

KAIYAO KE

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EDUCATION

Master of Science in Computer Science

University of Illinois Urbana-Champaign

May 2025

GPA: 4.00/4.00

Bachelor of Science in Mathematics and Computer Science

University of Illinois Urbana-Champaign

May 2022

GPA: 3.97/4.00

PUBLICATIONS

- **Kaiyao Ke**, Ali Reza Ibrahimzada, Rangeet Pan, Saurabh Sinha, and Reyhaneh Jabbarvand, “Advancing Automated In-Isolation Validation in Repository-Level Code Translation”, arXiv preprint, arXiv:2511.21878.
- Runxiang Cheng, **Kaiyao Ke**, Darko Marinov, “PyTest-Ranking: A Regression Test Prioritization Tool for Python”, In proceedings of FSE Demo 2025, The 33rd ACM International Conference on the Foundations of Software Engineering, Trondheim, Demo Papers, June 2025.
- Ali Reza Ibrahimzada, **Kaiyao Ke**, Mrigank Pawagi, Muhammad Salman Abid, Rangeet Pan, Saurabh Sinha, and Reyhaneh Jabbarvand, “AlphaTrans: A Neuro-Symbolic Compositional Approach for Repository-Level Code Translation and Validation”, In proceedings of FSE 2025, The 33rd ACM International Conference on the Foundations of Software Engineering, Trondheim, June 2025.
- **Kaiyao Ke**, “NIODebugger: A Novel Approach to Repair Non-Idempotent-Outcome Tests with LLM-Based Agent,” In proceedings of ICSE 2025, The 47th IEEE/ACM International Conference on Software Engineering, Ottawa, April 2025.
- **Kaiyao Ke** and Darko Marinov, “Evaluating NONDEX for Modern Java Ecosystem,” In proceedings of FTW @ ICSE 2025, 2nd International Workshop on Flaky Tests, Ottawa, April 2025.
- Feiqian Yang, **Kaiyao Ke**, “The Influence of Growth Mindset and Grit on Self-Efficacy Among Chinese Undergraduates”, In Proceedings of The European Conference on Education, London, July 2023.

RESEARCH EXPERIENCE

Repository-level Code Translation

Advised by Prof. Reyhaneh Jabbarvand

February 2024 - October 2025

Urbana-Champaign, IL

- Designed a comprehensive workflow to validate translated methods in isolation by generating JSON representations of input-language objects, recursively mapping them to output-language types, and setting up selective mock-based unit tests in the output language to pinpoint translation errors.
- Developed a retrieval-augmented generation (RAG) workflow to construct a comprehensive conversion map between programming languages, enabling automated program decomposition.
- Built a pipeline to minimize third-party library dependencies while preserving core functionality, facilitating the evaluation of code translation in zero-dependency scenarios.

Detection and Resolution of Test Non-Idempotency

Advised by Prof. Darko Marinov and Prof. Lingming Zhang

February 2024 - January 2025

Urbana-Champaign, IL

- Developed *NIODebugger*, the first framework for detecting and repairing non-idempotent-outcome (NIO) flaky tests caused by state pollution in large-scale software.
- Identified 172 NIO flaky tests across 20 open-source projects; our best variant successfully generated correct patches for 101 tests, with 58 patches merged via accepted pull requests and only 1 rejection.
- Designed *NIODebugger* as a Maven plugin for Java, enabling seamless detection and repair of NIO flaky tests within a single build lifecycle.
- Integrated custom test runners, static analysis tools, and configurable parameter selection to enhance detection accuracy and patch generation.

Evaluating Implementation-Dependent Flaky Tests

Advised by Prof. Darko Marinov

August 2023 - Nov 2024

Urbana-Champaign, IL

- Led the release of multiple versions of the research tool *NonDex*—a framework for discovering and debugging incorrect assumptions in unit tests relying on non-deterministic Java APIs—on Maven Central and the Gradle Plugin Portal.
- Enhanced *NonDex* functionality by extending its support to Java versions 9 through 21, including compatibility with the Java Module System, and improving its integration with modern build tools such as Maven and Gradle.
- Studied the key trends of implementation-dependent (ID) flaky tests, uncovering flakiness propagation, including resolving non-determinism issues in the Gradle build system itself.
- Enabled the adoption of *NonDex* in a graduate course (CS 527), with 50+ students per semester using the tool for hands-on learning and experimentation.

Improving Test Case Prioritization

Advised by Prof. Darko Marinov

January 2024 - March 2025

Urbana-Champaign, IL

- Led a study on the impact of flaky tests on test prioritization.
- Contributed to the development of *Pytest-Ranking*, a tool designed to reduce failure detection time in test suites through automated test prioritization.
- Conducted large-scale experiments on open-source projects to assess the tool's robustness and performance under diverse testing scenarios.
- Integrated *Pytest-Ranking* into GitHub CI workflows to measure its effectiveness in identifying new test failures in real-time environments.

TEACHING EXPERIENCE

CS 357 (Numerical Methods, taught by Prof. Mariana Silva)

Teaching Assistant

University of Illinois Urbana-Champaign

August 2023 - May 2025

Urbana-Champaign, IL

- Designed coding questions for bi-weekly quizzes and debrief questions for weekly group activity.
- Redesigned the CS 357 textbook to align better with lecture slides and provide more sample problems.
- Held office hours (5 hours a week) and group activity sessions (weekly) that mimic real-life engineering projects.
- Helped in optional study halls and answered students' questions in the online forum.

CS/ECE 374 A (Intro to Algorithms & Models of Computation, taught by Prof. Jeff Erickson)

Course Assistant

University of Illinois Urbana-Champaign

August 2021 - December 2021

Urbana-Champaign, IL

- Held office hours to answer students' questions with respect to homework and labs.
- Recorded walkthrough videos to help students with homework assignments and graded weekly written homework.
- Assisted in the development and maintenance of online pre-lecture problems on *Prairielearn@Illinois*.

OPEN-SOURCE CONTRIBUTIONS

- The International Dataset of Flaky Tests (IDoFT) [[My Commits](#)][[Contribution Overview](#)]
- NIOInspector, the non-anonymized version of NIODebugger, released to Maven Central [[NIOInspector v1.1.0](#)]
- NonDex [[NonDex Maven Plugin v2.2.1](#)] [[NonDex Gradle Plugin v2.2.1](#)]
- pytest-ranking [[pytest-ranking v0.3.4](#)]
- Fixed 300+ flaky tests in large-scale open source projects; my contributions can be tracked here: [[Github Page](#)]
- Improved several large-scale open source projects to handle non-determinism: [[Oracle Tribuo v4.2](#)] [[Gradle v8.6](#)] [[Apache Hadoop v3.4.1](#)]