

# MIKE (DEYUAN) HE

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## EDUCATION

Princeton University, Princeton, NJ

2022 – Est. 2027

Ph.D. in Computer Science, GPA: N/A

Advisors: Prof. Aarti Gupta & Prof. Sharad Malik

Fields of study: Compilers; Domain-specific Languages; Formal Methods; Software Systems

University of Washington, Seattle, WA

2018 – 2022

B.S. in Computer Science, GPA: 3.89/4.0 (CUM LAUDE)

Advisors: Prof. Zachary Tatlock & Dr. Steven Lybomirsky

Selected Honor: CRA Outstanding Undergraduate Researcher Award, Honorable Mention (2022)

## INDUSTRIAL EXPERIENCE

Taichi Graphics, Remote

June. 2022 – Sep. 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 **Pyrope** 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 model implementations

## 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