Michael Rozowski

Curriculum Vitae

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Applied Mathematics PhD Candidate

Education

2019 – 2025 (expected) **PhD, Applied Mathematics & Statistics, and Scientific Computation**, *University of Maryland–College Park*, College Park, MD, GPA: *3.68/4.00*
Advisor: Prof. Antoine Mellet, Research: partial differential equations for cell migration, applications of optimal transport, free boundary problems

2017 – 2019 **MA, Mathematics**, *Arizona State University*, Tempe, AZ, GPA: *4.00/4.00*
Advisor: Prof. Sébastien Motsch, Research: Voronoi cell-based probability density estimation, finite difference methods for curve shortening flow and reaction-diffusion equations

2011 – 2016 **BS, Mathematics; BS, Chemistry; BSE, Chemical Engineering**, *Arizona State University*, Tempe, AZ, GPA: *3.56/4.00 (cum laude)*

Publications

[4] A. Mellet, **M. Rozowski,** *Volume-Preserving Mean-Curvature Flow as a Singular Limit of a Diffusion-Aggregation Equation*. 2024. DOI: 10.48550/ARXIV.2408.14309. arXiv: 2408.14309 [math.AP]. Submitted to SIAM J. Math. Anal.

[3] **M. Rozowski,** *Hele-Shaw Flow with Surface Tension and Kinetic Undercooling as a Sharp Interface Limit of the Fully Parabolic Keller-Segel System*. 2024. In Preparation.

[2] **M. Rozowski,** J. Palumbo, J. Bisen, C. Bi, M. Bouhrara, W. Czaja, R. G. Spencer, "Input layer regularization for magnetic resonance relaxometry biexponential parameter estimation". In: *Magnetic Resonance in Chemistry* 60.11 (2022), pp. 1076–1086. DOI: 10.1002/mrc.5289.

[1] H. Yin, C. Y. Lau, **M. Rozowski,** C. Howard, Y. Xu, T. Lai, M. E. Dose, R. P. Lively, M. L. Lind, "Free-standing ZIF-71/PDMS nanocomposite membranes for the recovery of ethanol and 1-butanol from water through pervaporation". In: *Journal of Membrane Science* 529 (2017), pp. 286–292. ISSN: 0376-7388. DOI: 10.1016/j.memsci.2017.02.006.

Talks

May 2024 **Research Interaction Team on Applied PDE**, *Volume-preserving mean-curvature flow as a singular limit of a Keller-Segel-type system*, College Park, MD

Sept. 2023 **Joint AMSC, MATH, & STAT Student Seminar**, *What is... Γ-convergence?*, College Park, MD

Mar. 2023 **Applied Mathematics Student Seminar**, *What is a JKO Scheme?*, College Park, MD

Feb. 2023 **Research Interaction Team on Applied PDE**, *Chemotaxis and a JKO-type scheme for the congested parabolic-parabolic Keller-Segel system*, College Park, MD

Oct. 2022 **Applied Mathematics Student Seminar**, *An Introduction to Optimal Transport*, College Park, MD

Jun. 2022 **MSRI Summer School on Integral Equations and Applications Poster Session**, *Pointwise-constrained solutions for PDE models with aggregation via gradient flows in Wasserstein space*, Berkeley, CA

Mar. 2022 **Student PDE Seminar**, *A survey of real interpolation of Banach spaces with a view toward PDEs*, College Park, MD

Aug. 2021 – May 2022 **Research Interaction Team on Lévy Processes and the Fractional Laplacian**, *essentially weekly lectures on the basic theory of Lévy processes, their relationship to the integral fractional Laplacian, fractional Sobolev spaces, and the Dirichlet problem for the fractional Laplacian*, virtual

Apr. 2021 **American Physical Society April Meeting**, *Neural Network Analysis of Biexponential Decay Curves Using Regularized Input Data*, virtual

Aug. 2019 **Los Alamos National Laboratory Summer Intern Poster Symposium**, *Getting the Most out of Your Stencil Kernel on CPUs and GPUs: The Tools, Analyses, & Techniques*, Los Alamos, NM

Aug. 2018 **Lawrence Livermore National Laboratory Summer Intern Poster Symposium**, *Tuning Thermodynamic Properties of a Solid Detonation Product via Particle Swarm Optimization*, Livermore, CA

Conferences & Workshops

Jun. 2024 **Summer Graduate School: Particle interactive systems: Analysis and computational methods**, *Simons Laufer Mathematical Sciences Institute, Berkeley, CA*

Jul. 2023 **Summer School: Fluid Dynamics**, *Brin Mathematics Research Center, College Park, MD*

May 2023 **Free Boundary Problems: Lecture Series and Recent Advances in Theory and Applications**, *Columbia University, New York, NY*

