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. 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*

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)*

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*

Transactions on Software Engineering and Methodology, 2020

- **Feedback-Driven Semi-Supervised Synthesis of Program Transformations** **OOPSLA'20**
  ***X. Gao**, S. Barke, A. Radhakrishna, G. Soares, S. Gulwani, A. Leung, N. Nagappan, A. Tiwari*
  Object-Oriented Programming, Systems, Languages, and Applications, 2020
- **Binary Rewriting without Control Flow Recovery** **PLDI'20**
  *Gregory J. Duck, **Xiang Gao**, Abhik Roychoudhury*
  Programming Language Design and Implementation, 2020.
- **Interactive Patch Generation and Suggestion** **APR'20**
  ***Xiang Gao**, Abhik Roychoudhury*
  Automated Program Repair Workshop @ ICSE, 2020.
- **Fuzz Testing based Data Augmentation to Improve Robustness of Deep Neural Networks** **ICSE'20**
  ***Xiang Gao**, Ripon K. Saha, Mukul R. Prasad, Abhik Roychoudhury*
  International Conference on Software Engineering, 2020.
- **Crash-avoiding Program Repair** **ISSTA'19**
  ***Xiang Gao**, Sergey Mechtaev, Abhik Roychoudhury*
  International Symposium on Software Testing and Analysis, 2019.
- **Android Testing via Synthetic Symbolic Execution** **ASE'18**
  ***Xiang Gao,** Shin Hwei Tan, Zhen Dong, Abhik Roychoudhury*
  International Conference on Automated Software Engineering, 2018.
- **Test-equivalence Analysis for Automatic Patch Generation** **TOSEM'18**
  *Sergey Mechtaev, **Xiang Gao**, Shin Hwei Tan and Abhik Roychoudhury*
  Transactions on Software Engineering and Methodology, 2018
- **Repairing Crashes in Android Apps** **ICSE'18**
  *Shin Hwei Tan, Zhen Dong, **Xiang Gao**, and Abhik Roychoudhury*
  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*
  Design Automation Conference, 2016

WORK EXPERIENCE

- **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.
- **Research Assistant — National University of Singapore** 2017, 07 – 2017, 12
  Conduct research on dynamic Android program analysis.
- **System Engineer Intern — Alibaba** 2015, 07 – 2015, 10
  Use Security Enhanced Android (SEAndroid) to increase Android security.

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

REFERENCES

- **Abhik Roychoudhury** (thesis advisor)
  Provost's Chair Professor
  National University of Singapore
  abhik@comp.nus.edu.sg
- **Sumit Gulwani**
  Partner Research Manager
  Microsoft, Prose Team
  sumitg@microsoft.com
- **Nachiappan Nagappan**
  Partner Researcher
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