Damyn Chipman, Ph.D.

Computational Physicist · Scientific Software Developer

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Education

Boise State University

July 2024

Doctor of Philosophy in Computing

Boise, ID

- Emphasis: Computational Sciences and Engineering
- Dissertation Title: An Adaptive and Parallel Direct Solver for Elliptic Partial Differential Equations

Brigham Young University

April 2019

Bachelor of Science in Applied Physics

Provo, UT

- Emphasis: Computational Physics and Engineering
- Senior Thesis: Aerodynamics Modeling Using a Mesh-Free Approach

Research and Professional Experience

Los Alamos National Laboratory

October 2024 - Present

Postdoctoral Research Associate

Los Alamos, NM

- Perform research and development on scientific software.
- Model and simulate inertial confinement fusion (ICF) experiments.
- Dissimulate knowledge through presentations and papers.

Lawrence Livermore National Laboratory

May 2022 - August 2022

Defense Science and Technology Intern

Livermore, CA

- Developed scientific software for lab-wide physics applications.
- Implemented a new material interface reconstruction method into the multi-physics code `Kull`.
- Presented results during end of summer SLAM presentations to lab directorate.

Lawrence Livermore National Laboratory

May 2021 - August 2021

High Energy Density Physics Intern

Livermore, CA

- Aligned LLNL's nuclear data codes FUDGE and GIDI+ for improved productivity and accuracy.
- Contributed several new features across multiple programming APIs.
- Presented results during end of summer SLAM presentations to lab directorate.

Nevada National Security Site (Mission Support and Test Services, LLC)

June 2019 - August 2020

Associate in Science

Las Vegas, NV and Livermore, CA

- Supported multiple projects with a computational emphasis to develop tools for mission critical diagnostic equipment.
- Implemented an axis correction algorithm using machine learning techniques.
- Developed an image processing software package for neutron image data analysis.

Flight, Optimization and Wind Lab (BYU Mechanical Engineering)

April 2018 - May 2019

Research Assistant

Provo, UT

- Assisted in research for computational fluid dynamics software.
- Designed and developed a vortex sheet boundary package `VSB.jl` for vortex particle method integration.
- Modeled propeller-wing interaction using the novel vortex particle method.

Advanced Power Cycles Lab (BYU Chemical Engineering)

June 2016 - April 2018

Research Assistant

Provo, UT

- Assisted in research for nuclear power cycles.
- Developed a 1, 2, and 3-stage optimized Rankine power cycle model for nuclear power application.
- Assisted in formulation, testing, and verification of water-ammonia thermodynamic property package code.

Teaching Experience

Boise State University Mathematics Department *January 2024 - May 2024*

Graduate Assistant *Boise, ID*

- Teaching assistant for MATH565: Parallel Computing.
- Developed course content and delivered lectures on CPU/GPU parallel programming for scientific computing.
- Assisted in grading, mentoring, and evaluating students throughout the course.

Boise State University Geophysics Department *January 2022 - May 2022*

Adjunct Faculty *Boise, ID*

- Prepared course content and developed curriculum for GEOS357/597: Computation in the Geosciences.
- Delivered class lectures with in-person and online options.
- Received highly positive reviews from students.

Boise State University Mathematics Department *August 2019 - December 2019*

Graduate Assistant *Boise, ID*

- Teaching assistant for MATH365: Intro to Computational Mathematics.
- Assisted professor in teaching, guiding students, and grading.
- Generated new course materials for students and faculty.

Brigham Young University Physics Department *August 2016 - April 2018*

Teaching Assistant *Provo, UT*

- Assisted professors in teaching and grading for introductory to advanced physics classes, including computational physics lab sequence.
- Implemented new teaching program for 150+ students.
- Oversaw sections of 20-30 students as Recitation Section Leader.

Peer Reviewed Publications

2024 **D. Chipman**, D. Calhoun, C. Burstedde. *MPI Implementation of the Quadtree-Adaptive Hierarchical Poincaré-Steklov Method.* (In Preparation).

2024 **D. Chipman**, D. Calhoun, C. Burstedde. *A Fast Direct Solver for Elliptic PDEs on a Hierarchy of Adaptively Refined Quadtrees.* Journal of Computational Physics (In Review). https://arxiv.org/abs/2402.14936.

2024 **Chipman, D.**, (2024). EllipticForest: A Direct Solver Library for Elliptic Partial Differential Equations on Adaptive Meshes. Journal of Open Source Software, 9(96), 6339, https://doi.org/10.21105/joss.06339.

Miscellaneous Publications

2022 **D. Chipman**. *Overview of Solution Methods for Elliptic Partial Differential Equations on Cartesian and Hierarchical Grids.* Boise State University. Comprehensive Exam Paper. https://arxiv.org/abs/2205.03356.

2020 A. Durand, R. Freeman, **D. Chipman**, B. Garcia, M. Wallace, J. Bundgaard, D. Smalley, M. Raphaelian, D. Max, D. Lowe, et al. *High-fidelity dynamic neutron imaging and radiography for subcritical experiments and other applications.* Technical report, Nevada National Security Site/Mission Support and Test Services LLC. July 2020. https://www.osti.gov/biblio/1741025.

