University of Waterloo, DC 2524
200 Ring Rd, Waterloo, ON N2L 3G1
+1 (203) 435 6519
jialu.zhang@uwaterloo.ca
jialuzhang.netlify.app

Jialu Zhang

Research Interests

My research combines **Large Language Models (LLM), Programming Languages** and **Software Engineering** to develop practical tools for automatically preventing, detecting, and repairing crucial errors in programs, with minimum human effort.

Work Experience

03/24 - **Tenure-track Assistant Professor**, *Electrical and Computer Engineering*, University of Waterloo, Waterloo, ON, Canada

Education

09/23-02/24 **Postdoc**, *Computer Science*, Yale University, New Haven, CT, USA

Advisor Ruzica Piskac

08/17-05/23 **Ph.D.**, *Computer Science*, Yale University, New Haven, CT, USA

Advisor Ruzica Piskac

09/13-06/17 **B.S.**, *Electrical and Computer Engineering (IEEE Honor Class)*, Shanghai Jiao Tong University, Shanghai, China

Advisor Xinbing Wang

Publication

OOPSLA'24 **Jialu Zhang**, José Cambronero, Sumit Gulwani, Vu Le, Ruzica Piskac, Gustavo Soares, Gust Verbruggen: "PyDex: Repairing Bugs in Introductory Python Assignments using LLMs"

OOPSLA'21 **Jialu Zhang**, Ruzica Piskac, Ennan Zhai, Tianyin Xu: "Statically Detecting Silent Misconfigurations with Deep Interaction Analysis"

ASE'22 **Jialu Zhang**, De Li, John Kolesar, Hanyuan Shi , Ruzica Piskac: "Automated Feedback Generation for Competition-Level Code"

ISSTA'22 **Jialu Zhang**, Todd Mytkowicz, Mike Kaufman, Ruzica Piskac and Shuvendu Lahiri: "Using Pre-trained Language Models to Resolve Textual and Semantic Merge Conflicts (Experience Paper)"

SANER'22 Mark Santolucito, **Jialu Zhang**, Ennan Zhai, Jurgen Cito, Ruzica Piskac: "Learning CI Configuration Correctness for Early Build Feedback"

arxiv **Jialu Zhang**, Yitan Wang, Mark Santolucito, Ruzica Piskac: "Succinct Explanations with Cascading Decision Trees", in submission, preprint

Research Experience

2017-2023 **Yale University**, *Rigorous Software Engineering (ROSE) Group.*

Research Assistant for **Ruzica Piskac**.

• Designed Clef, the first paper at PL/SE conference on the topic of competitive programming. Automatically repaired incorrect competitive-level programs including non-functional property such as time and memory exceeded **[ASE'22]**.

• Designed ConfigX to derive complex dependencies between configurations by analyzing the semantics of system source code. Detected 2233 real silent misconfigurations in Apache, VSFTPD and PostgreSQL **[OOPSLA'21]**.

• Designed VeriCI to predict Continuous Integration (CI) build status (91% accuracy) with probable root cause locations in the source code **[SANER'22]**.

• Designed a novel cascading decision trees model for accurate, fast, and interpretable classification. Evaluated our model on standard UCI datasets, shortened the explanation depth by over 60.42% for positive classifications [In submission].

2022 **Microsoft Research**, *Program Synthesis using Examples (PROSE) group*, Remote.

Research Intern for **José Cambronero, Sumit Gulwani**.

• Designed PyDex, for the first time an automated tool (powered by Codex) can repair both syntactic and semantic errors in real-world students' Python programming assignments **[OOPSLA'24]**.

2021 **Microsoft Research**, *Research in Software Engineering (RiSE) group*, Remote.

Research Intern for **Shuvendu Lahiri, Todd Mytkowicz**.

• Designed Gmerge, the first LLM powered tool to repair merge conflicts. Evaluated on Microsoft Edge, obtained the state-of-the-art 64% fix rate on semantic merge conflicts **[ISSTA'22]**.

