

Rleigh Bandy

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Research Interests

UNCERTAINTY QUANTIFICATION AND VALIDATION

- Heliophysics, structural dynamics, chemical, ecological, and epidemic systems
- Development of data-driven models that adhere to physical constraints
- Calibration and validation techniques

Education

Ph.D., Computer Science

2024

THE UNIVERSITY OF COLORADO, BOULDER

- Advisor: Rebecca Morrison, Ph.D.
- Dissertation: *Uncertainty Representations in White- and Black-Box Models: Quantifying Model-Form and Measurement Errors in Computational Science*

M.S., Computer Science

2022

THE UNIVERSITY OF COLORADO, BOULDER

3.970/4.0 GPA

B.S., Computer Science

2019

THE UNIVERSITY OF TEXAS AT AUSTIN

3.67/4.0 GPA

Research and Industry Experience

Sandia National Laboratory

Albuquerque, NM

POSTDOCTORAL APPOINTEE - OPTIMIZATION & UNCERTAINTY

2024 - Present

QUANTIFICATION (ORG: 1463), UNDER TERESA PORTONE, PH.D.

RESEARCH AND DEVELOPMENT INTERN

2022 - 2024

- Employed grouped Sobol' indices to inform relevant reactions in a finite-rate gas-surface chemistry model.
- Calibrated and validated a neural-network-corrected compartmental disease model.
- Investigated how calibration data and the neural network architecture affected the validation time horizon.

University of Texas at Austin

Austin, TX

RESEARCH FELLOW - SECTION OF COMPUTATIONAL MATERIALS, UNDER

2016 - 2019

GRAEME HENKELMAN, PH.D.

- Contributed to the Transition State Atomic Simulation Environment (TSASE) software library global optimization methodology. (<http://theory.cm.utexas.edu/tsase/>)
- Helped create a database for sharing collaborative results.

Institute of Pure and Applied Mathematics

Los Angeles, CA

REU PARTICIPANT - INDUSTRY SPONSOR: HRL LABORATORIES, LLC

2018

- Employed a data science approach and machine learning to simulated additive manufacturing.

Electric Reliability Council of Texas

Taylor, TX

CYBERSECURITY INTERN

2017

- Improved the company's security posture through the creation of an automated Open-Source Intelligence program that alerts security analysts of threats to the company or its personnel on the Clearnet and dark web.
- Created educational phishing exercises.

Awards & Distinctions

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| 2023 | Recipient , Space Weather with Quantified Uncertainties Student Travel Fellowship | Cambridge, MA |
| | Winner of the Best Paper in Model Validation and Uncertainty Quantification , Conference Proceedings of the Society for Experimental Mechanics (SEM) Series | Austin, TX |
| 2020 | Recipient , Dean's Summer Research Fellowship | Boulder, CO |
| | Winner of the Student E-Poster Competition in the Technology, Engineering, and Math category , the American Association for the Advancement of Science (AAAS) annual meeting | Austin, TX |

Journal and Conference Papers

3. **Bandy, Rileigh**, Teresa Portone, and Rebecca E. Morrison. Stochastic model correction for the adaptive vibration isolation round-robin challenge. In *Proceedings of the IMAC XLII Conference*, Orlando, FL, USA, January 2024
2. **Bandy, Rileigh** and Rebecca Morrison. Stochastic model corrections for reduced Lotka-Volterra models exhibiting mutual, commensal, competitive, and predatory interactions. *Chaos: An Interdisciplinary Journal of Nonlinear Science*, 34(1), 2024. URL: <https://doi.org/10.1063/5.0159043>
1. **Bandy, Rileigh** and Rebecca Morrison. Quantifying model form uncertainty in spring-mass-damper systems. In *Proceedings of the IMAC XLI Conference*, Austin, TX, USA, February 2023. Springer. URL: <https://doi.org/10.1007/978-3-031-37003-8>

