

# Connor Robertson

email: cnr.robertson@gmail.com

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## Education

**PhD - Applied Mathematics**

*New Jersey Institute of Technology*

*August 2018 - Present*

**B.S. - Applied and Computational Mathematics**

*Brigham Young University*

*August 2011 - May 2018*

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## Research Experience

**Discovering governing equations for active nematics from data**

*September '19 - Present*

*Research Assistant - New Jersey Institute of Technology - Newark, New Jersey*

*Advisors: Travis Askham, Anand Oza*

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

**Modeling two-species bacteria interaction via recurrent neural networks**

*September '19 - Present*

*Research Award - Oak Ridge National Laboratory - Oak Ridge, Tennessee*

*Mentor: Miguel Fuentes-Cabrera*

Using images of mutant and natural bacterial strains from the researchers at Oak Ridge National Lab, adjusted PredRNN architecture to model and predict population and colony growth. Focus on image processing, neural network architecture, and accelerating agent-based modeling approaches

**Forecasting water main breaks from data**

*March '18 - December '18*

*Cofounder - Coventina LLC - Provo, Utah*

Developed statistics and machine learning toolkit used to forecast water main breaks for public works departments. Research and development comprised of data collection, cleaning, imputation, regression analysis, model building and validating

**Determining optimal new facility location via network theory**

*March '17 - May '18*

*Research Assistant - Brigham Young University - Provo, Utah*

Undergraduate research team focused on applying new mathematical concepts to problems in society and industry. Projects include: Use of network theory and Markov Chains for facility location problems in operations research and utilizing data science tools in optimizing improvements in water access in developing countries

**Developing computational math curriculum**

*September '17 - May '18*

*Project Assistant - Brigham Young University - Provo, Utah*

Editing and writing academic programming assignments in Python and managing lab computer and servers. Assignments include curriculum on: Web Scraping, Serialization, NoSQL DBMS, parallel processing techniques, quasi-newton optimization, and numerical Arnoldi method for eigenvalue and eigenvector computation

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## Conference Participation

- Talk: Data-driven continuum modeling of active nematics via sparse identification of nonlinear dynamics* March 2022  
APS March - Chicago, Illinois
- Talk: Neural networks for function approximation and data-driven modeling* October 2021  
Department of Mathematics Machine Learning and Optimization Seminar - NJIT, New Jersey
- Poster: Discovering governing equation of an active nematic system using PDE-Find* August 2020  
GAMM Juniors' Summer School - Magdeburg, Germany
- Poster: Aligning Self-Propelling Particles in Non-Trivial Domains* May 2019  
Frontiers in Applied and Computational Mathematics - Newark, New Jersey
- Talk: Facility location using Markov chains* March 2018  
CPMS Student Research Conference - Brigham Young University - Provo, Utah
- Talk: Efficiency of Water Distribution in Water Poor Areas of the World* July 2017  
Student Days - SIAM Annual Meeting - Pittsburgh, Pennsylvania
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## Honors and Awards

- Graduate Student Research Award (SCGSR) - Department of Energy* 2021
- Ahluwalia Doctoral Fellowship - Department of Mathematical Sciences (NJIT)* 2021
- Honorable mention - NSF Graduate Research Fellowship Program* 2020
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## Teaching Experience

- Teaching Assistant - New Jersey Institute of Technology - Newark, New Jersey*
- Math 111, 238 - Calculus
  - Math 340, 391 - Numerical Methods and Linear Algebra
  - Math 631 - Graduate Linear Algebra
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## Professional Associations

- Member - Society for Industrial and Applied Mathematics (SIAM)* 2017 - Present
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## Qualifications and Skills

### Programming

*In order of experience:* Python, Julia, Matlab, C++, Mathematica, HTML/CSS

Educational projects include: noisy differentiation methods, sparse basis pursuit and regression, facial recognition, signal processing with Fourier transforms, markov chains for NLP, optimization (Simplex Method, Newton's Method, etc.), data processing tools, implementation of numerical solvers for ODEs, PDEs, and various applications of machine learning algorithms

### Language

- English (native)
  - Spanish (fluent)
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## Publications

*Performing Video Frame Prediction of Microbial Growth with a Recurrent Neural Network. arXiv (2022).* <https://doi.org/10.48550/arXiv.2205.05810>

*Investigating the growth of an engineered strain of Cyanobacteria with an Agent-Based Model and a Recurrent Neural Network. bioRxiv (2021).* <https://doi.org/10.1101/2021.10.11.463942>

*Using Survey Data and Mathematical Modeling to Prioritize Water Interventions in Developing Countries. Water Resource Management (2021).* <https://doi.org/10.1007/s11269-020-02761-8>