Daniel Ames Messenger — September, 2022

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Education

August 2022	**PhD** Applied Mathematics	University of Colorado Boulder (CU)
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, CU; Supervisor: David Bortz
Summer 2020 - Summer 2022	**Research Assistant**, Department of Applied Mathematics, CU 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, 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, March 2022. arXiv: 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, CU Boulder
	APPM 7400 Teaching Excellend (Fall 2020)
2019 - 2020	**Teaching Assistant**
	Department of Applied Mathematics, CU Boulder
	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

2019	Special Entrance Scholarship ($5,000)	CU Boulder
2019	MSc Thesis Certificate with Distinction	SFU
2018	Best Poster Award	SFU Summer Research Symposium
2018	Graduate Fellowship ($6,500)	SFU
2017	Special Entrance Scholarship ($3,000)	SFU
2011-2015	Dean's Scholarship ($14,000 annually)	UPS
2012-2014	Hoffman Construction Scholarship ($2,000 annually)	UPS

Programming Languages

MATLAB, LaTeX, 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