Zhang Xing

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Research direction: Programming Languages

- Language Design
- Bidirectional Compiler

Educational Background

Peking University, School of Computer Science, Computer Software and Theory

PhD Candidate *2020.9-2025.6(expected)*

- Advisor: Zhenjiang Hu (Chair Professor, Fellow of European Academy of Sciences, Fellow of Japan Academy of Engineering, Dean of Peking University School of Computer Science)
- President's Scholarship (highest honor for graduate students), Huawei Scholarship (2/36), Huatai Securities Technology Scholarship (3/126), Hongsheng Scholarship (5/36), Peking University Excellent Student, Peking University Outstanding Research Award, Peking University Outstanding Student Cadre

University of Bristol School of Computer Science

Visiting Scholar *2024.3-2024.8*

- Supervisor: Associate Professor Wang Meng

Nankai University, School of Software, Software Engineering

Bachelor of Engineering *2016.9-2020.6*

- Direct Ph.D. admission to Peking University (1/119), outstanding graduate of Nankai University, National Scholarship recipient*2, Tianjin Municipal Government Scholarship recipient

Shanxi University Affiliated High School, Competition Class

High School *2013.9-2016.6*

Publication of Papers

Published four CCF-A papers, with three first-authored long papers and one workshop first-authored paper. Three CCF-A long papers are under review.

- **(POPL'24) Xing Zhang**, Ruifeng Xie, Guanchen Guo, Xiao He, Tao Zan, Zhenjiang Hu. *Fusing Direct Manipulations into Functional Programs.*
- **(OOPSLA'23) Xing Zhang**, Guanchen Guo, Xiao He, Zhenjiang Hu. *Bidirectional Object-Oriented Programming: Towards Programmatic and Direct Manipulation of Objects.*
- **(ICSE'22) Xing Zhang,** Zhenjiang Hu. *Towards Bidirectional Live Programming for Incomplete Programs*.
- **(SFDI'20) Xing Zhang**, Van-Dang Tran, Zhenjiang Hu. *A Cheap Implementation of Resugaring in BIRDS based on Bidirectional Transformation*. [Workshop in VLDB]

- **(Under Submission) Xing Zhang**, Minh Nguyen, Fusen Wang, Meng Wang, Xiao He, Tao Zan, Zhenjiang Hu. *Lazy Bidirectional Evaluation.*
- **(TOSEM'24 Major Revision)** Luyao Ren, **Xing Zhang**, Ziyue Hua, Yanyan Jiang, Xiao He, Tao Xie. *Validity-Preserving Delta Debugging via Generator.*

Project Experience [1]

Supporting bidirectional live programming for incomplete programs (ICSE'2022) 2021-2022

- Extend bidirectional live programming from supporting only complete programs to supporting incomplete programs, where incomplete outputs are obtained for programs with blanks, programmers can modify incomplete outputs, and changes are automatically synchronized to incomplete programs.
- Extend forward semantics to incomplete programs, and define outputs for incomplete outputs; propose reverse semantics for incomplete programs and verify
- Implement programming tool Bidirectional Preview (6k lines of Elm) that supports web development

Bidirectional Object-Oriented Programming (OOPSLA'2023) 2022-2023

- Adapting bidirectional live programming to the object-oriented paradigm and supporting structured modification output
- Propose a refactoring technique to reduce the ambiguity of class inheritance structure; solve the problem of pointer data rollback
- Implement programming tools that support web development BiOOP (9k lines of Elm)

Fusion of direct manipulation and functional programming (POPL'2024) 2023-2024

- First Operation-based bidirectional live programming framework
- Design a DSL language to describe direct manipulation on SVG
- Design algorithms to integrate SVG operations into functional programs and verify correctness
- Developed programming tool FuseDM (7k lines of Elm) that supports SVG design

Bidirectional dynamic GUI development 2023-2024

- Proposed a solution for supporting bidirectional development of dynamic GUI for the first time. Programmers interact with the output dynamic GUI, modify the newly generated page after interaction, and the source program will automatically synchronize, so that the same interaction will result in the expected page upon re-execution
- Proposed the bidirectional semantics of lazy computation for the first time, supporting modification of outputs containing functions and dynamic data

[1] All projects revolved around "bidirectional live programming": a new programming paradigm and environment aimed at innovating user interface (UI) design, web development, game development, data visualization, and document formatting. It empowers programmers with the ability to see program output immediately while programming, without the need for frequent compilation and execution. More importantly, they can directly modify program output using a mouse, including shapes, positions, and colors, automatically updating the source code. It has good property guarantees, meaning that updated source code will always produce the desired output upon recompilation and execution. This technology promotes collaboration between professional programmers and prototype designers.

Competition award

- The 31st "Challenge Cup" of Peking University **First Prize** 2023
- "Beida Cup" Badminton Team Competition Group B **Champion** 2023
- WeChat Mini Program Competition North China Division **Second Prize** 2019
- National College Student Mathematical Modeling Competition **First Prize** 2018
- National High School Mathematics League (Shanxi Division) **Second Prize** 2015
- National High School Mathematics League (Shanxi Division) **Third Prize** 2014

Report Experience

- 51st POPL Main Conference, London, UK January 2024
- SPLASH Main Conference, Cascais, Portugal October 2023
- 44th ICSE Main Conference, Online May 2022
- 2023 Chinasoft China Software Conference, Outstanding Ph.D. Forum December 2023
- The 11th Peking University Programming Language Seminar November 2023

Academic Services

- **SoSyM** Reviewer 2024
- **PLDI** Artifact Reviewer 2024
- **ICFP** Sub-Review 2024
- **POPL** Sub-Review 2023

Core Courses

- PhD : Software Analysis Techniques, Principles of Programming Language Design, Foundations and Practices of Software Theory, Introduction to Formal Languages and Automata
- Undergraduate : Compiler Principles (98), Operating Systems (96), Principles of Database Systems (95), Computer Networks (100), Parallel and Distributed Program Design (100), Machine Learning and Applications (97), Computer Organization Principles (96), Discrete Mathematics (99), Linear Algebra (98), Probability and Mathematical Statistics (97), Java Language and Applications (95), Python Language Program Design (92)

Internship Experience

- Jisuanke Online Education, Engineering Intern 2019.07-2019.10
  - Online Platform Backend Development

Technical Skills

- English Proficiency: CET-4 CET-6
- Knowledge/Skills: Formal Methods (Verification), Type Systems; Coq, UPPAAL; Docker; Git

- Programming Languages: C, C++, Python, Java, Haskell, OCaml, Elm, JavaScript, LaTeX, Markdown

Hobbies and Specialties

Badminton, Photography, Singing