Ziteng Yang

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Education

Georgia Institute of Technology (Georgia Tech), Atlanta, GA, USA 2021 – 2026 (expected)

Ph.D. student in Computer Science, Advised by *Vivek Sarkar*, GPA: 3.6 / 4.0

- Research Interests: Program Verification, Interactive Theorem Prover, Parallelism & Concurrency

Shanghai Jiao Tong University (SJTU), Shanghai, China 2017 – 2021

B.E. in Computer Science and Technology, Minor in Music (non-degree), GPA: 3.6 / 4.0

Publications

- **Z. Yang**, J. Shirako, V. Sarkar, Fully Verified Instruction Scheduling, OOPSLA'24 **[Compiler Verification]**
- **Z. Yang**, X. Yin and S. Li, Maximally permissive supervisor control of timed discrete-event systems under partial observation, in 21st IFAC World Congress, 2020 **[Control Theory]**

Research Projects

Doctorate Thesis Topics: Improving Theory and Optimization of Certified Compiler 2022-now

Advisor: *Vivek Sarkar*, School of Computer Science, Georgia Tech.

- **[OOPSLA'24] Verified Instruction Scheduling** Formally built the first foundational theory to fully verify instruction scheduling passes in the CompCert certified compiler and achieved the first ever fully verified instruction scheduling pass in a formally verified compiler. Continuing work on supporting inter-block/memory-aware scheduling and linking.
- **Verified Linear Scan Register Allocation**: Incorporating and formally proving linear scan register allocation algorithm in CompCert addressing the problem that graph coloring register allocation requires either heavy work on proofs or heavy compile time during validation.
- **Missing Correctness Specification in Compiler Verification**: Investigating the problem that current compiler correctness specification may cause a valid input to be rejected.

Program Analysis of Parallel Programming 2022-now

Advisor: *Vivek Sarkar*, School of Computer Science, Georgia Tech.

- Proposed, proved, and implemented $O(V+E)$-worst-case algorithm (previously $O(V^3)$) for may-happen-in-parallel analysis of programs with async and finish structures based on sub-problems of CFL-reachability
- Investigating applications on data-race detection/prediction

Undergraduate Thesis and Research Internship 2020 – 2021

Advisor: *Qinxiang Cao*, John Hopcroft Center for Computer Science, SJTU.

- **Compiler Correctness for Annotation Verifier**: Designed and formalized (in Coq) a parameterized semantics & correctness framework to verify optimizations that use logical assertions annotated in C programs (VST-A) as hints based on CompCert framework, and proved that any optimization that preserved the validity of assertions inside programs preserved the semantics simulation relation.
- **Formalized Modal Logic**: Practice on Coq through formally proving completeness of modal logic.

[IFAC'20] Formal Control Theory of Timed Discrete-Event Systems 2019

Advisor: *Xiang Yin*, Department of Automation, SJTU.

- Designed an algorithm for synthesizing a safe and maximally-permissive supervisor for Timed Discrete Event System and formally proved its correctness, i.e. the language generated by the automata under such synthesized supervisor is safe yet maximal.

Teaching Experience

Teaching Assistant, CS6390 Programming Languages, Georgia Tech, taught by *Vivek Sarkar* Spring 2023

- The foundational principles of programming languages

Teaching Assistant, CS4510 Automata and Complexity, Georgia Tech, taught by *Joseph Jaeger* Fall 2022

- Introduction to Computability: regular language & DFA/NFA, context-free language & PDA, Turning Machine, complexity theory (P/NP/co-NP., L/NL, co-NL)

Teaching Assistant, Discrete Mathematics (IEEE Honor Class), SJTU, taught by *Qinxiang Cao* Fall 2020

- First-order Logic (proof, semantics, and soundness), Set Theory as foundation of mathematics

Teaching Assistant, Discrete Mathematics (Zhiyuan Honor Class), SJTU, taught by *Xiang Yin* Fall 2020

- Logic and deduction, Graph Theory, Set Theory

Selected Courses and Projects

Graduate Courses and Projects: 2021 - Present, Georgia Tech

- **Software Development Process**: Object-oriented software engineering, unit test, UML, android/java development, group development, software refactoring
- **Parallelizing Compilers**, theories and techniques for loop-level & instruction-level parallelism
- **High-Performance Computer Architecture**, with labs simulating CPU with bypassing, branch-prediction, super-scalar, out-of-order-execution, multi-level caches, DRAM, multi-processor, cache way-partition etc.
- **Compiler Design**, with labs on optimization techniques of compiler using LLVM IR
- **Software Analysis and Testing**, program analysis techniques, paper reviews and projects on static analysis
- **[Minor in math] Measure Theory**(= Real Analysis I)

Selected Undergraduate Courses and Projects: 2017 - 2021, SJTU

- **Courses**: Programming Languages, Computing Theory, Artificial Intelligence, Machine Learning, Operating System, Linux Kernel, Database System, Information Security, Computer Network, Game Design
- **Interpreter for "SimPL" Programming Language (2020)**: Implemented an interpreter (type inference/checking and evaluation) in Java for a simplified dialect of ML following given semantic specification
- **Machine Learning Course Project (2020)**: i) Reproduction of paper on DeepMoji ii) Reinforcement learning on 2048-game; iii) Imitation learning of 2048-game from a trained model
- **Naive-Airdrop App (2019)**: Designed & implemented an encrypted file synchronizing application between Android and Windows PC within local area network with auto connection, changes detecting etc.
- **Linux Memory Management (2018)**: i)Page table remapping & page replacement algorithm from given specifications; ii)Page hot map collector; iii)Comparison on out-of-memory evaluation strategy
- **Data Structure Project (2018)**: Implemented dequeue and map in C++ under same interface of STL.

Skills

Programming Experiences:

- **Coq/OCaml**: long-term research projects on certified compiler and program logic
- **C/C++**: course and research projects (LLVM IR, Linux kernel, STL implementation, algorithm design)
- **Python, Java**: course projects (machine learning, small apps, etc.)

Honors and Scholarships

- Conference Travel & Registration Grant by PLMW@PLDI'22, San Diego 2022
- Rongchang Scholarship for Science and Technology Innovation, Finalist, 10,000 CNY (10 finalists and 10 winners per year, university-wide) 2020
- Undergraduate Excellence Scholarship, 500 CNY Third-class 2018