Aug. 2018 to Dec. 2018**

- Proposed the first course in Software Testing in SUSTech
- Designed course syllabus and prepared teaching materials for 29 students
- Designed course project for finding bugs in open-source Android apps

National University of Singapore, Singapore

Teaching Assistant for *CS 4218 Software Testing* **Aug. 2012 to May 2013**

- Designed courses structure and prepared material for first software testing class
- Graded weekly programming homework

University of Illinois at Urbana-Champaign, Champaign, IL

Teaching Assistant for CS242: Programming Studio Laboratory **Aug. 2011 to May 2012**

- Supervised programming assign` ments presentation for 5-6 students per section

Teaching Assistant for CS427: Software Engineering I **Aug. 2010 to May 2011**

Fall 2010 and Fall 2011

- Advised students for course project for Eclipse refactoring engines
- Graded bi-weekly programming assignments for 20 groups of students

Teaching Assistant for CS428: Software Engineering II **Jan. 2010 to Dec. 2011**

Spring 2011

- Provided support for online students through the Illinois Internet Computer Science Program (I2CS)
- Conducted bi-weekly meeting with students for course projects to develop games, mobile applications, websites.

Laboratory Helper for CS 102: Little Bits to Big Ideas **Aug. 2009 to May 2009**

- Assisted non-majors in two consecutive laboratory sessions
- Graded student programming assignments

Invited Talks

Selecting a research topic: Reflection and Lessons from My Research Journey **16 Jul. 2019**
Ada workshop @ISSTA 2019

Repairing crashes in Android apps **24 Nov. 2018**
Program Repair Workshop@NASAC

Repairing crashes in Android apps **17 Nov. 2018**
Chinese Search-based Software Engineering Workshop

Repairing crashes in Android apps **16 Nov. 2018**
Peking University

Repairing crashes in Android apps **22 June 2018**
Wuhan University

Repairing crashes in Android apps **30 Jan. 2018**
GI-Dagstuhl Seminars, Germany

Design of Repair Operators for Automated Program Repair **30 Jan. 2017**
50th CREST Open Workshop, University of College London

Anti-patterns in Search-based Program Repair **20 Sept. 2016**
Microsoft PhD Forum 2016, Microsoft Research Asia, Beijing, China

Conference Talks

Test-equivalence Analysis for Automatic Patch Generation **29 May. 2019**
International Conference on Software Engineering (ICSE) 2019

Anti-patterns in Search-based Program Repair **17 Nov. 2016**
Foundations of Software Engineering (FSE) 2016

Relifix: Automated Repair of Software Regressions **21 May 2015**
International Conference on Software Engineering (ICSE) 2015

@tComment: Testing Javadoc Comments to Detect Comment-Code Inconsistencies **19 April 2012**
International Conference on Software Testing, Verification & Validation (*ICST) 2012*

Work Experience

NUS-Singtel Cyber Security Research and Development Lab, Singapore
Research Assistant **Nov. 2017 to May 2018**
- Developed and invented techniques for automated repair of crashes for Android apps

Fujitsu Laboratories of America, Sunnyvale, CA, USA
Research Intern **Feb. 2015 to May 2015**
- Conducted a study of the common characteristics of automatically generated patches
- Developed techniques for improving search-based automated program repair

Intel Corporation, Penang, Malaysia
Summer Intern for Testing Hole Resolution (THR) **June 2011 to Aug. 2011**
- Developed automation for improving efficiency in running automated tests for CPU caches
- Implemented features and developed error handling for program in Perl and Tcl

Railroad Department, Champaign, IL, USA
Undergraduate Assistant **Aug. 2007 to May. 2009**
- Maintained MS Access database for daily tank car accident reports
- Debugged and programmed using Visual Basic, Ruby, and HTML

Current Students
- Hsu Myat Win - Co-advised with Prof. Yulei Sui (SUSTECH-UTS Joint PhD program)
- Zhiyu Fan - Co-advised with Prof. Abhik Roychoudhury at NUS
- Ziqiang Li - SUSTech Master program 2019
- Xiaowen Zhang - SUSTech Master program 2019

Software Skills
- Computer Programming: Java, Python, C, C++, OCAML
- Version Control: DVCS (Mercurial, Git), and VCS (CVS, SVN)
- Software Testing: Randoop, JUnit, KLEE

Language Skills Fluent in Mandarin, Cantonese, English and Malay

References

Abhik Roychoudhury (thesis advisor)
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