

# John T. Nardini

Assistant Professor  
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## Academic appointments

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<b>The College of New Jersey</b> , Ewing, NJ Assistant Professor of Mathematics	2021-present
<b>N. C. State University</b> , Raleigh, NC Postdoctoral Scholar	2018-2021
<b>Statistical and Applied Mathematical Science Institute (SAMSI)</b> , Durham, NC Postdoctoral Scholar (Joint)	2018-2020

## Education

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<b>University of Colorado</b> Boulder, CO Ph.D., Applied Mathematics Dissertation Title: PDE Models of Collective Migration During Wound Healing Adviser: David M. Bortz Certificate in Interdisciplinary Quantitative Biology	2018
<b>University of Colorado</b> , Boulder, CO M.S., Applied Mathematics	2016
<b>N.C. State University</b> , Raleigh, NC B.S., Mathematics	2013

## Research Interests

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Data-driven Mathematical Modeling, Analysis and Simulation of Partial Differential Equations, Agent-based Models, Machine Learning, Topological Data Analysis

## Grants and Awards

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<b>AMS-Simons Travel Grant (\$5,000)</b> <i>American Mathematical Society</i> Funding to aid in travel for research collaboration	2020-22
<b>Professional Development Award (\$698)</b> <i>NC State University Graduate School and the Office of Postdoctoral Affairs</i> Funding to develop innovative metacognitive approaches for undergraduate classrooms	2019-20
<b>SAMSI Postdoctoral Fellowship (\$130,000)</b> <i>National Science Foundation</i> Fellowship on SAMSI's program on precision medicine	2018-20

## Research Publications

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Peer-reviewed articles (\*denotes undergraduate co-author, †denotes equal contribution)

14. **J. Nardini**, C. Pugh\*, H. Byrne. Statistical and topological summaries aid disease detection for segmented retinal vascular images. *Microcirculation* 30 (4) 2023. DOI: 10.1111/micc.12799.
13. **J. Nardini**, B. Stolz, H. Harrington, K. Flores, H. Byrne. Topological data analysis distinguishes parameter regimes in the Anderson-Chaplain model of angiogenesis. *PLoS Computational Biology* 17 (6) 2021. DOI: 10.1371/journal.pcbi.1009094.
12. **J. Nardini**, R. Baker, M. Simpson, K. Flores. Learning differential equation models from stochastic agent-based model simulations. *Journal of the Royal Society Interface* 18 (176) 2021. DOI: 10.1098/rsif.2020.0987.
11. J. Lagergren, **J. Nardini**, R. Baker, M. Simpson, K. Flores. Biologically-informed Neural Networks Guide Mechanistic Modeling from Sparse Experimental Data. *PLoS Computational Biology*. 16 (12) 2020. DOI: 10.1371/journal.pcbi.1008462.
10. **J. Nardini**, J. Lagergren, E. Rutter, A. Hawkins-Daarud, L. Curtin, B. Chandler, K. Swanson, K. Flores. Learning Equations from Biological data with Limited Time Samples. *Bulletin of Mathematical Biology* 82 (119) 2020. DOI: 10.1007/s11538-020-00794-z
9. R. Everett, K. Flores, N. Henscheid, J. Lagergren, K. Larripa, D. Li, **J. Nardini**, P. Nguyen, E. B. Pittman, E. Rutter. A tutorial Review of Mathematical Techniques for Quantifying Tumor Heterogeneity. *Mathematical Biosciences and Engineering*. 17(4), 2020. DOI: 10.3934/mbe.2020207.
8. J. Lagergren†, **J. Nardini**†, G. M. Lavigne, E. M. Rutter, K. B. Flores. Learning Partial Differential Equation Models from Noisy Spatiotemporal Data. *Proceedings of the Royal Society A* 476 (2234), 2020. DOI: 10.1098/rspa.2019.0800.
7. D. Bhaskar, A. Manhart, J. Milzman, **J. Nardini**, K. Storey, C. M. Topaz, L. Ziegelmeier. Analyzing Collective Motion with Machine Learning and Topology. *Chaos: an Interdisciplinary Journal of Nonlinear Science* 29 (12) 123125, 2019. DOI: 10.1063/1.5125493.
6. **J. Nardini**, D. M. Bortz. The influence of numerical error on parameter estimation and uncertainty quantification for advective PDE models. *Inverse Problems* 35 (6) 065003, 2019. DOI: 10.1088/1361-6420/ab10bb.
5. **J. Nardini**, D. M. Bortz. Investigation of a Structured Fisher's Equation with Applications in Biochemistry. *SIAM Journal on Applied Mathematics* 78 (3) 1712, 2018. DOI: 10.1137/16M1108546.
4. **J. Nardini**, D. Chapnick, X. Liu, D. M. Bortz. Modeling keratinocyte wound healing dynamics: cell-cell adhesion promotes sustained collective migration. *Journal of Theoretical Biology* 7 July 2016, 103. DOI: 10.1016/j.jtbi.2016.04.015.
3. K. Adoteye, R. Baraldi, K. Flores, **J. Nardini**, H. T. Banks, W. C. Thompson. Correlation of parameter estimators for models admitting multiple parameterizations. *International Journal of Pure and Applied Mathematics*, 105(3) 497, 2015. DOI: 10.12732/ijpam.v105i3.16.
2. T. Huffman, K. Link, **J. Nardini**, L. Poag, K. Flores, H.T. Banks, B. Biasco, J. Jungfleisch, J. Diez. A mathematical model of RNA3 recruitment in the replication cycle of brome mosaic virus. *International Journal of Pure and Applied Mathematics*, 92(1) 27, 2014. DOI: 10.12732/ijpam.v92i1.3.
1. H.T. Banks, A. Choi, T. Huffman, **J. Nardini**, L. Poag, W.C. Thompson. Quantifying CFSE label decay in flow cytometry data. *Applied Mathematics Letters*, 26(5) 571, 2013. DOI: 10.1016/j.aml.2012.12.010

