

# Nicole Buczkowski

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## WORK EXPERIENCE

**Worcester Polytechnic Institute**, Worcester, Massachusetts

- Postdoctoral Scholar Fall 2022-Present
  - Advisers: Christopher Larsen and Guanying Peng
  - Research Interests: nonlocal models, peridynamics, differential equations, calculus of variations

## EDUCATION

**University of Nebraska-Lincoln**, Lincoln, Nebraska

- PhD in Mathematics Summer 2022
  - Advisers: Mikil Foss and Petronela Radu
  - Dissertation: Continuous Dependence of Solutions to Nonlocal Systems with Heterogeneous Kernels of Interaction
- MS in Mathematics S 2019

**Jacksonville University**, Jacksonville, Florida

- BS in Mathematics and Mechanical Engineering F 2013-S 2017
  - Minor in History
  - 3.9 Cumulative GPA (Summa Cum Laude)

## RESEARCH PUBLICATIONS

3. N. Buczkowski, M. Foss, M. Parks, P. Radu 2022, *Sensitivity analysis for solutions to heterogeneous nonlocal systems*. Journal of Peridynamics and Nonlocal Modeling: pp 1-31.
2. N.E. Buczkowski, M.D. Foss, M.L. Parks, J. Trageser, and P. Radu *Two Nonlocal Biharmonic Operators*, in Computer Science Research Institute Summer Proceedings 2021, J.D. Smith and E. Galvan, eds., Technical Report SAND2022-0653R, Sandia National Laboratories, 2021, pp. 3–15.
1. N.E. Buczkowski, M. D’Elia and M.L. Parks, *Nonlocal Physics-Informed Neural Networks*, in Computer Science Research Institute Summer Proceedings 2019, M. Powell and M.L. Parks, eds., Technical Report SAND2020-9969R, Sandia National Laboratories, 2020, pp. 29–40.

## OTHER ASSORTED WRITINGS

2. (submitted) N. Buczkowski, M. Foss, P. Radu, *An Increasingly Nonlocal Life*, in Snapshots of modern mathematics from Oberwolfach, 2024.
1. N. Buczkowski, *Highlighting Women in Mathematics*, Curriculum Resource, Licensed under Creative Commons BY Attribution 4.0 International, 2023.

## OTHER RESEARCH EXPERIENCE

### Current Research

- (Manuscript In-Preparation.) N. Buczkowski, M. Foss, M. Parks, P. Radu, J. Trageser *Theoretical and Numerical Studies of Two Nonlocal Biharmonic Operators with Clamped Boundary Conditions*.
- (In Progress) A. Biswas, N. Buczkowski, M. Foss *Convergence of a Class of Nonlocal Operators to their Classical Counterparts*

### Graduate Research

- Summer Internship with Sandia, supported by the NSF Summer 2021
  - Studied Nonlocal Biharmonic Operators
  - Advisers: Michael Parks and Jeremy Trageser
- Summer Internship at Sandia, supported by the NSF Summer 2019
  - Studied Nonlocal Physics-Informed Neural Networks
  - Advisers: Marta D’Elia and Michael Parks

## Undergraduate Research

- Research Experience for Undergraduates at Grand Valley State University Summer 2016
  - Studied the Mathematics of Lottery Voting
  - Advisor: Jonathon Hodge

## TEACHING EXPERIENCE

### Instructor of Record at WPI

- MA 2051 Ordinary Differential Equations (1 section)
- MA 1024 Calculus IV (2 sections)
- MA 1023 Calculus III (5 sections)
- MA 1022 Calculus II (6 sections)

### Instructor of Record at UNL

- Math 301 Geometry for Elementary School Teachers (1 section)
- Math 221 Ordinary Differential Equations (1 section)
- Math 203 Contemporary Mathematics (1 section)
- Math 103 College Algebra and Trigonometry (1 section)
- Math 102 Trigonometry (2 sections)
- Math 101 College Algebra (4 sections)

### Recitation Instructor at UNL

- Math 107R Calculus II Recitation (4 sections)

### Miscellaneous Teaching Opportunities at UNL

- Computing Skills Workshop Organizer F 2020
- Math 104 Applied Calculus Grader F 2020, 2021
- First Year Math Graduate Student Orientation Coordinator Summer 2019, 2020
- Math 101 Associate Convenor F 2019, S 2020
- Math Resource Center Counselor
- Math Day Volunteer- Facilitator, Moderator, Proctor, and Setup Crew F 2017, 2018, 2019, 2020, 2021

**INVITED TALKS AT CONFERENCES** *Upcoming, in AMS Eastern Sectional Meeting at the University of Albany Albany, New York Oct 2024.*

Comparing two nonlocal biharmonic operators, in *WCCM 2024/PANACM 2024* Vancouver, Canada Jul 2024.

