EMILY BOLGER

Ph.D. Candidate in Computational Mathematics, Science, and Engineering

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EDUCATION

Ph.D. Candidate in Computational Mathematics, Science, and Engineering

Michigan State University

📅 August 2020 – May 2026 (expected)

Advisor: Dr. Marcos (Danny) Caballero

B.S. in Mathematics

Moravian College

📅 August 2016 – May 2020

Minors in Economics, Informatics, and Dance (self-designed)
Summa Cum Laude with Honors in Statistics
GPA: 3.90

AFFILIATIONS

- PME National Mathematical Honors Society
- $O\Delta E$ National Economics Honors Society
- $\Phi H\Sigma$ National Honors Society
- Graduate Women in Science Mid-Michigan Chapter
- Association for Women in Mathematics

WHO AM I?

An interdisciplinary scientist utilizing computational tools to explore questions about data science & computing education.

SKILLS

Python | R | LaTeX | JavaScript | HTML
Artificial Intelligence | Machine Learning
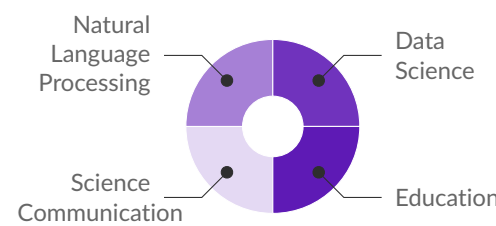Critical Thinking | Problem Solving
Leadership | Written & Verbal Communication
Microsoft Office | Google Applications

CURRENT INTERESTS

Natural Language Processing · Data Science · Science Communication · Education

AWARDS AND CERTIFICATES

The College of Engineering Graduate Travel Fellowship	*Michigan State University, March 2023*
The Raymond P. and Marie M. Ginther Graduate Fellowship	*Michigan State University, April 2020*
The Schattschneider Mathematics and Computer Science Prize	*Moravian College, April 2020*
$O\Delta K$ **Unsung Hero Award**	*Moravian College, April 2020*
Spartan Resilience Education Certificate	*University Health and Wellbeing, Michigan State University, June 2025*
Certificate of Attendance	*ComSciCon, Michigan State University, Oct 2024*
Certificate in College Teaching (CCT)	*The Graduate School, Michigan State University, June 2023*
Link to CCT Project.	

RESEARCH EXPERIENCE

Graduate Research Assistant

Michigan State University   📅 May 2021 – Present   📍 East Lansing, MI

Exploring the impact and ability of Natural Language Processing techniques for information extraction in systematic literature reviews. Identify and analyze change strategies published in undergraduate science education in the past decade. Project is multi-method synthesis in collaboration with four other research institutions.
- Funded by the National Science Foundation Award Number 2201795.
- Under the instruction of Dr. Marcos (Danny) Caballero.

Using Social Network Analysis techniques to analyze and model data in R from a messaging platform consisting of interactions between instructors at various institutions, who are seeking to better incorporate computation into their traditional STEM courses.
- Funded through the Michigan State University Graduate Office Fellowship.
- Under the instruction of Dr. Marcos (Danny) Caballero and Dr. Daryl McPadden.

Statistics Honors Student

Moravian College   📅 May 2019 - May 2020   📍 Bethelehem, PA

Built a linear Measurement Error Model in R and successfully defended an undergraduate honors thesis to understand the relationship between dietary intake, body composition, and energy expenditure in pre-professional, contemporary dancers.
- Completed under the instruction of Dr. Brenna Curley.

Undergraduate Research Assistant

Michigan State University   📅 May 2019-July 2019   📍 East Lansing, MI

Participated in the Institute for Cyber-Enabled Research Advanced Computational Research Experience for Students, a National Science Foundation Funded Research Experience for Undergraduates (iCER ACRES NSF REU). Built a deep learning TensorFlow Python framework to model the prediction of optimal plant traits from a genetics database. Model was a part of a larger project comparing the effectiveness of various models in predicting plant traits.
- Completed under the instruction of Dr. Shin-Han Shiu and Dr. Christina Azodi.

TEACHING EXPERIENCE

Graduate Teaching Assistant - CMSE Department

Michigan State University   📅 Aug 2020 - Dec 2022   📍 East Lansing, MI

Assist faculty with classroom instruction. Guide and mentor small groups of students through in class assignments. Hold twice weekly office hours to assist students in classwork. Provide students with constructive, graded feedback on their assignments.
- CMSE 201: Introduction to Computational Modeling and Data Analytics with Dr. Thomas Finzell
  - Fall 2020 (remote), Spring 2021 (remote), Fall 2021 (in-person)
- CMSE 381: Fundamentals of Data Science Methods with Dr. Elizabeth Munch
  - Spring 2022 (hybrid), Fall 2022 (in-person)

Curriculum Development

Michigan State University   📅 June 2021 - Present   📍 East Lansing, MI

Developed and refined current curriculum materials for introductory data science and computing course. Topics include data and algorithmic bias, ethics, data context, and code visualization. Course uses Jupyter Notebook class assignments managed through a GitHub Repository.

