Sara (Myers) McKnight

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Department of Mathematics and Statistics
Colorado Mesa University
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Research Interests

- Partial Differential Equations, Fluid Mechanics, Fluid Structure Interaction, Control Theory, Attractor Theory, Finite Element Method

Education

- **University of Nebraska - Lincoln** — Lincoln, NE
  Ph.D. Candidate in Mathematics — *Expected August 2024*
  - Thesis Advisor: George Avalos
  - Thesis Title: "Semigroup well-posedness and finite element analysis of a Biot-Stokes interactive system"

- **University of Nebraska - Lincoln** — Lincoln, NE
  Masters of Science in Mathematics — *May 2020*

- **University of Scranton** — Scranton, PA
  BS in Biomathematics, BS in Mathematics; Summa Cum Laude — *May 2018*

Certificates

- **SQL for Data Science** — May 2024

Professional Experience

- **Colorado Mesa University** — August 2024 - Current
  Adjunct Lecturer of Mathematics and Statistics
  - Teaching 1 section of MATH 110 Mathematical Investigation and 1 section of MATH 113 College Algebra in Fall 2024 semester using an active learning format.

- **University of Nebraska-Lincoln** — June 2024
  AGAM Codes Course Instructor
  - Prepared materials on the history of cryptography, methods of encryption, and modular arithmetic for a week-long course aimed at advanced high school students.
  - Engaged with a group of twelve high school students in an active classroom and facilitated groupwork.

- **University of Nebraska-Lincoln** — August 2018 - May 2024
  Graduate Teaching Assistant
  - Taught a group of 30-40 students in an active learning format for 1 semester of MATH 101 College Algebra, 1 semester of MATH 203 Contemporary Mathematics, 4 Semesters of MATH 103 College Algebra & Trigonometry, and 1 semester of MATH 107 Calculus II.
  - Managed classroom of 30 students, determined cirriculum and instructional materials, and wrote assessments for 1 semester each of MATH 221 Differential Equations and MATH 351 Linear Algebra.
  - Assisted lead instructor in working with four small groups of students on disease modeling projects for 1 semester in MATH 435 Math in the City.

- **National Aeronautics and Space Administration** — June - August 2022, June - August 2023
  Summer Intern (Virtual)

- Summer 2022: Performed Hyperspectral data analysis on AVIRIS-NG surface reflectance data to study seasonal trends in vegetative health
  - Summer 2023: Performed data processing and analysis on 3 different data sets per site and 2 sites to study various aspects of vegetative health in a tundra ecosystem as part of the ABoVE project (Funded by NASA Nebraska Space Grant (Federal Award #80NSSC20M0112))

- **University of Nebraska-Lincoln**   June - August 2020, June - August 2021
  Graduate Research Assistant (NSF Grant 1907823)
  - Investigated of analyticity for a particular fluid-structure interaction problem
  - Studied well-posedness of a coupled system of fluids with a deforming boundary between them as performed finite element analysis of this system

Academic Awards

- Graduate Student Travel Award: University of Nebraska-Lincoln, Fall 2022
  - Awarded by the Office of Graduate Studies to support graduate student professional development

- Steven Haataja Award: University of Nebraska-Lincoln, 2022
  - Awarded anually to a graduate student for Outstanding Exposition in the Graduate Student Seminar

- Lloyd Jackson Award: University of Nebraska-Lincoln, 2020
  - Awarded anually to support graduate student research, based on academic performance

- Outstanding Student in Biomathematics: University of Scranton, 2018
  - Awarded annually to the graduating student in Biomathematics with the highest cumulative GPA

Research Experience

- **Graduate Research**
  - Investigated analyticity for a particular fluid-structure interaction problem, University of Nebraska - Lincoln
  - Studied well-posedness of a coupled system of fluids with a deforming boundary between them as well as performed finite element analysis of this system, University of Nebraska - Lincoln
  - Performed Hyperspectral data analysis on AVIRIS-NG surface reflectance data to study seasonal trends in vegetative health, NASA.
  - Performed data processing and analysis on 3 different data sets per site and 2 sites to study various aspects of vegetative health in a tundra ecosystem (Funded by NASA Nebraska Space Grant (Federal Award #80NSSC20M0112))

Grants

1. NASA Nebraska Space Grant (Federal Award #80NSSC20M0112), "SG Summer Internships FY23 UNL McKnight", June 2023 - August 2023

Publications

1. Dougherty, S. and **Myers, S.** *Orthogonality from Group Charaters.* Involve, a Journal of Mathematics 14-4 (2021), 555–570. DOI 10.2140/involve.2021.14.555.

