NICK GALIOTO

ngalioto@umich.edu ◇ https://ngalioto.github.io ◇ https://github.com/ngalioto

EDUCATION

University of Michigan September 2018 - July 2023
PhD and MSE in Aerospace Engineering *Ann Arbor, MI*
Adviser: Alex Gorodetsky

Vanderbilt University August 2014 - May 2018
BE in Mechanical Engineering *Nashville, TN*
summa cum laude

EXPERIENCE

University of Michigan; Ann Arbor, MI July 2024 - Present
Postdoctoral Research Fellow – Computational Medicine and Bioinformatics *Rajapakse Lab*

- Leads development of a novel foundation model for genome-wide chromosome conformation capture (Hi-C) under the DARPA *TwinCell Blueprint* project
- Fine-tunes biological foundation models on an HPC cluster and performs downstream *in silico* perturbation experiments to investigate the efficacy of transcription factors for cell reprogramming
- Processes high-dimensional (20,000 dimensions) single-cell RNA sequencing data for unsupervised inference of experimental time points using methods based on diffusion maps
- Works within an interdisciplinary team spanning biologists, mathematicians, and engineers

University of Michigan; Ann Arbor, MI July 2023 - July 2024
Postdoctoral Research Fellow – Aerospace Engineering *Gorodetsky Lab*

- Researched generative AI models and simulation-based inference methods for efficient sampling and evaluation of conditional distributions with time-series data
- Created novel algorithms for probabilistic inference and then implemented them in PyTorch
- Mentored a PhD student on the project of detection and estimation of time-varying sensor manipulation using switching Kalman filters

Sandia National Laboratories; Livermore, CA May 2022 - August 2022
R&D Graduate Summer Intern *Computer Science Research Institute*

- Independently researched the applicability of functional tensor networks and variational inference for scalable Bayesian estimation of dynamical systems
- Implemented functional tensor-train and variational sampling algorithms using Python and Pyro and integrated them with pre-existing code
- Composed a peer-reviewed technical report detailing research findings, conclusions, and future work

TECHNICAL SKILLS

Proficient languages (research)	Python, MATLAB
Familiar languages (coursework)	C++, Java
Technologies	PyTorch, Pyro, Lightning, BioNeMo, GitHub

PUBLICATIONS

Mustaev, Artem, et al. "A switching Kalman filter approach to online mitigation and correction sensor corruption for inertial navigation." arXiv preprint arXiv:2412.06601 (2024).

Galioto, Nicholas, et al. "Bayesian identification of nonseparable Hamiltonians with multiplicative noise using deep learning and reduced-order modeling." Computer Methods in Applied Mechanics and Engineering 430 (2024): 117194.

Galioto, Nicholas, and Alex Arkady Gorodetsky. "Likelihood-based generalization of Markov parameter estimation and multiple shooting objectives in system identification." *Physica D: Nonlinear Phenomena* 462 (2024): 134146.

Sharma, Harsh, et al. "Bayesian identification of nonseparable Hamiltonian systems using stochastic dynamic models." *2022 IEEE 61st Conference on Decision and Control (CDC)*. IEEE, 2022.

Galioto, Nicholas, and Alex Arkady Gorodetsky. "A new objective for identification of partially observed linear time-invariant dynamical systems from input-output data." *Learning for Dynamics and Control*. PMLR, 2021.

Galioto, Nicholas, and Alex Arkady Gorodetsky. "Bayesian identification of Hamiltonian dynamics from symplectic data." *2020 59th IEEE Conference on Decision and Control (CDC)*. IEEE, 2020.

Galioto, Nicholas, and Alex Arkady Gorodetsky. "Bayesian system ID: Optimal management of parameter, model, and measurement uncertainty." *Nonlinear Dynamics* 102.1 (2020): 241-267..

CONFERENCE AND WORKSHOP PRESENTATIONS

"Discovery of cellular reprogramming methodology through single-cell foundation models." Frontiers in Scientific Machine Learning Lecture Series, 1 Nov. 2024, Ann Arbor, MI. Seminar.

"Simulation-based inference of dynamical systems with model uncertainty." 16th World Congress on Computational Mechanics, 24 July 2024, Vancouver, Canada. Conference.

"Correcting for error in reduced-order modeling using experimental partial observations and Bayesian system ID." SIAM Conference on Uncertainty Quantification, 28 Feb. 2024, Trieste, Italy. Conference.

"Learning partially observed stochastic dynamical systems." SIAM Conference on Mathematics of Data Science, 26 Sept. 2022, San Diego, CA. Conference presentation.

"Accounting for model uncertainty in the identification of partially known models." 8th European Congress on Computational Methods in Applied Sciences and Engineering, 9 June 2022, Oslo, Norway. Conference.

"Bayesian learning of stochastic dynamical models for quantities of interest." SIAM Conference on Uncertainty Quantification, 15 April, 2022, Atlanta, GA. Conference.

"Enforcing physical phenomena in system identification using Bayesian inference and stochastic models." Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering & Technology, 29 Sept. 2021, San Diego, CA. Conference.

"Accounting for model errors in probabilistic linear identification of nonlinear PDE systems." 16th U.S. National Congress on Computational Mechanics, 27 July 2021, Virtual. Conference.

"A new objective function for identification of partially observed LTI dynamical systems from input-output data." Learning for Dynamics & Control Conference, 8 June 2021, Virtual. Poster.

"Robust Bayesian inference by accounting for model error: with applications to Hamiltonian systems." SIAM Conference on Computational Science and Engineering, 4 March 2021, Virtual. Conference.

"Bayesian identification of Hamiltonian dynamics from symplectic data." 59th IEEE Conference on Decision and Control, 14 Dec. 2020, Virtual. Conference.

"Bayesian approaches for data-driven learning of dynamical systems." 3rd Physics Informed Machine Learning, 13 Jan. 2020, Santa Fe, NM. Poster.

TEACHING ASSISTANTSHIPS

University of Michigan, Ann Arbor *Ann Arbor, MI*

· AEROSP 567: Statistical inference, estimation and learning Fall 2020, 2021

Vanderbilt University *Nashville, TN*

· ME 3224: Fluid mechanics Fall 2017
· ME 4267: Aerospace propulsion Spring 2018

PROFESSIONAL SERVICE

Reviews

· Journal of Aerospace Information Systems
· Journal of Machine Learning for Modeling and Computing
· Journal of the Royal Society Interface
· IEEE Transactions on Automatic Control
· IEEE Conference on Decision and Control

Societal Membership

· United States Association for Computational Mechanics (USACM) 2021 - 2024
· Society for Industrial and Applied Mathematics (SIAM) 2021 - 2024
· Institute of Electrical and Electronics Engineers (IEEE) 2020 - 2024

SELECTED GRADUATE COURSEWORK

· MATH 525: Probability theory
· MATH 551: Introduction to real analysis
· MATH 558: Applied nonlinear dynamics
· MATH 571: Numerical linear algebra
· MATH 590: Introduction to topology
· EECS 550: Information theory
· EECS 598: Randomized numerical linear algebra for machine learning