

Addison Alvey-Blanco

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Research Interests

High-performance computing and compiler systems for GPU architectures, with a focus on domain-specific code transformations and pipelines for numerical applications.

Education

University of Illinois Urbana-Champaign

Aug 2022 – Present

Ph.D. in Computer Science (expected 2027)

Advised by: Andreas Kloeckner

Working title: High-Level Code Transformations for Numerical Applications

Northern Illinois University

Aug 2019 – May 2022

B.S. in Computer Science & Mathematics

Experience

Sandia National Laboratories

May 2024 – Present

Year-Round Intern

- Developing an abstraction layer for hardware-accelerated matrix multiplication intrinsics to support portable generation of optimized linear algebra kernels
- Prototyped a kernel fusion pipeline in an MLIR-based compiler to improve memory locality and reduce intermediate memory traffic
- Designed and implemented an algebraic reordering compiler pass in MLIR for fused linear algebra kernels, optimizing contraction order, reducing asymptotic operation counts, and intermediate storage requirements in applicable cases

National Center for Supercomputing Applications (NCSA)

Aug 2022 – Present

Research Assistant, Center for Exascale-Enabled Scramjet Design (CEESD)

- Developing a polyhedral-model-based materialization transformation to control when intermediate array expressions are explicitly computed and stored
- Building general pattern-matching infrastructure for algebraic rewrites and structured code generation in compiler transformation pipelines
- Constructing a domain-specific transformation pipeline for tensor-product discretized discontinuous Galerkin solvers
- Implemented computational graph rewrites that exploit tensor-product structure to reduce runtime cost in discontinuous Galerkin operator application

Publications

- A. Klöckner, A. Fikl, X. Wei, T. Gibson, **A. Alvey-Blanco**, “modepy: Basis Functions, Interpolation, and Quadrature (not just) for Finite Elements,” *Journal of Open Source Software*, 2026. DOI: 10.21105/joss.09294

- **A. Alvey-Blanco**, B. Kelley, S. Rajamanickam, “Platform-Agnostic Kernel Fusion Pipeline for Linear Algebra Kernels in MLIR,” in *Computer Science Research Institute Summer Proceedings 2025*, Sandia National Laboratories, 2025.
- **A. Alvey-Blanco**, K. Liegeois, B. Kelley, “Toward Automatic Kernel Fusion for Kokkos Using MLIR,” in *Computer Science Research Institute Summer Proceedings 2024*, Sandia National Laboratories Technical Report SAND2024-16688O, 2024, pp. 204–215.

Teaching Experience

Numerical Analysis (CS 450, UIUC)

Fall 2023

Graduate teaching assistant

Databases (CS 466, NIU)

Spring 2022

Undergraduate teaching assistant

Leadership

Treasurer, SIAM UIUC Student Chapter

Spring 2024 – Spring 2026