Papers in Progress

2. Avalos, G. , McKnight, D., and **McKnight, S.** *Gevrey Regularity for a Fluid-Structure Interaction Model.*

1. Avalos, G. **McKnight, S.**, and Webster, J. *Well-posedness and stability results for a Fluid-Structure Interaction model with Interaction along a Porous Interface.*

Presentations

(*) Conference presentations, (†) External presentations

29. (*,†) AMS Spring Central Sectional Meeting - Recent Advances in Nonlinear PDEs and Their Applications Special Session, March 20, 2024: "An Inf-Sup approach for semigroup well-posedness of a Biot-Stokes interactive system."

28. PDE & Applied Analysis Seminar, University of Nebraska - Lincoln, October 25, 2023: "Expoenential Decay for a Fluid-Structure Interaction Problem."

27. (*,†) The 8th Annual Meeting of SIAM Central States Section, October 7, 2023: "Semigroup Well-Posedness and Finite Element Approximation for a Biot Model."

26. (*,†)7th KUMUNU-ISU Conference in PDE, Dynamical Systems and Applicataions, Iowa State University, April 22, 2023: "Semigroup Well-Posedness and Finite Element Approximations for the Biot Model." Poster.

25. Student Applied Analysis Reading Seminar, University of Nebraska - Lincoln, February 7, 2023: "Control Theory to Infinity and Beyond."

24. Students in Partial Differential Equations Reading Seminar, University of Nebraska - Lincoln, January 31, 2023: " Introduction to Bochner Spaces."

23. (*,†) Advancing Global Imaging Spectroscopy and Thermal Infrared Measurements I Oral Session, American Geophycial Union Fall Meeting, Chicago, IL, December 14, 2022: "Assessment of the Seasonal Variation in Vegetation Photosynthetic Pigments and Function, Using the Time Series of Hyperspectral Airborne Data from the SHIFT Campaign."

22. PDE & Applied Analysis Seminar, University of Nebraska - Lincoln, November 2, 2022: "A Fluid Structure Interaction Model Utilizing Oseen Equations for the Fluid Component."

21. (†) Great Plains Alliance, Wayne State College, October 27, 2022: "Zombies? RUN (maybe)!"

20. Student Applied Analysis Reading Seminar, University of Nebraska - Lincoln, October 25, 2022: "An Enticing Subject – Attractor Theory."

19. PDE & Applied Analysis Seminar, University of Nebraska - Lincoln, September 27, 2022: "Seasonal Trends in Vegetative Photosynthetic Activity, Canopy Reflectance, and Biophysical Traits using AVIRIS-NG Imagery."

18. Student Applied Analysis Reading Seminar, University of Nebraska - Lincoln, September 13, 2022: "Analytic Semigroups for Linear Partial Differential Equations."

17. 2022 OSTEM Summer Intern Poster Session, NASA, August 12, 2022: "Seasonal Trends in Vegetative Photosynthetic Activity, Canopy Reflectance, and Biophysical Traits using AVIRIS-NG Imagery," Poster.

16. Student Applied Analysis Reading Seminar, University of Nebraska - Lincoln, March 30, 2022: "How Critical is the Axiom of Choice?"

15. PDE & Applied Analysis Seminar, University of Nebraska - Lincoln, February 8, 2022: "Serrin's Uniqueness Condition for Weak Solutions of Navier-Stokes, Part II."

14. Students in Partial Differential Equations Reading Seminar, University of Nebraska - Lincoln, January 25, 2022: "Introduction to Attractor Theory."

13. Graduate Student Seminar, Universiy of Nebraska - Lincoln, November 8, 2021: "When Zombies Attack!"

12. [†] Great Plains Alliance, University of Nebraska - Kearney, October 29, 2021: "Mathematical Control Theory and Applications."

11. Student Applied Analysis Reading Seminar, University of Nebraska - Lincoln, October 13, 2021: "Laplace's Operator and Poisson's Equation."

10. PDE & Applied Analysis Seminar, University of Nebraska - Lincoln, October 12, 2021: "Optimal Regularity and Regularization of a Coupled System."

9. Student Applied Analysis Reading Seminar, University of Nebraska - Lincoln, October 6, 2021: "A Primer on Unbounded Operators."