2020 J. Hunter, B. Hunter, **D. Chipman**, K. Jespersen, A. Imtiaz, S. Garcia, G. Cowell, and N. Price. *Forms of Energy: Kailani K. Invents All Day*. STEMTaught, 2020. https://books.google.com/books?id=EK-5zwEACAAJ

2019 **D. Chipman**. *Viscous Aerodynamics Modeling Using a Mesh-Free Approach*. Brigham Young University. Senior Thesis. https://physics.byu.edu/docs/thesis/1372.

Conferences and Presentations

2024 **D. Chipman**, D. Calhoun. *Adaptive Matrix Factorization on Supercomputers*. Boise State University Research Computing Days and Graduate Student Showcase. Boise, ID.

2024 **D. Chipman**, D. Calhoun. *A Coupled Elliptic/Hyperbolic Adaptive Finite Volume Solver for High-Performance Heterogeneous Architectures*. SIAM Parallel Processing 2024 Conference. Baltimore, MD.

2023 **D. Chipman**, D. Calhoun. *A Coupled Elliptic/Hyperbolic Adaptive Finite Volume Solver for High-Performance Heterogeneous Architectures*. SIAM Pacific Northwest 2023 Conference. Bellingham, WA.

2023 **D. Chipman**, D. Calhoun. *A Fast, Adaptive, Matrix-Free Direct Elliptic Solver on Quadtree Meshes*. SIAM CSE2023 Conference. Amsterdam, The Netherlands.

2022 **D. Chipman**, B. Stephens. *A New Material Interface Reconstruction (MIR) Implementation in KULL*. LLNL SLAM Presentation. Livermore, CA.

2022 **D. Chipman**. *Higher Order Tsunami Simulations and Novel Solution Methods.* Boise State University Graduate Student Showcase Poster. Boise, ID.

2021 **D. Chipman**, et al. *FUDGE and GIDI+: Aligning LLNL's Nuclear Data Codes and API.* LLNL SLAM Presentation. Livermore, CA.

2021 **D. Chipman**, D. Calhoun. *Progress Towards a Fast, Scalable, and Direct Elliptic PDE Solver for Adaptive Meshes.* SIAM CSE 2021 Conference Presentation.

2020 A. Durand, **et al.**. *High-Fidelity Dynamic Neutron Imaging and Radiography for Subcritical Experiments and Other Applications.* No. DOE/NV/03624-0829. FY2020 Annual SDRD Conference. Nevada National Secruity Site/Mission Support and Test Services LLC. Las Vegas, NV.

2020 **D. Chipman**, et al. *Characterizing On-Axis X-Ray Spectra with Off-Avis Detectors.* Mission Directorate Presentation. Las Vegas, NV.

2019 **D. Chipman** et al. *Image Processing and Reconstruction of Neutron and X-Ray Images.* Senior Leadership Team Presentation. Las Veags, NV.

2019 **D. Chipman** et al. *Aerodynamics Modeling Using a Mesh-Free Approach.* Utah Conference for Undergraduate Research Presentation. Ogden, UT.

Honors and Awards

2024 **Dean's Award,** Boise State University College of Arts and Science *Boise, ID*

2023 **Semi-Finalist,** SIAM Computational Science and Engineering 2023 Hackathon *Amsterdam, NL*

2020 **Hot Shot Award,** Nevada National Security Site *Las Vegas, NV*

2019 **Graduate Assistant Fellow,** Boise State University *Boise, ID*

2013 **Eagle Scout Award,** Boy Scouts of America *Las Vegas, NV*

Professional Development

2024 **Training on AI-Driven Science on Supercomputers (20 Hours),** Argonne National Laboratory *Chicago, IL*

2023 **Argonne Training Program for Exascale Computing (80 Hours),** Argonne National Laboratory *Chicago, IL*

2021 **Advanced Numerical Methods for Hyperbolic PDEs (40 Hours),** Laboratory of Applied Mathematics - University of Trento Italy *Trento, Italy*

Clubs and Societies

SIAM Society of Industrial and Applied Mathematics (Boise State Chapter)

BSUA Boise State University Alpine Club

ANS American Nuclear Society (Brigham Young University Chapter) (past)

Grants and Allocations

Director's Discretionary Allocation *2,500 Node Hours*

Argonne Leadership Computing Facilities

- Recieved allocation on Polaris supercomputer (25.81 PFlops) for research in direct linear solvers.
- Successfully developed, tested, and scaled a direct solver for adaptive mesh refinement.

Volunteer Experience

Journal of Open Source Software

Peer Reviewer

- Reviewed multiple papers for the Computer Science, Information Science, and Mathematics track.

The Church of Jesus Christ of Latter-day Saints *August 2013 - August 2015*

Volunteer Missionary *Mexico City, Mexico*

- Served as religious representative in the Mexico City Northwest Mission, providing large and small scale community service.
- Oversaw 20-30 other volunteers through training in communication, problem solving, and volunteer strategy.