Aspects of Two Nonlocal Biharmonic Operators, in *PDE in Moab 2024* Moab, Utah Jun 2024.

Solution Sensitivity for Nonlocal Systems with Heterogeneous Kernels, in *AMS Special Session at the University of Wisconsin-Milwaukee* Milwaukee, Wisconsin Apr 2024.

Aspects of Nonlocal Biharmonic Operators with Clamped Boundary Conditions, in *Fracture as an Emergent Phenomenon* Oberwolfach, Germany Jan 2024.

Continuous dependence of solutions to nonlocal systems, in *Rising Stars in Computational and Data Sciences* Austin, Texas Apr 2023.

Stability of solutions to nonlocal systems with heterogeneous kernels, in *Theoretical and Applied Aspects for Nonlocal Models* Banff Centre, Alberta, Ca Jul 2022.

Continuous dependence for nonlocal models with respect to changes in data, in *Prairie Analysis Seminar Virtual* (Manhattan, Kansas) Nov 2021.

Stability of solutions to nonlocal models with respect to changes in data, in *KUMUNU-ISU* Lincoln, Nebraska Oct 2021.

Comparing and contrasting two nonlocal biharmonic operators, in *Fall Central Sectional Meeting Virtual* (Omaha, Nebraska) Oct 2021.

Continuity with Respect to Data and Stability due to changes in parameters of Nonlocal Models, in *16th U.S. National Congress on Computational Mechanics Virtual* (Chicago, Illinois) Jul 2021.

Continuous Dependence for Nonlocal Systems, in *One Nonlocal World Virtual* Jan 2021.

**CONTRIBUTED  
TALKS AT  
CONFERENCES**

- Upcoming*, in *Joint Mathematics Meetings* Seattle, Washington Jan 2025.
- Comparing Two Nonlocal Biharmonic Operators with Clamped Boundary Conditions, in *SIAM Conference on Materials Science* Pittsburgh, Pennsylvania May 2024.
- Comparing Two Nonlocal Biharmonic Operators, in *Joint Mathematics Meetings* Boston, Massachusetts Jan 2023.
- Solution sensitivity on data parameters for nonlocal systems, in *Joint Mathematics Meetings* Virtual (Seattle, Washington) Apr 2022.
- Solution sensitivity on data parameters for nonlocal systems, in *AWM at SIAM* Virtual Jul 2021.
- Nonlocal Physics-Informed Neural Networks, in *SIAM Central States Sectional* Ames, Iowa, Oct 2019.
- Drones in Firefighting (with C. Carter, K. Crews, T. Clark, M. Espinal, and J. Summers), in *National Conference on Undergraduate Research*, Memphis, Tennessee, Apr 2017.
- Drones in Firefighting (with C. Carter and J. Summers), in *Florida Collegiate Honors Council Conference*, Jacksonville, Florida, Feb 2017.
- Lottery Voting (with S.Thrash), in *Joint Mathematics Meetings*, Atlanta, Georgia, Jan 2017.
- Lottery Voting (with S.Thrash), in *Mathfest*, Columbus, Ohio, Aug 2016.
- Lottery Voting (with S.Thrash), in *Summer Undergraduate Michigan Mathematics Research Conference*, Dearborn, Michigan, Jul 2016.

**INVITED TALKS AT  
OTHER  
INSTITUTIONS**

- Two Nonlocal Biharmonic Operators and their respective boundary conditions at *University of Nebraska-Lincoln* Lincoln, Nebraska Feb 2024.
- Comparing Two Nonlocal Biharmonic Operators at *Oak Ridge National Laboratories* Oak Ridge, Tennessee Aug 2023.
- Continuous dependence of solutions with respect to changes in data and parameters of nonlocal models at *University of Connecticut* Mansfield, Connecticut Feb 2023.
- Convergencia del laplaciano no local a el laplaciano clásico in *Matemáticas at University of Nebraska-Lincoln*, Oct 2022.
- Properties for Solutions to Integral and Differential Equations at *Wayne State College* Wayne, Nebraska Oct 2021.
- Properties for Solutions to Integral and Differential Equations at *Metropolitan State University* Denver, Colorado, Apr 2021.
- Dependence on data and parameters for solutions of nonlocal systems at *Kansas State University* Manhattan, Kansas, Mar 2021.
- Stability of solutions with respect to changes in data and parameters of nonlocal models at *Iowa State University* Ames, Iowa, Mar 2021.
- Nonlocal Euler-Lagrange Equations at *Iowa State University* Ames, Iowa, Feb 2020.