Academic Tutor

Moravian College   📅 Sept 2015-Aug 2020   📍 Bethlehem, PA

Tutored peer students in collegiate level Mathematics and Economics courses. Tutored local students in high school and middle school mathematics courses. Provided skills assistance related to problem solving and exam preparation.

WORK EXPERIENCE

Summer Intern

Los Alamos National Laboratory (LANL)   📅 June 2023-Aug 2023   📍 Los Alamos, NM

Developed a machine learning GUI framework using Python, JavaScript, HTML, and Py-Script. Tool will be used by scientists at LANL to perform machine learning tasks on data they chose.
- Worked in the Information Science & Technology Institute under Director Dr. Jim Ahrens.

Summer Intern

Willis Towers Watson   📅 June 2018-Aug 2018   📍 New York City, NY

Created risk management analysis models for insurance brokers to use with their clients. Compiled and organized model usage data for frequency analysis. Created and edited marketing storyboards to explain the analytical tools purpose and benefits.

Summer Extern

AT&T Summer Externship   📅 July 2020   📍 Online

Improved professional and personal skills through completing 80+ hours of the 2020 AT&T Summer Learning Academy self-paced online courses and live-event speaker workshops.

MENTORING

Research Mentorship to Students

Michigan State University   📅 May 2022 - Present   📍 East Lansing, MI

Graduate Students
- Cassandra Lem, Current PhD Student at Michigan State University
- Dawson Kinsman, Current PhD Student at Michigan State University

Undergraduate Students
- Marius Nwobi, Current Master's Student at Carnegie Mellon University
- Anthony Kosinski, Current Undergraduate Student at Michigan State University

Peer Mentorship

Michigan State University   📅 August 2021 - Present   📍 East Lansing, MI

- GWIS Undergraduate Mentorship Program (2 students)
- CMSE DEI Committee Peer Mentorship Program (3 students)

Letters to a Pre-Scientist

Pen Pal   📅 Aug 2022-May 2023, Aug 2024-May 2025   📍 East Lansing, MI

Exchange letters with a middle school student interested in learning more about STEM-related careers.

ACRES REU Graduate Student Mentor

Michigan State University   📅 May 2022 - July 2022   📍 East Lansing, MI

Led weekly professional development workshops covering topics such as conducting literature reviews, applying to PhD programs, and developing a research poster. Held social events for students in the REU.

Mentor for Undergraduate Research Course

Moravian College   📅 Jan 2019-May 2020   📍 Bethlehem, PA

Assisted first- and second-year students in semester-long mathematics course with writing a formal research paper, designing a poster presentation, and creating a formal presentation on their research. Course taught by Dr. Nathan Shank.

LEADERSHIP AND SERVICE

Graduate Women in Science Mid-Michigan Chapter

President, National Member   📅 Jan 2022-Present   📍 East Lansing, MI

Host and organize monthly executive board meetings. Oversee and assist where needed with all operations of the Mid-Michigan organization. Communicate with GWIS National. Organizing mentoring program for undergraduate students interested in pursuing STEM careers. Volunteer and coordinate STEM outreach events focused on science learning for K-12 students.

- *Past Positions: Co-Chair, Girls Math and Science Day Committee (June 2022- June 2024); Chair, Undergraduate Mentoring Program (June 2022 - June 2023)*

Moravian College Dance Company
President, Treasurer/Secretary, Choreographer 📅 Aug 2016-May 2020 📍 Bethelehem, PA

Led discussions with fellow collegiate board members as well as faculty members on dance program improvements. Negotiated larger, newly renovated dance company rehearsal space. Managed various fundraising activities. Developed faculty-approved criteria and achieved inaugural formal dance minor at Moravian College.