Teaching Experience

Database Systems (Fall 2018, Fall 2019, Fall 2021), Yale University. **Head TA**. In charge of quizzes and homework assignments. Helped instructor for designing exams. Led weekly office hour sessions.

Principles of Operating Systems (Spring 2022), Yale University.

Principles and Practice of Computer Algorithms (Summer 2015), Shanghai Jiao Tong University.

Invited Talks and Presentations

2024 "Automatically Detecting and Repairing Crucial Errors", Barnard College, Columbia University, February 2024

2022 "Automated Feedback Generation for Competition-Level Code". ASE 2022.

2022 "Using Large Language Models to Repair Syntax and Semantic Bugs in Educational Programming Assignments", Microsoft Research, October 2022.

2022 "Automated Feedback Generation for Competition-Level Code". Microsoft Research, October 2022.

2022 "Automate What Users Need: Automatically Detecting And Repairing Errors", Microsoft Research, Virtual, July 2022.

2022 "Using Pre-trained Language Models to Resolve Textual and Semantic Merge Conflicts". ISSTA 2022.

2022 "Learning CI Configuration Correctness for Early Build Feedback". SANER 2022.

2021 "Statically Detecting Silent Misconfigurations with Deep Interaction Analysis". OOPSLA 2021.

2021 "Resolving Merge Conflicts in Microsoft Edge Using GPT-3". Microsoft Research, July 2021.

2020 "Misconfiguration, From Networking to Programming Language", Shanghai Jiao Tong University, July 2020.

2019 "Statically Detecting Configuration Errors in Continuous Integration", Ninth Summer School on Formal Techniques (SSFT), May 2019.

Selected Honors and Awards

2022 Yale GSA CTF Award

2017 Yale University Graduate Fellowship

2017 National Endeavor Fellowship (Top 1%)

2017 A+ Senior Thesis, Shanghai Jiao Tong University (Top 5%)

2016, 2017 Academic Excellence Scholarship of Shanghai Jiao Tong University

Services

OOPSLA'23 Program Committee

OOPSLA'23 Artifact Evaluation Committee Member

VMCAI'22 Artifact Evaluation Committee Member

Reviewer PLDI'18, PLDI'20, PLDI'21, PLDI'22, CAV'21, CAV'22, S&P'23, CAV'24

Coach ICPC North America Championship (Yale Team) 2022, 2023

Lab Session GAINS: Girls Advancing in STEM, 2022

Keynote GAINS: Girls Advancing in STEM, 2022

Advising Experience

2023-Present Jialiang Gu, Research Assistant, currently an undergrad at Wuhan University.

2019-Present John Kolesar, collaborated on the ASE 2022 paper, currently a PhD student at Yale University.

2019-2021 De Li, collaborated on the ASE 2022 paper, currently at Mathworks Inc.

2020-2021 Andong Fan, Research Assistant, currently an incoming PhD student at University of Toronto.

2018-2019 Andreas Ravichandran, advised senior thesis, currently at Centiva Capital.

Hobbies

Table Tennis	Retired Pro player. Coached by Ding Song (Former Gold Metal of World Champion)

References

Ruzica Piskac (advisor)
Associate Professor
Dept. of Computer Science, Yale University
New Haven, CT
https://www.cs.yale.edu/homes/piskac/
203-432-8001
ruzica.piskac@yale.edu

Shuvendu Lahiri
Senior Principal Researcher
RiSE: Research in Software Engineering Group, Microsoft Research
Redmond, WA
https://www.microsoft.com/en-us/research/people/shuvendu/
425-722-4122
shuvendu.lahiri@microsoft.com

Sumit Gulwani
Partner Research Manager
PROSE: Programming by Examples and Natural Language Team, Microsoft Research
Redmond, WA
https://www.microsoft.com/en-us/research/people/sumitg/
425-706-7709
sumitg@microsoft.com

José Cambronero
Senior Researcher
PROSE: Programming by Examples and Natural Language Team, Microsoft Research
Redmond, WA
https://www.josecambronero.com
215-900-5308
jcambronero@microsoft.com