Technical Reports

4. **Bandy, Rileigh**, Michael Sands, and Teresa Portone. Quantifying uncertainties in ablation models for hypersonic flight. In *Computer Science Research Institute Summer Proceedings*, pages 16–29, 2023. Technical Report SAND2023-13916R, Sandia National Laboratories. URL: https://www.sandia.gov/app/uploads/sites/210/2023/11/CSRI-2023-proceedings_FINAL.pdf#page=24
3. Teresa Portone, **Bandy, Rileigh**, Rebekah White, Haley Rosso, and Joseph L. Hart. Quantifying model prediction sensitivity to model-form uncertainty. Technical Report SAND2023-10274R, Sandia National Lab.(SNL-NM), Albuquerque, NM (United States), 2023
2. **Bandy, Rileigh**, Teresa Portone, and Erin Acquesta. Validating neural-network-corrected dynamical systems. In *Computer Science Research Institute Summer Proceedings*, pages 14–30, 2022. Technical Report SAND2022-10280R, Sandia National Laboratories. URL: <https://www.sandia.gov/app/uploads/sites/127/2022/12/CSRI-2022-proceedings.pdf>
1. Erin Acquesta, Teresa Portone, Raj Dandekar, Chris Rackauckas, **Bandy, Rileigh**, and Jose Huerta. Model-Form Epistemic Uncertainty Quantification for Modeling with Differential Equations: Application to Epidemiology. Technical Report SAND2022-12823, Sandia National Lab.(SNL-NM), Albuquerque, NM (United States), 2022. URL: <https://doi.org/10.2172/1888443>

Presentation

- Model Enrichments in Reduced Ablation Models for Hypersonic Flight Simulations. Presented at 16th World Congress on Computational Mechanics and 4th Pan American Congress on Computational Mechanics; Vancouver, Canada; July 23rd, 2024.
- Nonlinear Forces and Omitted Masses: Mass-Spring-Damper Models and Their Model-Form Errors. Presented at SIAM Conference on Uncertainty Quantification; Trieste, Italy; February 29th, 2024.
- Stochastic Model Correction for the Adaptive Vibration Isolation Round-Robin Challenge. Presented at SEM IMAC-XLII; Orlando, FL; January 30th, 2024.
- Complex Couplings and Simple Springs: Analysis of Model-Form Error for Highly Nonlinear Oscillatory Systems. MS 407.2 session presented at 17th U.S. National Congress on Computational Mechanics (USNCCM); Albuquerque, NM; July 26th, 2023.
- Skewed Uncertainty Estimates for Deterministic Predictions. Poster session for junior researchers presented at Space Weather with Quantified Uncertainties Spring Meeting 2023; Cambridge, MA; March 10th, 2023.
- Quantifying Model Form Uncertainty in Spring-Mass-Damper Systems. Session 23 presented at SEM IMAC-XLI; Austin, TX; February 14th, 2023.
- Model Correction and Validation of Reduced Lotka-Volterra Models. MS 104 session presented at SIAM Conference on Uncertainty Quantification; Atlanta, GA; April 14th, 2022.
- Model Correction and Validation of Reduced Lotka-Volterra Models. Poster session presented at SIAM Conference on Applications of Dynamical Systems; Virtual; May 26th, 2021.
- Investigating Methodology for Global Optimization. Poster session presented at the AAAS Annual Meeting; Austin, TX; February 18th, 2018.
- Investigating Methodology for Global Optimization. Poster session presented at: Institute of Pure and Applied Mathematics workshop on Optimization and Optimal Control for Complex Energy and Property Landscapes; Los Angeles, CA; October 2nd, 2017.

Service and Professional Activities

Graduate Mentor

2020 - 2022

ACCESS AND INCLUSION PEER MENTORING PROGRAM

- Served as a mentor for first-year undergraduate underrepresented minority students in Engineering.
- Met regularly with my mentees to answer questions and provide support as they transitioned to college.

Post Secondary Volunteer Tutor

2021

BOULDER "I HAVE A DREAM" FOUNDATION

- Tutored post-secondary students in STEM subjects.

Peer Mentor

2016 - 2019

COMPUTATIONAL MATERIALS FRESHMAN RESEARCH INITIATIVE (FRI) LAB

- Facilitated high school students in the lab's summer program code for the first time.
- Held lab hours for undergraduate students in the FRI course.
- Helped create and grade assignments for the FRI course.

REVIEWER FOR JOURNALS

- Review of Scientific Instruments

PROFESSIONAL MEMBERSHIPS

- Society for Industrial and Applied Mathematics (SIAM)
- U.S. Association for Computational Mechanics (USACM)
- Society for Experimental Mechanics (SEM)

Technical Skills

Programming Languages C++, HTML, Java, Julia, MATLAB, Python, R, SQL.

Technologies and Services Amazon Web Services, Git.

High Performance Computing MPI, OpenMPI, Slurm.