

Postdoctoral Researcher, University of Colorado at Boulder
Department of Applied Mathematics

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Education

August 2022	PhD Applied Mathematics	University of Colorado Boulder (UCB)
July 2019	MSc Applied Mathematics	Simon Fraser University (SFU)
May 2015	BSc Mathematics, BA Physics	University of Puget Sound (UPS)

Research Interests

- Robust, efficient machine learning algorithms for automated discovery of mathematical models from data
- Emergent phenomena in large systems of autonomous agents (e.g. financial markets, autonomous vehicles, biological swarms, plasma physics)

Research Experience

Summer 2022 - (current)	Postdoctoral Research Associate , Dept. of Applied Mathematics, UCB; Supervisor: David Bortz
Summer 2020 - Summer 2022	Research Assistant , Department of Applied Mathematics, UCB Supervisor: David Bortz
Summer 2019	Research Assistant , Department of Mathematics, SFU Supervisors: Razvan Fetecau, Ralf Wittenberg
Summer 2018	Research Assistant , Department of Mathematics, SFU Supervisors: Razvan Fetecau, Ralf Wittenberg
Summer 2014	Research Intern , Visiting Faculty Program, U.S. Department of Energy, Pacific Northwest National Lab (PNNL) Supervisors: Amanda Mifflin (UPS), P. El-Khoury (PNNL)

Preprints

- Daniel A Messenger, Graycen E Wheeler, Xuedong Liu, and David M Bortz. Learning anisotropic interaction rules from individual trajectories in a heterogeneous cellular population. *(To appear in JRSI)* arXiv preprint [arXiv:2204.14141](https://arxiv.org/abs/2204.14141), May 2022
- Daniel A. Messenger, Emiliano Dall’Anese, and David M. Bortz. Online Weak-form Sparse Identification of Partial Differential Equations. *(To appear in PMLR)* [arXiv:2203.03979](https://arxiv.org/abs/2203.03979), March 2022. [arXiv: 2203.03979](https://arxiv.org/abs/2203.03979)

Articles

1. Daniel A Messenger and David M Bortz. Learning mean-field equations from particle data using wsindy. Physica D: Nonlinear Phenomena, page 133406, 2022
2. Daniel A. Messenger and David M. Bortz. Weak SINDy: Galerkin-Based Data-Driven Model Selection. SIAM Multiscale Modeling & Simulation, 19(3):1474–1497, 2021. arXiv: 2005.04339
3. Daniel A. Messenger and David M. Bortz. Weak SINDy For Partial Differential Equations. Journal of Computational Physics, 443:110525, October 2021. arXiv: 2007.02848
4. Daniel Messenger and Razvan C. Fetecau. Equilibria of an aggregation model with linear diffusion in domains with boundaries. Mathematical Models and Methods in Applied Sciences, 30(04):805–845, April 2020
5. Razvan C. Fetecau, Hui Huang, Daniel Messenger, and Weiran Sun. Zero-diffusion limit for aggregation equations over bounded domains. Discrete and Continuous Dynamical Systems, 2022

