Connor Robertson

(+1) 949-245-5236 | cnr.robertson@gmail.com | cnrrobertson.github.io | cnrrobertson | Connor Robertson

Education

PhD - Applied Mathematics *2018 - 2023*
New Jersey Institute of Technology

BS - Applied and Computational Mathematics *2011 - 2018*
Brigham Young University

Experience

Calibration of stochastic agent-based models for epidemiology *2023 -*
Postdoctoral researcher - Sandia National Laboratories *Livermore, CA*

Developing machine learning surrogate models to efficiently approximate the agent based models. Surrogates used to perform Bayesian inference or variational inference to calibrate model parameters. Includes time series analysis, random forests, gaussian processes, neural and universal differential equations, Markov chain monte carlo, and Stein variational inference.

Data-driven discovery of governing equations for active nematics *2019 - 2023*
Research Assistant - New Jersey Institute of Technology *Newark, NJ*

Discovering the governing partial differential equation of an active nematic system directly from experimental video. Includes image processing, numerical differentiation of noisy data, sparse regression, symbolic generation of differential terms, continuum models of active nematic liquid crystal systems, and pseudospectral PDE simulations.

Forecasting bacterial growth and interaction via recurrent neural networks *2021 - 2022*
Graduate Student Research Awardee (SCGSR) - Oak Ridge National Laboratory *Remote*

Using images of mutant and natural bacterial strains from the researchers at Oak Ridge National Lab, modified PredRNN recurrent network architecture to model and predict population and colony growth. Quantified quality of fit via various image and biological metrics. Included image processing, recurrent neural network architecture, and accelerating agent-based modeling approaches.

Water main break prediction for water utilities *2018*
Cofounder - Coventina LLC. *Provo, UT*

Developed machine learning toolkit used to forecast water main breaks for public works departments. Research and development consisted of data collection from various public and private sources, cleaning, imputation, regression analysis, tree-based model tuning, validation, and balance of physical models and machine learning predictions.

Determining optimal new facility locations via network theory *2017 - 2018*
Research Assistant - Brigham Young University *Provo, UT*

Undergraduate research team focused on applying mathematical concepts to new problems in society and industry. Projects include: Use of network theory and Markov Chains for facility location problems in operations research and utilizing statistical modeling to optimize infrastructure decisions for water access in developing countries.

Developing computational math curriculum *2016 - 2018*
Project Assistant - Brigham Young University *Provo, UT*

Editing and writing academic programming assignments in Python and managing lab computers and servers. Assignments include curriculum on: web scraping, serialization, noSQL, parallel processing techniques, Quasi-Newton optimization, and Arnoldi method for eigenvalue and eigenvector numerical computation.

Conferences

Talks

Bayesian Calibration of Stochastic Agent Based Model via PCA Based Surrogate Modeling *2024*
SIAM Conference on Uncertainty Quantification *Trieste, Italy*

Data-driven continuum modeling of active nematics via sparse identification of nonlinear dynamics *2023*
SIAM Conference on Computational Science and Engineering *Amsterdam, Netherlands*

Data-driven continuum modeling of active nematics via sparse identification of nonlinear dynamics *2022*
Annual Meeting of the APS Division of Fluid Dynamics (APS DFD) *Indianapolis, Indiana*

Data-driven continuum modeling of active nematics via sparse identification of nonlinear dynamics *2022*
Annual Meeting of the American Physical Society (APS March) *Chicago, Illinois*

Neural networks for function approximation and data-driven modeling *2021*
Machine Learning and Optimization Seminar - Department of Mathematical Sciences NJIT *Newark, New Jersey*

Facility location using Markov chains *2018*
CPMS Student Research Conference - Brigham Young University *Provo, Utah*

Efficiency of Water Distribution in Water Poor Areas of the World *2017*
Student Days - SIAM Annual Meeting *Pittsburgh, Pennsylvania*

Posters

National Academy of Inventors - NJIT Chapter Workshop *2022*
Data-driven discovery of PDEs for active nematic systems *Newark, New Jersey*

GAMM Juniors' Summer School *2020*
Discovering governing equations of an active nematic system using PDE-Find *(virtual) Magdeburg, Germany*

Frontiers in Applied and Computational Mathematics *2019*
Aligning Self-Propelling Particles in Non-trivial Domains *Newark, New Jersey*

Seminar Organization

Department of Mathematical Sciences - NJIT *2022 - 2023*
Machine Learning and Optimization Seminar Chair *Newark, New Jersey*

Click here to see more information about the seminar or see my website.

Honors

2023 **Outstanding Graduate Student Award**, College of Science and Liberal Arts - NJIT
2023 **Chair: Machine Learning & Optimization Seminar**, Department of Mathematical Sciences - NJIT
2023 **DSECOP Fellow**, Data Science Education Community of Practice - APS
2021 **Graduate Student Research Award (SCGSR)**, US Department of Energy - ORNL (remote)
2021 **Ahluwalia Doctoral Fellowship**, Deparment of Mathematical Sciences - NJIT
2020 **(Honorable mention) Graduate Research Fellowship Program**, National Science Foundation

Qualifications and Skills

Clearance	Department of Energy Q-level
Programming Languages	**Python**, **Julia**, Matlab, R, Mathematica, C++
Project Keywords	Time series analysis, Bayesian inference, Variational inference, Neural ODEs, differentiation of noisy data, sparse basis pursuit and regression, recurrent neural networks for image prediction, pseudospectral PDE solvers, Markov chains for NLP, optimization (simplex method, Newton's method, varieties of gradient descent, etc.), simple facial recognition, numerical solvers for ODES, and various applications of machine learning algorithms
Spoken Languages	**English**, Spanish

Professional Associations

Society for Industrial and Applied Mathematics *2017 -*
American Physical Society *2022 - 2024*

Publications

Performing Video Frame Prediction of Microbial Growth with a Recurrent Neural Network *2023*
Frontiers in Microbiology: Systems Microbiology *Click to open*

Investigating the growth of an engineered strain of Cyanobacteria with an Agent-Based Model and a Recurrent Neural Network *2021*
bioRxiv *Click to open*

Using Survey Data and Mathematical Modeling to Prioritize Water Interventions in Developing Countries *2021*
Water Resource Management *Click to open*