

Alec D. Wendland

Curriculum Vitae

U.S. Citizen — Eligible for Clearance — Willing to Relocate

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RESEARCH INTERESTS

Applied/computational mathematics, numerical PDE/ODE, variational methods, numerical analysis, scientific computing, materials modeling, multiscale simulation, computational materials science

EDUCATION

The University of Connecticut — PhD Mathematics
Storrs, CT

August 2021 – May 2027 (expected)
GPA: 3.984/4.0

- **Advisor:** Dr. Xiaodong Yan
- **Relevant coursework:** Applied mathematics, numerical analysis, FEM, PDE, ODE, Materials science and engineering

Carroll University — B.S. Mathematics (Minor: Computer Science)
Waukesha, WI

September 2017 – May 2021
GPA: 4.0/4.0

PUBLICATIONS

Published Papers

1. T. E. St. George and A.D.W, *Orthonormalization of a subset of Bernstein polynomial basis functions*, PUMP Journal of Undergraduate Research 7 (2024), 258-273, DOI <https://doi.org/10.46787/pump.v7i0.3765>.

Manuscripts in Preparation

1. A.D.W. and Xiaodong Yan, *Polar director structure of SmAP_F phase of bent-core liquid crystals in thin planar cells with bias electric field*, manuscript submitted to Nonlinear Science, November 2025.

RESEARCH EXPERIENCE

The University of Connecticut, Department of Mathematics
Graduate Researcher

Storrs, CT

August 2021 - present

- Formulated and analyzed nonlinear **Euler-Lagrange PDE/ODE systems** governing polar director configuration in ferroelectric liquid crystal phases; constructed finite-difference and variational discretizations under nonlinear Robin boundary conditions.
- Implemented **gradient-descent and Newton methods** in MATLAB; studied convergence behavior, numerical stability, and parameter sensitivity.
- Analyzed equilibrium solutions of **free energy models and their stability properties** using analytical techniques and numerical simulation; validated numerical solutions against theoretical predictions.
- Communicated results by writing research articles and presenting findings at regional and national conferences.

PROJECTS

FCC Metals Molecular Dynamics Simulator

[GitHub & Web App](#)

- Designed a complete **atomistic molecular dynamics simulator** modeling eight FCC metals (Ag, Al, Au, Cu, Ni, Pb, Pd, Pt) with 12-6 Lennard-Jones interatomic potentials and periodic boundary conditions.
- Implemented **velocity-Verlet integration** featuring a **Verlet neighbor list** to reduce computational complexity from $\mathcal{O}(N^2)$ to $\mathcal{O}(N)$.
- Analyzed **numerical stability and energy drift** in NVE ensembles to ensure integrator accuracy; achieved stable NVE/NVT analysis up to 10^6 steps at 0.001-0.005 fs timesteps.
- Computed key thermodynamic and structural quantities, including **radial distribution functions, mean squared displacement, velocity autocorrelation**, diffusion coefficients, and structure factors.
- Benchmarked results against **EAM potentials using LAMMPS**; validated RDF/MSD/VACF profiles against theoretical predictions.
- Visualized atomic trajectories in OVITO/PyOVITO.

TECHNICAL SKILLS

Numerical and Mathematical Methods: Finite difference (FDM), finite element (FEM), nonlinear optimization (gradient descent, Newton), numerical linear algebra (matrix decomposition, iterative solvers), shooting methods, stability & convergence analysis

Programming: Python (NumPy/SciPy/Matplotlib), MATLAB, C/C++, Julia

Computational modeling: Molecular dynamics (LJ/EAM), NVE/NVT ensembles, neighbor lists, RDF/MSD/VACF, structure factor, OVITO/PyOVITO, LAMMPS

Tools: Git, VS Code, Jupyter, MS Office, LaTeX

AWARDS AND HONORS

- Predoctoral Fellowship, UConn, Spring 2025 — \$8,078
- Summer Research Assistantship, UConn, Summer 2024 — \$5,498
- Summer Fellowship, UConn, Summer 2022 — \$5,000
- Alan and Linda Thompson Scholarship, Carroll University, August 2020 — \$2,500
- Mathematics Major of the Year Award, Carroll University, 2019, 2021
- Student Scholarly Travel Grant, Carroll University, December 2018 — \$700
- Pioneer Scholar Grant, Carroll University, Summer 2018 — \$3,000
- Dean's List, Carroll University, 2017–2021
- National Merit Scholarship, Mead Witter Foundation, awarded annually 2017–2020 — \$20,000 total
- Wisconsin Academic Excellence Scholarship, awarded annually 2017–2020 — \$10,000 total

PRESENTATIONS

- *The Direct Method in the Calculus of Variations*, Mathematics Continued Conference, UConn, March 2024 (Talk).
- *Variational Problems in Liquid Crystal Theory*, Geometric Analysis Student Seminar, UConn, October 2023 (Talk).
- *Negative Sobolev Spaces and a Compactness Result in Liquid Crystal Theory*, Geometric Analysis Student Seminar, UConn, March 2023 (Talk).
- *Two Proofs of an Explicit Orthonormalization Formula for Bernstein Polynomials*, Celebrate Carroll Academic Research Conference, Carroll University, April 2020 (Talk).
- *Bernstein Polynomial Reproducing Kernel Method*, Celebrate Carroll Academic Research Conference, Carroll University, April 2019 (Talk).
- *Bernstein Polynomial Reproducing Kernel Method*, Joint Mathematics Meetings, Undergraduate Poster Session, Baltimore, MD, January 2019 (Poster).

TEACHING EXPERIENCE

The University of Connecticut, Department of Mathematics

Lead Instructor

Storrs, CT

August 2021 - present

- Instructor of record for nine undergraduate math courses (ODE, technical writing, business calculus)

SERVICE

The University of Connecticut, Department of Mathematics

Vice President and Treasurer, SIAM Graduate Student Chapter

Storrs, CT

August 2021 - present

- Led UConn's SIAM graduate student chapter as treasurer (August 2021 - August 2024) and vice-president (August 2024 - present).
- Collaborated with faculty and other graduate students to organize academic workshops, seminars, and other events.

Mentor, Directed Reading Program

Fall 2024

- Independently advised an undergraduate student in a semester-long independent study project.

PROFESSIONAL MEMBERSHIPS

SIAM, AMS