

Ph.D student, National University of Singapore (NUS)

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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. candidate *Fall 2016 – 2021 (estimated)*
Advisor: Abhik Roychoudhury, GPA: 4.7/5 (until now)
- **Shandong University, Computer Science** Shandong, China
Bachelor (Elite class) *Fall, 2012 – Jun, 2016*
Advisor: Lei Ju, GPA: 90.34/100

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

- **APIFix: Output-Oriented Program Synthesis for Combating Breaking Changes in Lib.** OOPSLA'21
X. Gao, A. Radhakrishna, G. Soares, R. Shariffdeen, S. Gulwani, A. Roychoudhury (CCF-A)
Object-Oriented Programming, Systems, Languages, and Applications, 2021 (conditional accept)
- **Automated Patch Backporting in Linux (Experience Paper)** ISSTA'21
R. Shariffdeen, X. Gao*, 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
Xiang Gao, 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**

X. Gao, S. Barke, A. Radhakrishna, G. Soares, S. Gulwani, A. Leung, N. Nagappan, A. Tiwari

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

OOPSLA'20

(CCF-A)
- **Binary Rewriting without Control Flow Recovery**

Gregory J. Duck, **Xiang Gao**, Abhik Roychoudhury

Programming Language Design and Implementation, 2020.

PLDI'20

(CCF-A)
- **Interactive Patch Generation and Suggestion**

Xiang Gao, Abhik Roychoudhury

Automated Program Repair Workshop @ ICSE, 2020.

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

Xiang Gao, Ripon K. Saha, Mukul R. Prasad, Abhik Roychoudhury

International Conference on Software Engineering, 2020.

ICSE'20

(CCF-A)
- **Crash-avoiding Program Repair**

Xiang Gao, Sergey Mechtaev, Abhik Roychoudhury

International Symposium on Software Testing and Analysis, 2019.

ISSTA'19

(CCF-A)
- **Android Testing via Synthetic Symbolic Execution**

Xiang Gao, Shin Hwei Tan, Zhen Dong, Abhik Roychoudhury

International Conference on Automated Software Engineering, 2018.

ASE'18

(CCF-A)
- **Test-equivalence Analysis for Automatic Patch Generation**

Sergey Mechtaev, **Xiang Gao**, Shin Hwei Tan and Abhik Roychoudhury

Transactions on Software Engineering and Methodology, 2018

TOSEM'18

(CCF-A)
- **Repairing Crashes in Android Apps**

Shin Hwei Tan, Zhen Dong, **Xiang Gao**, and Abhik Roychoudhury

International Conference on Software Engineering, 2018

ICSE'18

(CCF-A)
- **Write-back aware shared last-level cache management for hybrid main memory**

Deshan Zhang, Lei Ju, Mengying Zhao, **Xiang Gao**, Zhiping Jia

Design Automation Conference, 2016

DAC'16

(CCF-A)

WORK EXPERIENCE

- **Research Intern — Microsoft Research**

Program synthesis to automatically generate edit suggestions in Visual Studio.

2020, 01 – 2020, 06
- **Research Intern — Fujitsu Laboratories of American**

Enhance the robustness of AI models via data augmentation.

2018, 09 – 2018, 12
- **Research Assistant — National University of Singapore**

Conduct research on dynamic Android program analysis.

2017, 07 – 2017, 12
- **System Engineer Intern — Alibaba**

Use Security Enhanced Android (SEAndroid) to increase Android security.

2015, 07 – 2015, 10

TEACHING

- | | |
|---|---|
| <ul style="list-style-type: none">• CS4218 Software Testing
Teaching assistant, prepare software testing project. | National University of Singapore
2018, 08 – 2018, 12 |
| <ul style="list-style-type: none">• CS2100 - Computer Organization
Tutor, conduct tutorial sessions with 70 students for 4 hours per week. | National University of Singapore
2017, 01 – 2017, 05 |
| <ul style="list-style-type: none">• CS4211- Formal Methods
Teaching assistant, design courses project. | National University of Singapore
2017, 08 – 2017, 12 |
| <ul style="list-style-type: none">• Embedded System
Lab Tutor. | Shandong University
2016, 03 – 2016, 06 |

SELECTED AWARDS

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| • Dean's Graduate Research Excellence Award, NUS | 2019 |
| • Research Achievement Award, NUS | 2018 |
| • President's Graduate Fellowship, Singapore | 2016 – 2020 |

REFERENCES

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| <ul style="list-style-type: none">• Abhik Roychoudhury (thesis advisor)
Provost's Chair Professor
National University of Singapore
abhik@comp.nus.edu.sg | <ul style="list-style-type: none">• Sumit Gulwani
Partner Research Manager
Microsoft, Prose Team
sumitg@microsoft.com |
| <ul style="list-style-type: none">• Nachiappan Nagappan
Partner Researcher
Microsoft Research
nachin@microsoft.com | <ul style="list-style-type: none">• Mukul R Prasad
Director of Research
Fujitsu Laboratories of America, INC
mukul@us.fujitsu.com |