## Pedagogical Publications

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Book chapters (Not peer-reviewed)

1. **J. Nardini**. Trusting Students with Flexible Deadlines, pp. 88 - 96. In Practice and Policies: Advocating for Students of Color in Mathematics, P. E. Harris and A. Winger, independently published, 2021.

## Teaching Experience

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### Course Instructor

Calculus I for Engineers, APPM 1350 (CU Boulder)	Summer 2017
Calculus for Life and Management Sciences A, MA 131 (NCSU)	Fall 2019
Foundations of Advanced Mathematics, MA 225 (NCSU)	Spring 2020, Fall 2020
Applied Differential Equations, MA 341 (NCSU)	Spring 2021
Calculus A, MAT 127 (TCNJ)	Fall 2021, Fall 2022, Fall 2023
Linear Algebra: Theory and Applications, MAT 205 (TCNJ)	Spring 2022
Computational Mathematics, MAT 341 (TCNJ)	Fall 2023

### Peer Scholar Groups

AMS Project NExT <i>Professional development program incorporating inclusive teaching methods into math classrooms.</i>	2020-21
TRESTLE Faculty Learning Community on metacognition <i>Met weekly with group of scholars to discuss methods to promote metacognition in the classroom.</i>	Spring 2017

## Mentoring Experience

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### Undergraduate Research

Eddie Rohr <i>"Computational summaries of tumor spheroids"</i>	2023-present
Alexa Karamanoogian <i>"Mathematical models of enzyme kinetics"</i>	2022-present
Charlie Pugh <i>"Applying TDA to Retinal Vasculature Segmentations"</i>	2021-2022
Allison Duprey, Fanuel Sisay, Natasha Stewart, and Yangxinyu Xie <i>"Sampling for Equation Learning Methods"</i>	Summer 2019

### Graduate Research

Carter Jameson <i>"Using Topology and Machine Learning to Aid Parameter Estimation of Cell Microscopy Models"</i>	2020 - 2021
Mike Ackermann, Jorge Arroyo Esquivel, Jake Cherry, Jimi Kim, Ruby Kim, Natalie Meacham <i>"Learning Equations from Stochastic Agent-based Model Simulations"</i>	Summer 2021

