Mike (Deyuan) He

mikehe@princeton.edu · @Mike He

Education

Princeton University, Princeton, NJ 2022 – Present

Ph.D. in Computer Science, expected July 2027
Advisors: Prof. Aarti Gupta & Prof. Sharad Malik
Field of study: Compilers; Domain-specific Languages; Formal Methods; MLSys

University of Washington, Seattle, WA 2018 – 2022

B.S. in Computer Science, GPA: 3.89/4.0 (ranking N/A)
Selected Honor: CRA Outstanding Undergraduate Researcher Award, Honorable Mention (2022)

Industrial Experience

Taichi Graphics, Remote June. 2022 – Sept. 2022

Compiler R&D Intern (Graphics/Compiler/C++/Python)

Focusing on IR optimizations for Taichi Language, including:

- Refactoring and implementing local matrices for Frontend and CHI IR of Taichi Language
- Extending IR optimizations (e.g. **dead code elimination**) to support the new matrix operations
- Enabling large matrices and optimizations (e.g. **SIMD**) for matrix operations
- Conducting experiments on performance gains; implementing fallback strategies to avoid performance regression on backends that do not support SIMD

Intel Labs, Hillsboro, OR Mar. 2022 – June. 2022

Formal Verification Research Intern (Formal Methods/Python/Dafny)

Developed the **Py***rope* framework for **correct-by-construction** hardware modeling.

- Enabled **proof-driven development** purely in Python
- Encoded the correctness proof of (multi-)montgomery reduction algorithm in Python and verified successfully by compiling to Dafny
- Unified "sources of truth" for correctness proofs and hardware models implementation

Selected Publications

- Marisa Kirisame*, Steven Lyubomirsky*, Altan Haan*, Jennifer Brennan, **Mike He**, Jared Roesch, Tianqi Chen, and Zachary Tatlock. *Dynamic Tensor Rematerialization*, 2021
- Bo-Yuan Huang*, Steven Lyubomirsky*, Yi Li, **Mike He**, Thierry Tambe, Gus Henry Smith, Akash Gaonkar, Vishal Canumalla, Gu-Yeon Wei, Aarti Gupta, Sharad Malik, and Zachary Tatlock. *Application-Level Validation of Accelerator Designs Using a Formal Software/Hardware Interface*, 2022

Skills

- **Languages:** C/C++, Python, Rust, OCaml, Coq, Dafny, etc. (Open to other languages)
- **Compiler & Applied PL:** Equality Saturation, Static Analysis, Computer-aided Reasoning, SMT
- **PL Theory:** Formal Verification, Type Theory, Mathematical Logic
- **Systems:** Distributed Systems, Machine Learning Systems, Data Center Systems
- **Others:** Computer Graphics, Design and Implementation of Algorithms and Data Structures

Conference Service

- Artifact Evaluation, MICRO'21