Northwestern University
Dept. of Computer Science

Tommy McMichen

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Research Interests

My interests lie in *compilers*, specifically how we can leverage modern programming languages to design general-purpose *intermediate representations* that (1) improve the precision of *static analysis* by preserving high-level information, (2) enable novel *optimizations* on the layout and organization of memory, and (3) open the door to *compiler-runtime codesigns* that rethink existing hardware abstractions.

Education

Northwestern University, Evanston, Illinois, USA — 2020 – Present
Ph.D. in Computer Science, *Advised by Simone Campanoni* — (Expected 2026)
M.Sc. in Computer Science, *Advised by Simone Campanoni* — 2023

Rose-Hulman Institute of Technology, Terre Haute, Indiana, USA — 2016–2020
B.Sc. in Computer Engineering and Computer Science

Publications

Automatic Data Enumeration for Fast Data Collections, *CGO 2026.*
Tommy McMichen, Simone Campanoni.

Saving Energy with Per-Variable Bitwidth Speculation, *ASPLOS 2025.*
Tommy McMichen, David Dlott, Panitan Wongse-ammat, Nathan Greiner, Hussain Khajanchi, Russ Joseph, Simone Campanoni.

Representing Data Collections in an SSA Form, *CGO 2024.*
Tommy McMichen, Nathan Greiner, Peter Zhong, Federico Sossai, Atmn Patel, Simone Campanoni.

Getting a Handle on Unmanaged Memory, *ASPLOS 2024.*
Nick Wanninger, **Tommy McMichen**, Simone Campanoni, Peter Dinda.

Program State Element Characterization, *CGO 2023.*
Enrico Armenio Deiana, Brian Suchy, Michael Wilkins, Brian Homerding, **Tommy McMichen**, Katarzyna Dunajewski, Peter Dinda, Nikos Hardavellas, Simone Campanoni.

NOELLE Offers Empowering LLVM Extensions, *CGO 2022.*
Angelo Matni, Enrico Armenio Deiana, Yian Su, Lukas Gross, Souradip Ghosh, Sotiris Apostolakis, Ziyang Xu, Zujun Tan, Ishita Chaturvedi, Brian Homerding, **Tommy McMichen**, David I. August, Simone Campanoni.

Fine-Grained Acceleration using Runtime Integrated Custom Execution (RICE), *CASES 2019.*
Leela Pakanati, **Tommy McMichen**, Zachary Estrada.

Invited Talks

"Representing Data Collections for Analysis and Transformation"
Languages, Systems, and Data Seminar, *University of California, Santa Cruz.* — October 2025
Computer Architecture Group Meeting, *University of Cambridge.* — March 2024
Tech Talk, *Rose-Hulman Institute of Technology.* — October 2023
Student Seminar Series, *Northwestern University.* — October 2023
Constellation Workshop, *Northwestern University.* — July 2023

"Towards Collection-Oriented Compilation in LLVM"
LLVM Developers' Meeting, *Santa Clara, California.* — October 2025

Industry Experience

Meta, Menlo Park, California, USA — Summer 2025
Software Engineering Intern, Programming Languages and Runtimes, Android Native Compiler Team
- Improved the representation of ClangIR, an open-source C/C++ MLIR compiler.
- Developed analyses and transformations for C++ move semantics in ClangIR.
- Lead ClangIR open-source development efforts through issue creation and code reviews.

Texas Instruments, Dallas, Texas, USA Summer 2019, Summer 2020
Digital Design Engineering Intern, Embedded Processors, Analytics Team
- Performed integration testing for hardware implementation of cache coherence protocol.
- Developed coverage metrics for cache coherence testing.
- Implemented automatic generation of RTL and TLM from descriptor files.

National Instruments, Austin, Texas, USA Summer 2018
R&D Software Engineering Intern, Digitizers
- Designed and implemented FPGA logic for new function generator feature with LabVIEW.
- Added kernel, driver and API support for new function generator feature.
- Implemented full driver stack support for highly-customisable oscilloscope triggers.
- Communicated with multiple teams to add new .NET API entry points.

Teaching Experience

Teaching Assistant, *COMP_SCI 322 Compiler Construction*, Prof. Simone Campanoni. Winter 2022
Resident Tutor, *Computer Science and Computer Engineering Departments.* Aug. 2019 – May 2020

Service

Artifact Evaluation Committee, International Conference on Compiler Construction (CC). 2026
Board Member, Computer Science Social Initiative, Northwestern University. 2021 – Present
Member, CS Ph.D. Orientation Planning Committee, Northwestern University. 2022 – 2025
Member, CS Ph.D. Visit Day Planning Committee, Northwestern University. 2022 – 2026
Student Volunteer, International Symposium on Microarchitecture (MICRO). October 2022
Chairperson, IEEE, Rose-Hulman Institute of Technology student branch. August 2019 – May 2020
Corresponding Secretary, Eta Kappa Nu (HKN), Epsilon Eta Chapter. August 2019 – May 2020
Member, Eta Kappa Nu (HKN), Epsilon Eta Chapter. May 2018 – May 2020

Funding and Awards

LLVM Foundation Student Travel Grant, *LLVM Developers' Meeting.* 2025
NSF Student Travel Grant, *ASPLOS.* 2025
NSF Student Travel Grant, *HPCA/PPoPP/CGO.* 2024
NSF Student Travel Grant, *HPCA/PPoPP/CGO.* 2023
IP/ROP Student Travel Award. 2019
NSF Student Travel Grant, *ESweek.* 2019
IP/ROP Student Project Grant. 2018

Research Advising

Akash Deo, M.Sc., *Designing compiler tools for AI-assisted vectorization.* 2025 – Present
Benjamin Ye, M.Sc., *Characterizing differences between LLVM front-ends.* 2025 – Present
Benjamin Ye, B.Sc., *Automatically generating MemOIR from Rust.* 2024 – 2025