## Invited Talks

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<b>"Statistical and Topological Summaries Aid Disease Detection for Segmented Retinal Vascular Images"</b>	
Society for Mathematical Biology Annual Meetings, Columbus, OH	July 2023
SIAM Conference on the Life Sciences, Pittsburgh, PA	July 2022
<b>"Workshop on Data-driven Mathematical Modeling"</b>	
SIAM Conference on the Life Sciences, Pittsburgh, PA	July 2022
<b>"Data-driven modeling for noisy biological data and agent-based Models"</b>	
U. Florida Systems Medicine Seminar, held virtually	April 2021
<b>"Topology Discriminates Models of Angiogenesis"</b>	
Maathfest, Philadelphia, PA	August 2022
TCNJ School of Science Colloquium, Ewing NJ	November 2021
Society for Mathematical Biology Annual Meetings, held virtually	July 2021
U. Nottingham Mathematical Medicine and Biology Virtual Seminar, held virtually	March 2021
AMS-MAA Joint Math Meetings session, held virtually	January 2021
Second Symposium on Machine Learning and Dynamical Systems, held virtually	September 2020

## Invited Talks (cont.)

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<b>“Learning Equations from Biological Data with Limited Time Samples”</b>	
University of Colorado, Boulder Biomath Seminar, held virtually	November 2020
Data Science, Statistics, and Visualization Conference, held virtually	July 2020
SIAM Conference on the Life Sciences, cancelled due to Covid-19	June 2020
SIAM Conference on the Mathematics of Data Science, held virtually	June 2020
<b>“Analyzing Collective Motion with Machine Learning and Topology”</b>	
Society for Mathematical Biology Annual Meetings, held virtually	August 2020
University of Oxford Mathematical Biology Seminar, Oxford, U.K.	February 2020
International Conference on Industrial and Applied Mathematics, Valencia, Spain	July 2019
<b>“Learning PDE Models from Noisy Spatiotemporal Data”</b>	
Society for Mathematical Biology Annual Meetings, Montreal, Canada	July 2019
International Conference on Industrial and Applied Mathematics, Valencia, Spain	July 2019
VCU Biomath Seminar, Richmond, VA	April 2019
<b>“Parameter Estimation and Uncertainty Quantification in the Presence of Numerical Error”</b>	
NCSU Tutorial Workshop on Parameter Estimation for Biological Models, Raleigh, NC	July 2019
<b>“A Stage-structured Fisher’s Equation with Applications in Biochemistry”</b>	
SIAM Central States Section Meetings, Fort Collins, CO	October 2017
Society for Mathematical Biology Annual Meetings, Salt Lake City, UT	July 2017
<b>“Modeling Wound Healing: Cell-Cell Adhesion Promotes Collective Migration”</b>	
SIAM Meeting on the Life Sciences, Boston, MA	July 2016
Society for Mathematical Biology Annual Meetings, Atlanta, GA	July 2015

## Pedagogical Talks and Outreach

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<b>“How to apply to and thrive in quantitative biology REUs”</b>	
Post in the AMS E-mentoring Network in the Mathematical Science blog	November 2021
<b>“Topological data analysis for an angiogenesis ABM”</b>	
Speaker in Southeast Center for Mathematical Biology’s Modeling Accelerator undergraduate research program.	June 2021
<b>“Machine Learning and Math Modelling of Wound Healing”</b>	
Featured on the Pod of Asclepius podcast	June 2020
<b>“From Homework to Home Work”</b>	
Interviewed on my virtual teaching experience during COVID-19 for the Against the Grain blog	May 2020
<b>“The Topology of Data”</b>	
Lecture at the NCSU SUM Series for Undergraduates, Raleigh, NC	November 2019
<b>“Introduction to Data Science: Classifying Flocks in Biology”</b>	
Plenary lecture at NC Central University’s “Black Men in STEM” Event Durham, NC	April 2019
<b>“The Mathematics Underlying Cell Migration During Wound Healing”</b>	
Lecture at the Wake Technical Community College STEM Center Speaker Series, Raleigh, NC	January 2019
<b>“Mathematical Modeling for Precision Medicine”</b>	
Tutorial at the SAMSI Undergraduate Workshop on Precision Medicine, Durham, NC	October 2018

