Katherine J. Pearce

Ph.D. Candidate

1320 Plymouth Ct
Raleigh, NC, 27610
✆ +1(713)882-4545
✉ kjpearce@ncsu.edu
🖥 github.com/kjpearce

Education

2017 – Present	**North Carolina State University, Raleigh, NC**, *Ph.D.*, *Applied Mathematics*. Research Advisor: Mansoor Haider. *Expected Graduation: Spring 2022*
2014 – 2016	**University of Denver, Denver, CO**, *M.S.*, *Mathematics*.
2009 – 2013	**University of Texas, Austin, TX**, *B.S.*, *Mathematics*.
2009 – 2013	**University of Texas, Austin, TX**, *B.A.*, *English Literature*.

Research Interests

Mathematical modeling of physical processes; sensitivity analysis; uncertainty quantification; topological data analysis; hybrid numeric-symbolic methods for root-finding; applications of abstract and linear algebra.

Publications

- KJ Pearce, K Nellenbach, RC Smith, AC Brown, and MA Haider (2021). "Modeling and parameter subset selection for fibrin polymerization kinetics with applications to wound healing," *Bulletin of Mathematical Biology*, 83(47):1-22.
- MA Haider, KJ Pearce, NC Chesler, NA Hill, and MS Olufsen (in preparation). "Application of the HGO model to capturing in vitro relationships between pressure, area, and wall thickness in murine left pulmonary arteries," submitting to *Biomechanics and Modeling in Mechanobiology*.
- KJ Pearce, "Mightier Than the Sword: The Influence of Literature on the Origins, Dynamics, and Outcomes of Nonviolent Movements," Honors Program Thesis, University of Texas, 2013.

Fellowships

Spring 2020*	**AMS Catalyzing Advocacy in Science and Engineering (CASE) Fellowship**. 1 of 2 students nationwide to receive annual award (*DC in-person event postponed to Sep 2021 due to COVID-19).
Summer 2020	**NC State Graduate School Summer Fellowship**. Awarded by the Graduate School for excellent degree progress.

Relevant Skills

Programming	MATLAB, Python, Maple, R, C
Software	HPC, LaTeX, Moodle, Blackboard, Gradescope, Ayasdi, Adobe, MS Office
Communication	Editing, proficiency in English/Spanish, MLA/APA fluency

Projects and Research Experience

Jan 2019 – Present [Thesis]	**Mathematical models and parameter subset selection techniques for fibrin matrix polymerization in a biomimetic wound healing system**, NC State. Develop mathematical model for wound healing application and implement algorithms to detect unidentifiable model parameters and reduce computational complexity in associated inverse problems.
Aug 2020 – June 2021	**Numerical analysis in data science**, SAMSI. Participated in Global Sensitivity Analysis working group to design and implement novel algorithms for sensitivity analysis in mathematical modeling.
May-Aug '19	**Network measure framework for topological data analysis (TDA)**, Air Force Research Laboratory. Researched homological foundations of TDA. Implemented MAPPER algorithm in R to study effects of parameter variation on data topology and constructed a framework for network analysis.
Aug-Dec '18	**Holzapfel-Gasser-Ogden (HGO)-based model for pulmonary hypertension**, NC State. Developed and calibrated hyperelastic models for murine left pulmonary arterial wall using HGO constitutive framework. Estimated values and local sensitivities for parameters in two-layer model (paper forthcoming).
May-Dec '18	**Polynomial sum-of-squares optimization without semidefinite programming**, NC State. Researched hybrid numeric-symbolic multivariate root-finding methods and applications of SOS in nonlinear optimization over symmetric positive semidefinite matrices and dual cones.
Jan-Dec '16	**Decoding methods and efficiency in error-correcting codes**, University of Denver. Investigated interleaver efficiency in Shannon decoding algorithm for turbo codes in C. Compared turbo codes to Reed-Solomon error-correcting codes in Voyager II.

Work and Teaching Experience

Since Aug '20	**Research Assistant**, Statistical and Applied Mathematical Sciences Institute (SAMSI), NC.
Aug 2019 – May 2020	**Instructor of Record**, North Carolina State University, Raleigh, NC. Taught MA 241 (Calculus II) and MA 242 (Calculus III). Created original lecture materials, projects, and exams. Received over 4.8/5 in teaching effectiveness.
May-Aug '19	**Repperger Intern**, Air Force Research Laboratory, Wright-Patterson AFB, OH.
Sep 2014 – May 2019	**Teaching Assistant**, North Carolina State University, University of Denver. Led recitation sections, created lecture materials, and graded for: trigonometry, pre-calculus, calculus (I, II, III), differential equations, and linear algebra.
Jun 2013 – Aug 2014	**Floor Manager**, Mathnasium, Austin, TX. Designed curriculum, supervised and led training for new instructors, and tutored students.
May-Aug '12	**Data Analytics and Software Automation Intern**, Pervasive Software, Austin, TX.

Service and Leadership Experience

Association for Women in Mathematics (AWM).
President and co-founder of DU AWM Chapter.

Diversity, Equity, and Inclusion (DEI) Teaching Assistant Workshop.
Founded new TA position and graduate curriculum to foster DEI in math classrooms.

Undergrads Union Grads (UUG).
Mentor to undergraduate mathematics students interested in attending graduate school.

SAMSI Undergraduate Modeling Project.
Co-organized workshop for undergraduate students on mathematical modeling of the COVID-19 pandemic, May 2021.

Diversity, Equity, and Inclusion (DEI) Committee.
Founding member of faculty and graduate student departmental committee to create and continue DEI initiatives.

Intersectional Working Research Group (IWRG).
Founder of abolitionist research group counteracting systemic prejudice through civic action and weekly seminars.

Family Readiness Group, A/83d Civil Affairs, US Army (FRG).
Supported other military families by volunteering with the FRG in my spouse's unit during deployments.

Collegiate Water Polo Association (CWPA).
Goalkeeper, captain of UT, DU Women's Water Polo teams; 2018 Regional Championship goalkeeper of NCSU Men's team.

Certifications and Training

- Modern Workplace and Managing Bias Training
- QPR+ Suicide Prevention Training
- Online Course Design and Development Training
- Creating an Academic Continuity Plan Training
- How to Manage Conflict in the Classroom Seminar
- First Amendment and DEI Impact Response Seminar
- edX Inclusive STEM Teaching Certificate
- How to Create an Inclusive Classroom Workshop
- Designing Effective Online Courses Training
- Creating an Effective Lecture Video Seminar
- Identifying Learning Objectives for Your Course Seminar

Research Presentations

- Joint Mathematics Meeting - Advocacy Panel, Seattle, WA, January 2022
- Triangle Area Graduate Mathematics Conference (TAGMaC), Duke University, November 2021
- paraDIGMS Fall 2021 Conference, Diversity Committee Lightning Talk, October 2021
- Society for Mathematical Biology Annual Meeting, Methods for Biological Modeling, June 2021
- SAMSI Numerical Analysis in Data Science Transition Workshop, June 2021
- SAMSI Undergraduate Modeling Workshop, June 2021
- SAMSI Seminar, February 2021
- Triangle Area Graduate Mathematics Conference (TAGMaC), UNC, December 2020
- Repperger Closing Workshop, Air Force Research Lab, August 2019
- Association for Women in Mathematics Conference, UNC, February 2018

Memberships and Affiliations

- American Mathematical Society (AMS)
- Society for Mathematical Biology (SMB)
- Local Science Engagement Network (AAAS)
- Association for Women in Mathematics (AWM)
- Society for Industrial and Applied Mathematics (SIAM)
- Texas Exes Hispanic Alumni Network