8. Students in Partial Differential Equations Reading Seminar, University of Nebraska - Lincoln, February 9, 2021: "A Crash Course in Topology."

7. Student Applied Analysis Reading Seminar, University of Nebraska - Lincoln, October 7, 2020: "Introduction to Control Theory."

6. PDE & Applied Analysis Seminar, University of Nebraska - Lincoln, September 29, 2020: "Approximate Controllability of the Wave Equation (Part II)."

5. PDE & Applied Analysis Seminar, University of Nebraska - Lincoln, September 22, 2020: "Approximate Controllability of the Wave Equation (Part I)."

4. Student Applied Analysis Reading Seminar, University of Nebraska - Lincoln, September 2, 2020: "Newton's Method for Nonlinear Operators."

3. Mathematical Literature Seminar, University of Nebraska - Lincoln, June 20, 2019: "The Method of Conjugate Gradients."

2. [*,†] Twentieth Annual Nebraska Conference for Undergraduate Women in Mathematics, Lincoln, NE, January 27, 2018: "Orthogonality from Group Characters," Poster.

1. [*,†] Nineteenth Annual Nebraska Conference for Undergraduate Women in Mathematics, Lincoln, NE, February 5, 2017: "A Graph-Theoretic Approach to Predicting the NFL Playoff Results."

Teaching Experiences

- Instructor of Record:
    - College Algebra – Taught in an active learning format
    - College Algebra & Trigonometry – Taught in an active learning format
    - Contemporary Mathematics – Taught in an active learning format
    - Differential Equations
    - Linear Algebra

- Graduate Teaching Assistant:

- Math in the City – Mathematics course with an emphasis on hands-on, practical applications
- Calculus I Recitation
- Calulus II Recitation

- Directed Reading Program: Fall 2021, Fall 2022-Spring 2024

  - Mentored undergraduate students in vector calculus and control theory.
  - As a co-organizer, recruited undergraduate and graduate participants, organized two large meet-ups during the semester, and maintained the website.

Leadership and Service

- 8th Annual Meeting of SIAM Central States Section Co-organizer, Fall 2023

  - Organized registration data, maintained mailing list, and helped compile program PDF.

- First Year Mathematics Task Force Member, University of Nebraska - Lincoln, Fall 2023 - current

  - This committee focuses on development, analysis, and implementation of materials and syllabi for first year mathematics courses (college algebra, trigonometry, calculus I, and calculus II).

- Graduate Student Advisory Board Member, University of Nebraska - Lincoln, Fall 2022 - current

  - The Graduate Student Advisory Board serves as a liaison between the larger graduate student body and faculty. I have served as the Treasurer and currently serve as the Meeting Organizer.

- Student Applied Analysis Reading Seminar Co-Organizer, University of Nebraska - Lincoln, Fall 2022 - Spring 2023

- Students in Parital Differential Equations Reading Seminar co-organizer, University of Nebraska-Lincoln, Fall 2021 - Spring 2022

- Interdisciplinary Contest in Modeling Judge, Consortium for Mathematics and its Applications, 2020, 2021, 2022, 2023

- Mathematical Contest in Modeling Judge, Consortium for Mathematics and its Applications, 2020, 2021, 2022, 2023

  - The positions with COMAP involved reading papers in the first round of the competition, which receives submissionsfrom across the globe.

- Nebraska Conference for Undergraduate Women in Mathematics (NCUWM) Organizing Committee Member: Fall 2020 - Spring 2021, Fall 2022 - Spring 2023

  - Served in various roles to help during the conference, which facilitates speaking opportunities and preparation for post-undergraduate steps for undergraduate womem in mathematics

- Graduate Student Seminar co-organizer, University of Nebraska Lincoln: Fall 2019 - Spring 2020

- Nebraska Conference for Undergraduate Women in Mathematics Volunteer, University of Nebreaska-Lincoln: 2019, 2020, 2022

- Math Day Volunteer, University of Nebraska-Lincoln: 2018, 2019, 2020, 2021, 2022

  - Annual event designed to increase enthusiasm in mathematics for Nebraka high shcool students

Technical Skills

Programming Experience in: Python, MATLAB, Java, R, SQL

Typesetting Languages: LaTeX

Software: MATLAB R2022a, Microsoft Office Package, ENVI

Operating Systems: Windows, Linux