## **Pedagogical Talks and Outreach (cont.)**

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### **“Inverse Problems for Precision Medicine”**

Developed and lead hands-on project at the SAMSI Undergraduate Workshop on Precision Medicine, Durham, NC October 2018

### **“2018 Graduation Special (Part 1)”**

Featured on the How On Earth Podcast May 2018

## **Conference Organizing**

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### **Data-Driven Mathematical Modeling** (with Kevin Flores and Erica Rutter)

Minisymposium Organizer at SMB Annual Meetings, Columbus, OH July 2023

### **Combining Topological, Data-Driven, and Modeling Perspectives for Complex Biological Systems** (with Veronica Ciocanel and Alexandria Volkening)

Minisymposium Organizer at SIAM conference on the Life Sciences, Pittsburgh, PA July 2022

### **Combining Modeling and Inference in Cell Biology** (with Veronica Ciocanel)

Minisymposium Organizer at SMB annual Meetings, held Virtually July 2021

### **e-Society of Mathematical Biology (SMB) Annual Meetings 2020**

Served on the Organizing Committee and coordinated the mentoring program and scheduling for a virtual conference, held virtually August 2020

### **Topological and Network Analyses for Data** (with Veronica Ciocanel)

Minisymposium Organizer at SMB annual Meetings, held Virtually August 2020

### **Leveraging Machine Learning for Discovery of Mathematical Models in Biology**

(with John Lagergren and Kevin Flores) Minisymposium Organizer at SIAM Conference on the Mathematics of Data Science, held Virtually June 2020

### **Data-Driven Mathematical Models of Cell Migration** (with Erica Rutter and Kevin Flores)

Minisymposium Organizer at International Conference on Industrial and Applied Mathematics, Valencia, Spain July 2019

### **NCSU Postdoctoral Research Symposium**

Co-organizer for postdoctoral research symposium at NC State, Raleigh, NC May 2019

### **Stage-structured Populations Models in Biology** (with David Bortz)

Minisymposium Organizer at SMB Annual Meetings, Salt Lake City, UT July 2017

### **Quantitative Biology Symposium: Systems Biology in the Context of Aging and Disease**

Co-organizer for student symposium at University of Colorado, Boulder, CO May 2017

### **Migration and Signaling Waves in Cellular Biology** (with David Bortz)

Minisymposium Organizer at SMB Annual Meetings, Atlanta, GA July 2015

## **Outreach and Service**

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### Departmental

TCNJ Mathematics and Statistics Bachelor of Arts Committee 2022

TCNJ Mathematics and Statistics Mid-level Curriculum Committee 2022

TCNJ Mathematics and Statistics Department Colloquium organizer 2021 - present

TCNJ Applied Mathematics Committee 2021 - 2022

TCNJ Statistics Committee 2021 - 2022

## Outreach and Service (cont.)

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To the field

Reviewer for: *Bulletin of Mathematical Biology*, *Journal of Theoretical Biology*, *Inverse Problems*, *Nature Computational Science*, *Engineering Computations*, *PLOS One*, *Heliyon*, *SIAM Undergraduate Research Online*.

Guest editor for <i>Bulletin of Mathematical Biology</i> 's special issue on "Data-driven mathematical modeling."	2022-2023
SMB Methods for Biological Modeling subgroup co-chair	2019 - present
Participated in professional development panels for:	
- SAMSI undergraduate workshop on Methods of Uncertainty	February 2019
- SAMSI undergraduate workshop on Precision Medicine	October 2018
Poster Judge, Joint Math Meeting Undergraduate Poster Session	January 2019
Mentor, SMB Annual Meetings,	July 2019, August 2020, July 2021