Xiang Gao

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RESEARCH INTEREST

- **Software Engineering**: automated program repair, software testing.

- **Programming Language**: program synthesis, program analysis.

- **Software Security:** vulnerability detection and fix.

EDUCATION

• **National University of Singapore, School of Computing**	Singapore
Ph.D.	*Fall 2016 – Fall 2021*
Advisor: Abhik Roychoudhury	
• **Shandong University, Computer Science**	Shandong, China
Bachelor (Elite class)	*Fall, 2012 – Jun, 2016*
Advisor: Lei Ju	

WORK EXPERIENCE

• **Pre-tenure Associate Professor— Beihang University**	$2022, 01 -$ **now**
School of Software	
• **Postdoctor Researcher— National University of Singapore**	$2021, 04 - 2021, 12$
Conduct research on program transformation.	
• **Research Intern — Microsoft Research**	$2020, 01 - 2020, 06$
Program synthesis to automatically generate edit suggestions in Visual Studio.	
• **Research Intern — Fujitsu Laboratories of American**	$2018, 09 - 2018, 12$
Enhance the robustness of AI models via data augmentation.	
• **System Engineer Intern — Alibaba**	$2015, 07 - 2015, 10$
Use Security Enhanced Android (SEAndroid) to increase Android security.	

RESEARCH PROJECTS

• **Overfitting in Programming-by-Example**: systematically designed a set of techniques, using test generation, symbolic reasoning and semi-supervised approaches, to alleviate overfitting problem in program repair and synthesis. We showed that our approach can fix the bugs detected by OSS-Fuzz. The designed semi-supervised synthesis will be integrated into VS IntelliCode in the near future.

• **Scalable Binary Rewriting**: a static binary rewriting technique that can be scaled to large programs, e.g. Chrome, Firefox. It has collected more than 200 GitHub stars since Apr 2020.

• **Robustness of Deep Neural Network**: a technique based on software engineering approaches that improves the robustness of DNN model. We have a US patent derived from this project and a patent application under-review.

PUBLICATIONS

- **Trust Enhancement Issues in Program Repair**   **ICSE'22**

  A. Yannic Noller, Ridwan Shariffdeen, <u>Xiang Gao</u>, Abhik Roychoudhury   **(CCF-A)**

  ACM/IEEE 42nd International Conference on Software Engineering (ICSE) 2022

- **APIFix: Output-Oriented Program Synthesis for Combating Breaking Changes in Lib.**   **OOPSLA'21**

  <u>X. Gao</u>, A. Radhakrishna, G. Soares, R. Shariffdeen, S. Gulwani, A. Roychoudhury   **(CCF-A)**

  Object-Oriented Programming, Systems, Languages, and Applications, 2021

- **Automated Patch Backporting in Linux (Experience Paper)**   **ISSTA'21**

  R. Shariffdeen*, <u>X. Gao</u>*, G. J. Duck, S. Tan, J. Lawall, A. Roychoudhury (*co-first author)   **(CCF-A)**

  International Symposium on Software Testing and Analysis (ISSTA), 2021

  Distinguished Artifact Award

- **Beyond Tests: Program Vulnerability Repair via Crash Constraint Extraction**   **TOSEM'21**

  <u>Xiang Gao</u>, Bo Wang, Gregory J. Duck, Ruyi Ji, Yingfei Xiong, Abhik Roychoudhury   **(CCF-A)**

  Transactions on Software Engineering and Methodology, 2020

- **Feedback-Driven Semi-Supervised Synthesis of Program Transformations**   **OOPSLA'20**

  <u>X. Gao</u>, S. Barke, A. Radhakrishna, G. Soares, S. Gulwani, A. Leung, N. Nagappan, A. Tiwari   **(CCF-A)**

  Object-Oriented Programming, Systems, Languages, and Applications, 2020

- **Binary Rewriting without Control Flow Recovery**   **PLDI'20**

  Gregory J. Duck, <u>Xiang Gao</u>, Abhik Roychoudhury   **(CCF-A)**

  Programming Language Design and Implementation, 2020.

- **Interactive Patch Generation and Suggestion**   **APR'20**

  <u>Xiang Gao</u>, Abhik Roychoudhury

  Automated Program Repair Workshop @ ICSE, 2020.

- **Fuzz Testing based Data Augmentation to Improve Robustness of Deep Neural Networks**   **ICSE'20**

  <u>Xiang Gao</u>, Ripon K. Saha, Mukul R. Prasad, Abhik Roychoudhury   **(CCF-A)**

  International Conference on Software Engineering, 2020.

- **Crash-avoiding Program Repair**   **ISSTA'19**

  <u>Xiang Gao</u>, Sergey Mechtaev, Abhik Roychoudhury   **(CCF-A)**

  International Symposium on Software Testing and Analysis, 2019.

- **Android Testing via Synthetic Symbolic Execution**   **ASE'18**

  <u>Xiang Gao</u>, Shin Hwei Tan, Zhen Dong, Abhik Roychoudhury   **(CCF-A)**

  International Conference on Automated Software Engineering, 2018.

- **Test-equivalence Analysis for Automatic Patch Generation**   **TOSEM'18**

  Sergey Mechtaev, <u>Xiang Gao</u>, Shin Hwei Tan and Abhik Roychoudhury   **(CCF-A)**

  Transactions on Software Engineering and Methodology, 2018

- **Repairing Crashes in Android Apps** **ICSE'18**

  *Shin Hwei Tan, Zhen Dong, **Xiang Gao**, and Abhik Roychoudhury* **(CCF-A)**

  International Conference on Software Engineering, 2018

- **Write-back aware shared last-level cache management for hybrid main memory** **DAC'16**

  *Deshan Zhang, Lei Ju, Mengying Zhao, **Xiang Gao**, Zhiping Jia* **(CCF-A)**

  Design Automation Conference, 2016

TEACHING

- **CS4218 Software Testing** National University of Singapore

  Teaching assistant, prepare software testing project. $2018, 08 - 2018, 12$

- **CS2100 - Computer Organization** National University of Singapore

  Tutor, conduct tutorial sessions with 70 students for 4 hours per week. $2017, 01 - 2017, 05$

- **CS4211- Formal Methods** National University of Singapore

  Teaching assistant, design courses project. $2017, 08 - 2017, 12$

- **Embedded System** Shandong University

  Lab Tutor. $2016, 03 - 2016, 06$

SELECTED AWARDS

- Dean's Graduate Research Excellence Award, NUS 2019
- Research Achievement Award, NUS 2018
- President's Graduate Fellowship, Singapore $2016 - 2020$