May 2023 **Frontiers of Numerical PDEs: Fractional Differential Equations, Geometric Evolution, Liquid Crystals, Optimal Transport, and Adaptivity**, *Brin Mathematics Research Center, College Park, MD*

Jun. 2022 **Summer Graduate School: Integral Equations and Applications**, *Mathematical Sciences Research Institute, Berkeley, CA*

Apr. 2021 **American Physical Society April Meeting**, *virtual*

Mentorship

Sept. 2024 – now Directed Reading Program: Rodz Andrie Amor and Colin McElroy

Jan. 2024 – May 2024 Directed Reading Program: Roshni Sharma (Intro to the Calculus of Variations)

2022 – now AMSC Mentoring Program for first-year graduate students: Chugang Yi ('22–'23); Kejia (Alex) Zhang ('23–'24)

2020 – 2022 NIH postbaccalaureate research trainees Jay Bisen and Jonathan Palumbo

Teaching

Aug. 2019 – present **Graduate Assistant**, *University of Maryland–College Park*, College Park, MD

- 2 semesters: Calculus III (with Matlab)
- 1 semester, sole instructor: Mathematical Modeling and Probability
- 1 semester: College Algebra and Trigonometry, Calculus I, Calculus II, Intro to Matlab, Linear Algebra (with Matlab), Ordinary Differential Equations (with Matlab), Probability and Statistics (graduate course in a professional master's program); grading for PDE-I (graduate), Numerical Analysis (graduate), Numerical Methods for Evolution PDEs (graduate), and Complex Variables (undergraduate)

Jan. 2018 – May 2019 **Graduate Teaching Assistant**, *Arizona State University*, Tempe, AZ

- 1 Semester: Matlab, Applied Linear Algebra, Ordinary Differential Equations, Calculus I

Awards & Honors

May 2023 **Seymour Goldberg Spotlight On Graduate Student Research**

June 2023 **Graduate Student Summer Research Fellowship**

2019–2021 **University of Maryland–College Park Dean's Fellowship**
2017–2019 **AZ Graduate Scholar Scholarship**
2012–2014 **Fulton Undergraduate Research Initiative**
2011–2015 **Dean's List**
2011–2015 **Regents' High Honors Endorsement Scholarship**

Service

2023- – 2024 Student Liaison in the Graduate Student Committee of AMSC, MATH, & STAT
2023 – 2024 Student Representative on the AMSC Graduate Committee
2023 – 2024 Organizer of the Joint AMSC, MATH, & STAT Student Seminar
2022 – 2023 Organizer of the Applied Mathematics Student Seminar
2022 – 2023 Member of the AMSC Student Council
2021 – 2022 Organizer of the Research Interaction Team on Lévy processes & the fractional Laplacian
2012–2014 Science Detectives, LLC
2011–2012 Well∼Water

Internships

Summers 2020 & 2021 **Summer Internship Program in Biomedical Research**, *National Institutes of Health*, Baltimore, MD, Mentor: Richard G. Spencer, MD, PhD (National Institute on Aging)

- Developed a novel method of neural network regularization (input-layer regularization) in the context of parameter estimation problems.
- Demonstrated the method is effective at enhancing the estimation of time constants for biexponential models, a common signal model in magnetic resonance relaxometry.

Jun. 2019 – Aug. 2019 **Parallel Computing Summer Research Institute**, *Los Alamos National Laboratory*, Los Alamos, NM, Mentor: Robert W. Robey (XCP-2)

- Examined the impact of data locality on a stencil operator's performance at updating a two-dimensional grid implemented serially on CPUs and with GPU offloading via OpenACC.
- Metered hardware events on CPUs with the Performance API (PAPI), which showed that selecting a block size that minimizes L1 cache misses maximizes the rate that a grid is updated when it is so large that it spills into main memory.
- Hardware events monitored with nvprof on the GPU indicated that optimal block sizes impact work scheduling favorably, which enhance the rate that a grid is updated.
- Developed efficiency metrics to examine performance portability across hardware platforms.

May 2018 – Aug. 2018 **High Energy Density Physics Summer Program**, *Lawrence Livermore National Laboratory*, Livermore, CA, Mentor: Thomas Rehagen, PhD (Weapons & Complex Integration)

- Developed and tested a metric to quantify the deviation between laboratory double-shock experiments and 2D simulations of these experiments computed with the hydrocode ARES coupled to the thermochemical code CHEETAH.
- Implemented a particle swarm optimization algorithm in Python to improve the agreement between these laboratory and the simulated experiments, which resulted in simulations with enhanced accuracy in second shock arrival time and maintained fidelity elsewhere.