**TALKS AT WPI**

- An Introduction to Physics-Informed Neural Networks in *Scientific Machine Learning Reading Group*, Sep 2024.
- Convergence of Nonlocal Operators to Classical Operators in *Analysis and PDE Seminar*, Sep 2024.
- An Introduction to Physics-Informed Neural Networks in *Machine Learning in Maths Seminar*, Apr 2024.
- Comparing and Contrasting Two Nonlocal Biharmonic Operators in *Analysis and PDE Seminar*, Sep 2023.
- Graduate Student Internships and Introduction to Nonlocal Models in *Faculty Lunch Talk*, Apr 2023.
- More applications of the stability of solutions to nonlocal models with respect to changes in data in *Analysis and PDE Seminar*, Sep 2022.
- Stability of solutions to nonlocal models with respect to changes in data and parameters in *Mathematical Sciences Department Colloquium*, Sep 2022.

**TALKS AT UNL AS A GRADUATE STUDENT**

Continuous Dependence for the Classical and Nonlocal Laplacians in *Nonlocal Modeling Student Reading Seminar*, Mar 2022.

Creating Illustrative Examples in *Teaching Round Table*, Feb 2022.

Continuous Dependence for the Classical and Nonlocal Laplacians in *Graduate Student Seminar*, Feb 2022.

Scaling of the Nonlocal Laplacian to Converge to the Classical Laplacian in *Nonlocal Modeling Student Reading Seminar*, Jan 2022.

How STEM instructors can build more inclusive classrooms in *Diversity, Equity, and Inclusion Seminar*, Nov 2021.

Peridynamic J-Integral in *Continuum Mechanics Seminar*, Aug 2021.

EDPs y modelos no locales in *Matemáticas*, Feb 2021.

Local and Nonlocal Energy Minimization in *Graduate Student Seminar*, Nov 2020.

Women in Math History in *Matemáticas*, Oct 2020.

Intro. to Dual Spaces, Sobolev Spaces, and Weak Derivatives in *Student PDE Seminar*, Sep 2020.

Stability of Nonlocal Poisson Boundary Value Problems in *Continuum Mechanics Seminar*, Sep 2020.

Energy Minimization in *Matemáticas* Apr 2020.

Functional Differential Equations in *Student Partial Differential Equations Seminar* Mar 2020.

Early History of Numbers in *Matemáticas*, Feb 2020.

History of PDEs in *PDE Seminar*, Jan 2020.

Harnack's Inequality in *PDE Seminar*, Dec 2019.

Physics-Informed Neural Networks in *Continuum Mechanics Seminar*, Oct 2019.

Introduction to Neural Networks in *Matemáticas*, Sep 2019.

Introduction to Neural Networks in *Graduate Student Seminar*, Nov 2019.

Local and Nonlocal Dirichlet's Principle in *Graduate Student Seminar*, Feb 2019.

Semigroup Methods in *Student PDE Seminar*, Nov 2018.

Local and Nonlocal Dirichlet's Principle in *Continuum Mechanics Seminar*, Oct 2018.

Introduction to Stochastic Partial Differential Equations in *PDE Seminar*, Sep 2018.

Local and Nonlocal Dirichlet's Principle in *Mathematical Literature*, Jun 2018.

**GRANTS**

- Empower Grant for OER Adaptation Fellowship S 2023

**AWARDS & SCHOLARSHIPS**

- Morgan Pedagogy Champion F 2024-S 2025  
Awarded to help bring Universal Design for Learning to the Math Department at WPI
- Amy Bouska GTA Leadership Award F 2020  
Awarded for leadership in service to the UNL Math Department
- Engineering Student Scholarship Recipient sponsored by the Florida Engineering Society S 2017  
Awarded for involvement in engineering
- Jacksonville University Renaissance Student of the Year S 2017  
Awarded for involvement in the STEM and the arts
- Phi Beta Kappa Alumni Association Scholarship Recipient S 2016  
Awarded for involvement in the liberal arts
- Jacksonville University Mathematics Student of the Year S 2016
- Honorable Mention in Mathematical Contest in Modeling S 2017  
Created and tested a model for replacing the Kariba Dam
- Honorable Mention in Mathematical Contest in Modeling S 2015  
Created and tested a model for the distribution of a medicine to combat Ebola
- Honorable Mention in Mathematical Contest in Modeling S 2014  
Created and tested a model for ranking college coaches
- Jacksonville University Honors Program Full Tuition Scholarship F 2013-S 2017

**TRAVEL AWARDS**

- WCCM-PANACM 2024, Vancouver 2024
- Fracture as an Emergent Phenomenon, US Junior Oberwolfach Fellow (NSF Grant) 2024

