Benjamin Plumridge

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Education

Ph.D., Mathematics University of Tennessee, Knoxville August 2025
Thesis: "Filtered Angular Discretizations in Radiation Transport"
Advisor: Cory Hauck, Ph.D.

M.S., Applied Mathematics West Chester University of Pennsylvania May 2018

B.S., Physics (Minor in Mathematics) West Chester University of Pennsylvania May 2012

Research Experience

Doctoral Research University of Tennessee, Knoxville May 2020 - August 2025

- Developed a PDE-constrained optimization framework for optimal filtering of the filtered spherical harmonic method
- Designed and trained neural networks to model the filters adaptively in time and space, leveraging GPU acceleration
- Evaluated and compared discrete vs. continuous adjoint-based optimization strategies, identifying trade-offs between computational cost and accuracy
- Derived rigorous error estimates for the filtered spherical harmonic method using hypocoercivity theory
- Formulated, implemented, and tested a filtered variable Eddington factor method for thermal radiative transfer, demonstrating improved accuracy and stability
- Collaborated with researchers at Oak Ridge National Laboratory and Lawrence Livermore National Laboratory on large-scale applications in radiation transport

Summer Intern Lawrence Livermore National Laboratory May-August 2023
Project: "An IMEX Scheme for Thermal Radiative Transfer"

- Implemented and tested an implicit-explicit (IMEX) time-stepping scheme to reduce computational cost while preserving sufficient accuracy
- Derived error estimates to analyze stability and convergence properties of the scheme
- Gained experience in high-performance computing (HPC) with C++ and MPI in a collaborative, team-driven environment

Masters Research West Chester University of Pennsylvania December 2016 - May 2018

- Developed and analyzed models in mathematical biology describing morphogenetic processes
- Implemented and tested numerical schemes for the non-linear Schrödinger equation

Manuscripts in Preparation

- B. Plumridge, C. Hauck, and S. Schotthöfer, "Neural Network-Based Adaptive Filtering of the Spherical Harmonic Method," in preparation for submission to the *Journal of Scientific Computing*.
- B. Plumridge, T. Haut, and C. Hauck, "Filtered Variable Eddington Factor Method for Thermal Radiative Transfer," in preparation.

Technical Skills

- **Programming:** Python, C++, Matlab, SAS, Git
- **Scientific Computing:** MPI, PyTorch, HPC
- **Mathematics and Machine Learning:** Numerical analysis, optimization, neural networks, kinetic equations, spectral methods

Presentations and Workshops

- Invited talk at SIAM SEAS, *Neural Network-Based Adaptive Filtering of the Spherical Harmonic Method*, March 2025
- Presentation at University of Tennessee's Computational and Applied Math Seminar, *Neural Network-Based Adaptive Filtering of the Spherical Harmonic Method*, April 2025
- Winter School in Machine Learning, University of Texas at Austin, January 2024
- Poster presentation at Lawrence Livermore National Laboratory *An IMEX Scheme for Thermal Radiative Transfer*, August 2023
- SAMSI's Industrial Math/Stat Modeling Workshop for Graduate Students, North Carolina State University, *Translational Modeling of Irritable Bowel Syndrome*, July 2017

Teaching Experience

- Instructed up to two undergraduate mathematics courses per semester at University of Tennessee, Knoxville, with class sizes up to 40 students
- Courses taught include Statistical Reasoning, Calculus for the Life Sciences, Basic Calculus, Finite Mathematics, and College Algebra
- Designed course materials, assignments, and assessments tailored to diverse student backgrounds
- Evaluated coursework and assigned final grades according to departmental standards
- Fostered an inclusive and engaging classroom environment that promoted active participation