Miao Miao

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RESEARCH INTERESTS

My research interest lies in program analysis and its applications in software reliability and security. I focus on enhancing the reliability and usability of static analysis tools by automatically detecting bugs and diagnosing their root causes. Additionally, I work on improving the fuzz testing evaluation process by developing benchmarks that integrate program characteristics, aiming for a more comprehensive and accurate assessment of fuzzing tools.

EDUCATION

Doctor of Philosophy, Software Engineering — Jan. 2023 - present
The University of Texas at Dallas, Richardson, Texas (*Advisor: Dr. Shiyi Wei)*

Master of Science, Software Engineering — Aug. 2021 - Dec. 2022
The University of Texas at Dallas, Richardson, Texas — GPA: 3.97

Bachelor of Engineering, Computer Science and Technology — Sep. 2014 - Jun. 2018
The Xi'an University of Finance and Economics, Xi'an, China — GPA: 3.59

RESEARCH EXPERIENCE

An Extensive Empirical Study of Nondeterministic Behavior in Static Analysis Tools

- Performed qualitative analysis of the repositories of 11 popular static analysis tools that shows common nondeterministic issues and categorizes their root causes.
- Constructed an experiment framework and conducted empirical study that detects previously unknown nondeterministic behaviors in tools such as SOOT, WALA, DOOP, FlowDroid, PyCG and Infer.
- Debugged root causes of discovered nondeterministic bugs and reported them to tool developers.

Program Feature-based Benchmarking for Fuzz Testing

- Performed a literature review of 25 recent grey-box fuzzing papers to extract fine-grained program features from their claimed improvements.
- Created the first feature-based benchmark that defines 10 configurable parameters for the extracted program features with 153 generated programs.
- Evaluated 11 popular fuzzers to understand fuzzer behaviors and the impact of each program parameter on their performance.

Visualization Task Taxonomy to Understand the Fuzzing Internals

- Conducted semi-structured interviews with fuzzing experts.
- Systematically extracted the task taxonomy from the interview data through qualitative data analysis.
- Evaluated the support of existing visualization tools for fuzzing through the lens of our taxonomy.

Towards Automated Identification of Data Constraints in Software Documentation

- Identified and validated the data constraints in requirements documentation which specify allowed data values in software systems.
- Identified 15 discourse patterns, commonly used to describe data constraints in natural language.
- Debugged and evaluated an NLP-based automated splitter which breaks down a sentence to fragments based on the developed discourse patterns. These patterns are used as features for machine learning.

- Trained and evaluated 5 machine learning classifiers for automatically extracting data constraints.

PUBLICATIONS

- **An Extensive Empirical Study of Nondeterministic Behavior in Static Analysis Tools**
  Miao Miao, Austin Mordahl, Dakota Soles, Alice Beideck, Shiyi Wei, *The IEEE/ACM International Conference on Software Engineering (ICSE), 2025.*
- **Program Feature-based Fuzzing Benchmarking**
  Miao Miao, *The IEEE/ACM International Conference on Software Engineering: Companion Proceedings (ICSE-Companion), 2025.*
- **Visualization Task Taxonomy to Understand the Fuzzing Internals**
  Kummita Sriteja, **Miao Miao**, Bodden Eric, Shiyi Wei, *Proceedings of the 3rd ACM International Fuzzing Workshop (FUZZING), 2024.*
- **ECSTATIC: Automatic Configuration-Aware Testing and Debugging of Static Analysis Tools**
  Austin Mordahl, Dakota Soles, **Miao Miao**, Zenong Zhang, Shiyi Wei, *The 32nd ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA), Tool Demonstration Track, 2023.*
- **Towards Automated Identification of Data Constraints in Software Documentation**
  Ying Zhou, **Miao Miao**, Vlad Birsan, Oscar Chaparro, Shiyi Wei, Andrian Marcus, *Empirical Software Engineering (Submitting)*

INDUSTRY EXPERIENCE

iOS Engineering Intern, Tinder Inc. May 2022 – Aug. 2022

iOS Developer, LotusFlare Inc. Aug. 2019 – Jun. 2021

Junior Software Engineer, KA Software Apr. 2018 – Apr. 2019

TEACHING EXPERIENCE

Teaching Assistant

- CS/SE 6356: Software Maintenance Evolution and Re-Engineering (Spring 2023)
- CS 4386: Compiler Design (Fall 2023)
- CS 6353: Compiler Construction (Spring 2024)

SERVICES

- Served as a junior PC member in the International Conference on Mining Software Repositories (MSR 2025).
- Served as a mentor in the UTD K12 Summer Research, Software Testing and Analysis Lab (Summer 2023, Summer 2024).
- Volunteered in the ACM SIGSOFT International Symposium on Software Testing and Analysis (ISSTA 2023).
- Sub-review for USENIX2024, ISSTA2024, ICSE2024, FSE2024, FSE 2023, ISSTA 2023, SecDev 2023, ICSE 2023.