University Service
Committee Member 📅 Aug 2020 - Present 📍 East Lansing, MI

- CMSE Graduate Program Coordinator Search; MSU; Committee Member; Jan 2025-March 2025
- CMSE Graduate Student Diversity, Equity, and Inclusion Committee; MSU; Graduate Student Mentor, Minutes Moderator, Member; Aug 2020-May 2024
- CMSE Graduate Student Organization; MSU; Admissions and Recruitment Liaison (Jan 2024-May 2024); Treasurer (Aug 2021 - Aug 2022)
- Math Society; Moravian College; President, Treasurer, Member; Aug 2016-May 2020

PROFESSIONAL DEVELOPMENT

👥 Organized Workshops

- **Bolger**, **Emily**, Rachel Roca, Sona Chitchyan, Cassandra Lem, and Dawson Kinsman. Between the Lines: Reading Plots, Spotting AI, and Making Sense of Visual Data. *MSU Museum: Blurred Realities*, Jan. 2026.

- Silvia, Devin W., Marcos D. Caballero, Thomas Finzell, Rachel Frisbie, Patti Hamerski, **Emily Bolger**, Sarah Castle, Rachel Roca, and Paige Tourangeau. Computing in Support of Disciplinary Learning. *Proceedings of the 54th ACM Technical Symposium on Computer Science Education V. 2. Association for Computing Machinery.Toronto, Ontario, Canada*, Mar. 15-18, 2023. doi: **10.1145/3545947.3573341**.

👥 Selected Workshop Attendance

- Impactful curriculum development in mathematics: open education resources for future research. *American Institute of Mathematics. Pasadena, California, USA*, July 2025.

- ComSciCon-Michigan 2024. *ComSciCon. East Lansing, Michigan, USA*, Oct. 2024.

- Data Visualization and Science Communication. *MSU Museum: Science on a Sphere. East Lansing, Michigan, USA*, Mar. 2024.

- Inclusive Workspaces. *Office for Institutional Diversity and Inclusion: Education and Development Programs. East Lansing, Michigan, USA*, Mar. 2024.

- Fundamentals of Equity in Graduate Admissions. *Inclusive Graduate Education Network (IGEN). East Lansing, Michigan, USA*, Feb. 2024.

- Physics Education Research (PER) Summer Institute. *Center for Computing in Science Education. University of Olso, Norway*, June 2022.

- Understanding Levers of Change in Academia. *CIRTL Network, Online*, Nov. 2021.

- Classroom Strategies from a UDL Perspective. *MSU IT & MSU Hub. East Lansing, Michigan, USA*, July 2021.

- Bystander Intervention Workshop. *AdvanceGeo. East Lansing, Michigan, USA*, July 2021.

👥 Evaluator

- ACRES REU Student Final Presentations. July 2024.

PRESENTED WORK

📄 Peer-Reviewed Journal Articles

- **Bolger, Emily**, Rachel Renbarger, Taylor Boyd, Ying Wang, Marcos D. Caballero, Noah Finkelstein, Scott Simkins, Charles Henderson, and Andrea Beach. "Integrating Machine Learning into Systematic Literature Reviews: Advancing a Human-in-the-Loop Framework". *[Under Review]*, 2025.

- **Bolger, Emily**, Marius Nwobi, and Marcos D. Caballero. "Characterizing Faculty Online Learning Community Interactions Using Social Network Analysis". *[Under Review]*, 2024, Link here.

- Azodi, Christina B., **Emily G. Bolger**, Andrew McCarren, Mark Roantree, Gustavo de los Campos, and Shin-Han Shiu. "Benchmarking Parametric and Machine Learning Models for Genomic Prediction of Complex Traits." *G3: Genes | Genomes | Genetics*, 2019, Link here.

📄 Peer-Reviewed Conference Proceedings

- Wang, Yang, **Bolger, Emily**, Rachel Renbarger, Taylor Boyd, Noah Finkelstein, Charles Henderson, Andrea Beach, Scott Simkins, and Marcos D. [Poster Presentation] Caballero. "ECR: Facilitating Change in Undergraduate STEM: A Multidisciplinary, Multimethod, Meta-synthesis Mapping a Decade of Growth". American Society for Engineering Education Annual Conference. Montreal, Quebec, Canada, June 22-25, 2025.

- **Bolger, Emily**, Yang Wang, Rachel Renbarger, M. Danny Caballero, Marius Nwobi, Cassandra Lem, Noah Finkelstein, Scott Simkins, Taylor Boyd, Charles Henderson, and Andrea Beach. [Paper Presentation]. "Integrating machine learning into systematic reviews: Strengthening evidence synthesis". American Educational Research Association Annual Meeting. Denver, Colorado, USA, Apr. 23-27, 2025.

- **Bolger, Emily** and Marcos D. Caballero. [Poster Presentation]. "Exploring the Impact of Unsupervised Clustering Methods in Systematic Literature Reviews". *Proceedings of the 56th ACM Technical Symposium on Computer Science Education V. 2*. Association for Computing Machinery. Pittsburgh, Pennsylvania, USA, Feb. 26-1, 2025, doi: **10.1145/3641555.3705184**.