Posters & Presentations

- [1] **Normal and Enhanced Vibrational Spectroscopy.** Summer Intern Research Symposium, Pacific Northwest National Laboratory, Richland, WA. July 28, 2014.
- [2] **Normal and Enhanced Vibrational Spectroscopy.** Fall Physics Research Symposium, University of Puget Sound, Tacoma, WA. Oct. 17, 2014.
- [3] **Self-Organization in Domains with Boundaries.** Math Graduate Seminar, Simon Fraser University, Burnaby, BC. July 12, 2018.
- [4] **Interacting Particle Systems: Numerics for the Zero-Diffusion Limit.** Canadian Mathematical Society (CAS), Winter Meeting, Vancouver, BC. Dec. 7, 2018.
- [5] **Aggregation-Diffusion Phenomena in Domains with Boundaries.** Canadian Applied and Industrial Mathematics Society (CAIMS), Annual Meeting, Whistler, BC. June 10, 2019.
- [6] **Aggregation-Diffusion Phenomena in Domains with Boundaries.** Mathematical Biology Seminar, University of Colorado, Boulder, CO. Dec. 10, 2019.
- [7] **Aggregation-Diffusion Phenomena in Domains with Boundaries.** SIAM Front Range Student Conference, University of Colorado, Denver, CO. March 7, 2020.
- [8] **Weak SINDy: Galerkin-Based Data-Driven Model Selection.** SAMM 2020, Max Planck Institute for Dynamics of Complex Systems, Magdeburg, GE. July 27, 2020.
- [9] **Data-Driven Model Selection using Weak SINDy.** Mathematical Biology Seminar, University of Colorado, Boulder, CO. Sept. 21, 2020.
- [10] **Data-Driven Model Selection using Weak SINDy.** APPM Recruitment Symposium, University of Colorado, Boulder, CO. March 5, 2021.
- [11] **Data-Driven Model Selection using Weak SINDy.** T-5 Reading Group, Theoretical Division, Los Alamos National Laboratory, NM. Aug. 6, 2021.
- [12] **Data-Driven Model Selection using Weak SINDy.** APPM Recruitment Symposium, University of Colorado, Boulder, CO. March. 11, 2022.

- [13] **Data-Driven Model Selection using Weak SINDy**. AI Institute in Dynamics, University of Washington, Seattle, WA. March. 16, 2022.
- [14] **Online Weak-form Sparse Identification of Partial Differential Equations**. Mathematical and Scientific Machine Learning 2022 (MSML2022), Beijing, China. Aug. 16, 2022.

Teaching

2020- 2021	Co-Instructor Department of Applied Mathematics, UCB APPM 7400 Teaching Excellend (Fall 2020)
2019 - 2020	Teaching Assistant Department of Applied Mathematics, UCB APPM 2350 Calculus III & Differential equation (Spring 2019) APPM 2360 Differential Equations (Spring 2020) APPM 1350 Calculus I (Fall 2020)
2017 - 2019	Teaching Assistant Department of Mathematics, Simon Fraser University Numerical Analysis (MACM 316), Set Theory and Logic (MATH 303), Differential Equations (MATH 310), Calculus I,II,III
2015	Lab Assistant Physics Department, University of Puget Sound College Physics 2 (PHYS 110)

Professional Service

Fall 2021 - Spring 2022	President , SIAM Chapter at University of Colorado Boulder
Fall 2021 - Spring 2022	Peer mentor , Department of Applied Mathematics, University of Colorado Boulder
Fall 2021	Organizer, Co-creator , APPM Graduate Student Seminar, Department of Applied Mathematics
Summer 2020 - Spring 2021	Lead Teaching Assistant , Center for Teaching and Learning & Department of Applied Mathematics, University of Colorado Boulder
Spring 2020, Spring 2021, Spring 2022	Organizer , SIAM Front Range Student Conference
Fall 2019	Secretary , SIAM Chapter at University of Colorado Boulder
Fall 2018 - Summer 2019	Vice President , grill master, ski-trip organizer, Math Graduate Caucus, Simon Fraser University
Spring 2019	Councilor , Graduate Student Society, Simon Fraser University
Fall 2019 - Spring 2019	Committee Member , Internal Relations Committee, Teacher and Support Staff Union, Simon Fraser University

Awards & Scholarships

2022	Graduate Student Travel Award (MDS22)	SIAM
2019	Special Entrance Scholarship	UCB
2019	MSc Thesis Certificate with Distinction	SFU
2018	Best Poster Award	SFU Summer Research Symposium
2018	Graduate Fellowship	SFU
2017	Special Entrance Scholarship	SFU
2011-2015	Dean's Scholarship	UPS
2012-2014	Hoffman Construction Scholarship	UPS

Programming Languages

MATLAB, L^AT_EX, Git, Linux, Python, Mathematica

General Work Experience

Fall 2016-Summer 2017	Math and Physics Tutor	Fusion Math, Seattle, WA
Fall 2016-Summer 2017	IT Technician	Jet City IT, Seattle, WA
Summer 2016	Logistics Manager	Mountain Travel Sobek, Gustavus, AK
Summer 2015 - Spring 2016	Sales Representative	Reliable Credit Assoc., Federal Way, WA