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

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| **• National University of Singapore, School of Computing**Ph.D. candidateAdvisor: Abhik Roychoudhury, GPA: 4.7/5 (until now) | Singapore*Fall 2016 – 2021 (estimated)* |
| **• Shandong University, Computer Science**Bachelor (Elite class)Advisor: Lei Ju, GPA: 90.34/100 | Shandong, China*Fall, 2012 – Jun, 2016* |

Research Projects

**• Overfitting in Programming-by-Example**:systematicallydesigneda 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

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| **• APIFix: Output-Oriented Program Synthesis for Combating Breaking Changes in Lib.**  ***X. Gao****, A. Radhakrishna, G. Soares, R. Shariffdeen, S. Gulwani, A. Roychoudhury* Object-Oriented Programming, Systems, Languages, and Applications, 2021(conditional accept) | **OOPSLA’21**  **(CCF-A)** |
| **• Automated Patch Backporting in Linux (Experience Paper)**  R. Shariffdeen\*, **X. Gao**\*, G. J. Duck, S. Tan, J. Lawall, A. Roychoudhury (\*co-first author) International Symposium on Software Testing and Analysis (ISSTA), 2021Distinguished Artifact Award | **ISSTA’21**  **(CCF-A)** |
| **• Beyond Tests: Program Vulnerability Repair via Crash Constraint Extraction**  ***Xiang Gao****, Bo Wang, Gregory J. Duck, Ruyi Ji, Yingfei Xiong, Abhik Roychoudhury* Transactions on Software Engineering and Methodology, 2020 | **TOSEM’21**  **(CCF-A)** |
| **• 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

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| • **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

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| **• CS4218 Software Testing**  Teaching assistant, prepare software testing project. | National University of Singapore  2018, 08 – 2018, 12 |
| **• CS2100 - Computer Organization**  Tutor, conduct tutorial sessions with 70 students for 4 hours per week. | National University of Singapore  2017, 01 – 2017, 05 |
| • **CS4211- Formal Methods**  Teaching assistant, design courses project. | National University of Singapore  2017, 08 – 2017, 12 |
| • **Embedded System**  Lab Tutor. | Shandong University  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

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| • **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  Microsoft Research  nachin@microsoft.com | • **Mukul R Prasad**  Director of Research  Fujitsu Laboratories of America, INC  mukul@us.fujitsu.com |