- **Bolger, Emily** and Marcos D. Caballero. [Lightning Talk Presentation]. "Using Natural Language Processing to Explore Instructional Change Strategies in Undergraduate Science Education Literature". *Proceedings of the 55th ACM Technical Symposium on Computer Science Education V. 2*. Association for Computing Machinery. Portland, Oregon, USA, Mar. 20-23, 2024, doi: **10.1145/3626253.3635341**.

📄 Peer-Reviewed Conference Presentations

- **Bolger, Emily.** [Poster Presentation]. Developing Thoughtful Scientists through an Introduction to Data Science Course. *Electronic Conference On Teaching Statistics (eCOTS). Online*, June 10-13, 2024.

- **Bolger, Emily**, and Marcos D. Caballero. [Oral & Poster Presentation]. Using Natural Language Processing to Explore Instructional Change Strategies in Undergraduate Science Education Literature. *Symposium for Data Science & Statistics (SDSS). Richmond, Virginia, USA*, June 4-7, 2024.

- **Bolger, Emily**, and Brenna Curley. [Poster Presentation]. Nutrient Intake of Dancers: A Measurement Error Analysis Approach. *Annual Moravian College Honors Program. Bethlehem, Pennsylvania, USA*, Apr. 2020.

👥 Invited Talks

- **Bolger, Emily**, and Rachel Roca. Data Dilemmas: Ethics in an Algorithmic World. *Mathematical Association of America (MAA): MathFest. Sacramento, California, USA*, Aug. 2025.

- **Bolger, Emily**, Rachel Roca, and Rachel Frisbie. Theory to Practice: Implementing Data Feminism Across an Undergraduate Data Science Curriculum. *Ferris State University. Big Rapids, Michigan, USA*, Mar. 2025.

👥 Contributed Work

- **Bolger, Emily**, and Marcos D. Caballero. [Poster Presentation]. Exploring the Impact of Unsupervised Clustering Methods in Systematic Literature Reviews. *CREATE for STEM: Mini-Conference. East Lansing, Michigan, USA*, May 14, 2025.

- **Bolger, Emily**, and Rachel Roca [Presentation]. Data Dilemmas: Ethics in an Algorithmic World. *MSU Spring Talks: Center for Teaching & Learning. East Lansing, Michigan, USA*, May 8, 2025.

- **Bolger, Emily**, and Marcos D. Caballero. [Poster Presentation]. Exploring the Impact of Unsupervised Clustering Methods in Systematic Literature Reviews. *Council of Graduate Students 17th Annual Graduate Academic Conference. East Lansing, Michigan, USA*, Feb. 2025.

- **Bolger, Emily**, Marcos D. Caballero, and Daryl McPadden. [Poster Presentation]. Analyzing Slack Messages of Physics Instructors Using Social Network Analysis. *Oslo Physics Education Research Summer Institute. Oslo, Norway*, June 2022.

- **Bolger**, **Emily**, Marcos D. Caballero, and Daryl McPadden. [Poster Presentation]. Characterizing Community Interactions Among Faculty Using Social Network Analysis. *2nd Annual CMSE Data Science Student Conference. East Lansing, Michigan, USA*, Nov. 2022.
- **Bolger**, **Emily**, Christina Azodi, and Shin-Han Shiu. [Poster Presentation]. Genomic Prediction of Traits Using Convolutional Neural Networks. *Mid-Michigan Symposium for Undergraduate Research Experiences (MidSURE). East Lansing, Michigan, USA*, July 2019.
- **Bolger**, **Emily**, and Brenna Curley. [Oral Presentation]. Nutrient Intake of Dancers: A Measurement Error Analysis Approach. *The 15th Annual Student Scholarship and Creative Endeavors Day and Moravian College Mathematics Society Epsilon Series. Bethlehem, Pennsylvania, USA*, Apr. 2019.
- **Bolger**, **Emily.** [Oral Presentation]. Genomic Prediction of Traits Using Convolutional Neural Networks. *Moravian College Mathematics Society Epsilon Series. Bethlehem, Pennsylvania, USA*, 2019.
- **Bolger**, **Emily.** Undergraduate Honors Thesis: Nutrient Intake of Dancers: A Measurement Error Analysis Approach. 2020.

👥 Media

- Bolger, Emily. "Emily Bolger on Understanding the Role of Machine Learning and Text Analysis on Systematic Literature Reviews". The Sci-Files on Impact 89FM,. Apr. 2025.
- Bolger, Emily. "Episode 83 - Emily Bolger". Journeys of a Scientist, July 2022.