Gina Vasey

vaseygin@msu.edu
vaseygin.github.io

HIGHLIGHTED SKILLS

Data-Driven Experience

- **Applications to Plasma** - ideal MHD, particle-in-cell (PIC), Hall MHD, Direct Simulation Monte Carlo (DSMC)
- **Machine Learning** - sparse regression, template matching, neural networks (PyTorch and TensorFlow)
- **Reduced Order Models** - SVD based representations, fluid approximations

Computing

- **Language Skills** - C++, Python, MATLAB, Fortran, Bash
- **High Performance Computing** - parallelization, distributed systems, version control

EDUCATION AND HONORS

Michigan State University East Lansing, MI
Computational Mathematics, Science, and Engineering *Aug 2020 - Present*
PhD, Expected Completion August 2025

- Dissertation Completion Fellowship *Fall 2024*
- Michigan Institute for Plasma Science and Engineering Fellow *Academic Year 2022*
- Engineering Distinguished Scholarship *Academic Year 2020*

University of Michigan Ann Arbor, MI
Physics and Computer Science *Sep 2015 - Dec 2019*
Bachelor of Science

- University Honors
- James B. Angell Scholar

EXPERIENCE

Michigan State University East Lansing, MI
Computational Mathematics, Science, and Engineering *Aug 2020 - Present*
Graduate Assistant

- Applying sparse-regression methods to plasma simulations
- Enhance simulation accuracy and robustness while maintaining interpretability
- Mentor beginning graduate students on code development, distributed systems, and data analysis tools

Sandia National Laboratories Albuquerque, NM
Radiation & ICF Target Design *May 2021 - Present*
Graduate Research and Development Intern

- Training of surrogate models based on post-processed simulation data sets using machine learning algorithms
- Creating fast, high fidelity surrogate models of expensive simulations used to optimize experimental configurations

Wright State University (in Association with Air Force Research Labs) Dayton, OH
Summer Intern *Summers 2017 - 2020*

- Develop educational program to teach K12 students about code `sensorcraft.org`
- Apply computer vision techniques to data from varied domains
- Mentored high school interns
  - Outlined appropriately challenging tasks to implement
  - Assembled student components into final product

University of Michigan Ann Arbor, MI
Electrical Engineering and Computer Science *Academic Year 2017*
Multidisciplinary Design Program

- Helped develop centralized analysis code for variety of satellite data formats
- Implemented image processing techniques

PUBLICATIONS

Quantifying Hall Conductivity using Data-Driven Model Identification
Vasey G., Bennett N., Welch D., Watson E.
In preparation

Data-Driven Recovery of Fluid Plasma Closures from Particle Simulation Data
Vasey G., Christlieb A., O'Shea B.
In preparation

Influence of initial conditions on data-driven model identification and information entropy for ideal mhd problems
Vasey G., Messenger D., Bortz D., Christlieb A., O'Shea B. *Mar 2025*
Journal of Computational Physics,
https://www.sciencedirect.com/science/article/pii/S0021999125000026

Developing and applying quantifiable metrics for diagnostic and experiment design on Z
Lewis W. et al: Vasey G. co-author on "POD ROM Development" Section *Nov 2023*
Technical SAND Report: https://doi.org/10.2172/2335899

PRESENTATIONS

Quantifying Hall Conductivity of the Inner MITL on Z Berlin, Germany
Pulsed Power and Plasma Science Conference *June 2025*

Quantifying Hall Conductivity using Data-Driven Model Identification Atlanta, GA
American Physical Society Division of Plasma Physics *Oct 2024*

Data-Driven Recovery of Hammett-Perkins Closure from Particle Data Albuquerque, NM
Z Fundamental Science Workshop *Aug 2024*

Learning Plasma Fluid Equation via Data-Driven Model Identification East Lansing, MI
NRT Scientific Machine Learning Workshop *Mar 2024*

Successes and Challenges Using a Data-Driven Model Selection Algorithm on Plasma Simulations Albuquerque, NM
Z Fundamental Science Workshop *Aug 2023*

Successes and Challenges Using a Data-Driven Model Selection Algorithm on Plasma Simulations Ann Arbor, MI
Dense Z-Pinch Conference *Jul 2023*

POSTERS

Data-Driven Recovery of Hammett-Perkins Closure from Particle Data Atlanta, GA
American Physical Society Division of Plasma Physics *Oct, 2024*

Influence of Initial Conditions on Data-Driven Model Identification for Ideal MHD Test Problems Berkeley, CA
International Conference on Data-Driven Plasma Science *Aug, 2024*

Influence of Initial Conditions on Data-Driven Model Identification for Ideal MHD Test Problems Santa Fe, NM
International Conference on Plasma Science *May, 2023*

Identifying Governing ODEs in Irregular Physical Domain with Diffusion Spokane, WA
American Physical Society Division of Plasma Physics *Oct 2022*

HIGHLIGHTED COURSE WORK

My studies have covered high performance computing on CPUs and GPUs, theory and applications for machine learning, numerical methods and theory for simulating PDEs, and generalized as well as plasma specific physics.

Computer Science

- CMSE 822: Parallel Computing *Fall 2020*
- CMSE 890: Applied Machine Learning *Spring 2022*
- CSE 847: Machine Learning *Spring 2023*

Physics

- Physics 405: Intermediate Electricity and Magnetism *Winter 2018*
- Physics 453: Quantum Mechanics *Winter 2018*
- Physics 406: Statistical and Thermal Physics *Fall 2018*
- ECE 850: Electrodynamics of Plasmas *Spring 2021*

Applied Math

- CMSE 820: Mathematical Foundations of Data Science *Fall 2020*
- CMSE 821: Numerical Methods for Differential Equations *Spring 2021*
- CMSE 823: Numerical Linear Algebra *Spring 2021*
- CMSE 890: Hyperbolic Conservation Laws *Spring 2023*