	<ul style="list-style-type: none"> <li>▪ Mechanistic Machine Learning and Digital Twins for Computational Science, Engineering and Technology 2021 Conference NSF Fellowship</li> </ul>	
<b>PROFESSIONAL DEVELOPMENT</b>	<ul style="list-style-type: none"> <li>▪ Critical Literacy in Generative AI               <ul style="list-style-type: none"> <li>• Micro-course on build an understanding of what generative AI is and what that means for teaching</li> </ul> </li> </ul>	
<b>SERVICE TO THE PROFESSION</b>	<p><b>Co-Organizer</b> for <b>Theoretical and Numerical Aspects of Fractional and Nonlocal Models</b>, an AMS Session at JMM 2025</p> <p><b>Co-Organizer</b> for <b>Theoretical and Applied Aspects of Nonlocal Models</b>, in 2024 SIAM Conference on Materials Science</p> <p><b>Reporter</b> for <b>Fracture as an Emergent Phenomenon</b>, in MFO (Oberwolfach) Workshop</p> <p><b>Co-Organizer</b> for <b>Theoretical and Numerical Aspects of Nonlocal Models</b>, an AMS Session at JMM 2024</p> <p><b>Refereed Paper</b> for <b>Applied Mathematics and Optimization</b></p> <p><b>Refereed Paper</b> for <b>Computers and Mathematics with Applications</b></p> <p><b>Co-Organizer</b> for <b>Nonlocal Frameworks in Analysis and Mathematical Modeling</b>, an AMS Session at JMM 2023</p> <p><b>Refereed Paper</b> for <b>Journal of Integral Equations and Applications</b></p> <p><b>Co-Organizer</b> for <b>Graduate Research in Industry and in National Laboratory Internships</b>, a SIAM Session at JMM 2022</p> <p><b>Refereed Paper</b> for <b>Rocky Mountain Journal of Mathematics</b></p>	
<b>DEPARTMENTAL SERVICE</b>	<p><b>WPI Analysis/PDE Seminar</b>, Organizer</p> <p><b>UNL Nonlocal Modeling Student Reading Seminar</b>, Organizer and Co-founder</p> <p><b>UNL Continuum Mechanics Seminar</b>, Organizer</p> <p><b>UNL Graduate Student Seminar</b>, Organizer</p> <p><b>JU Pi Mu Epsilon</b>, Vice President</p>	<p>F 2022-Present</p> <p>S 2022</p> <p>S 2020</p> <p>F 2018-S 2019</p> <p>F 2016- S 2017</p>
<b>OUTREACH</b>	<p><b>Girls Talk Math</b></p> <ul style="list-style-type: none"> <li>▪ Lecturer</li> </ul> <p><b>Guest Speaker</b></p> <ul style="list-style-type: none"> <li>▪ Talked to high school seniors in Belgium about college in the United States</li> </ul> <p><b>Sofya Kovalevskaya Day</b></p> <ul style="list-style-type: none"> <li>▪ Volunteer</li> <li>▪ Activity Designer/Leader</li> </ul> <p><b>Directed Reading Program</b></p> <ul style="list-style-type: none"> <li>▪ Mentored an Undergraduate Student in learning more about PDEs and Nonlocal Models</li> </ul> <p><b>Great Plains Alliance Initiative</b></p> <ul style="list-style-type: none"> <li>▪ Graduate Student in Supporting Role</li> </ul> <p><b>Central States Math Undergraduate Research Conference</b></p> <ul style="list-style-type: none"> <li>▪ Provided Feedback on Talks</li> </ul> <p><b>Nebraska Conference for Undergraduate Women in Mathematics</b></p> <ul style="list-style-type: none"> <li>▪ Panelist</li> <li>▪ Moderator</li> </ul> <p><b>Jacksonville University STEM Workshop for High School Girls</b></p> <ul style="list-style-type: none"> <li>▪ Helped high school students learn about 3D printing</li> </ul>	<p>S 2024</p> <p>S 2024</p> <p>S 2024</p> <p>S 2023</p> <p>S 2020</p> <p>F 2018, F 2019</p> <p>S 2018</p> <p>S 2021</p> <p>S 2018</p> <p>S 2014</p>
<b>COMPUTING SKILLS</b>	<ul style="list-style-type: none"> <li>▪ Languages           <ul style="list-style-type: none"> <li>• MATLAB</li> <li>• Python</li> </ul> </li> <li>▪ Other Software Experience</li> </ul>	

- Autocad
- Solidworks
- ABAQUS
- Typesetting
  - $\text{\TeX}$
  - Microsoft Office

## LANGUAGES

- English: Fluent
- Spanish: Learning
  - Given and attended talks in Spanish about Mathematics

[CV compiled on 2024-10-17]