

Emma Hart

Updated June 2026

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EDUCATION

Emory University, Atlanta, GA

August 2022 - Present

PhD, Mathematics, Advised by Julianne Chung and Matthias Chung

Colgate University, Hamilton, NY

August 2018 - May 2022

Bachelor of Arts; Major in Applied Mathematics, Minor in Educational Studies

GPA: 4.00/4.00

RESEARCH INTERESTS

I am interested broadly in inverse problems and numerical linear algebra, and I currently work on projects that incorporate technologies from machine learning (in particular, autoencoder networks) to help address challenges in solving ill-posed, large-scale inverse problems.

PAPERS

1. Emma Hart, Bas Peters, Julianne Chung, and Matthias Chung (2026). Latent Space Inference via Paired Autoencoders. *Preprint* (Accepted, Journal of Mathematical Imaging and Vision)
2. Emma Hart, Julianne Chung, and Matthias Chung (2026). A Paired Autoencoder Framework for Inverse Problems via Bayes Risk Minimization. *SIAM Journal on Scientific Computing* 48.2, pp. C385–C414
3. Soon Hoe Lim, Yijin Wang, Annan Yu, Emma Hart, Michael W. Mahoney, Sherry Li, and N. Benjamin Erichson (2025). Elucidating the Design Choice of Probability Paths in Flow Matching for Forecasting. *Transactions on Machine Learning Research*
4. Matthias Chung, Emma Hart, Julianne Chung, Bas Peters, and Eldad Haber (Dec. 2024). Paired autoencoders for likelihood-free estimation in inverse problems. *Machine Learning: Science and Technology* 5.4, p. 045055
5. Elle Buser, Emma Hart, and Ben Huenemann (2022). Comparison of Atlas-Based and Neural-Network-Based Semantic Segmentation for DENSE MRI Images. *SIAM Undergraduate Research Online* 15

RESEARCH

DOE Computational Sciences Graduate Fellow

Fall 2023 - Present

Advisors: Julianne Chung and Matthias Chung

Developing methods for large-scale, ill-posed inverse problems (surrogate modeling, prior-learning, uncertainty quantification) by leveraging representation learning techniques.

Lawrence Berkeley National Lab Affiliate

Summer 2024

Advisor: Xiaoye Sherry Li

Explored flow matching for generative modeling and probabilistic time series forecasting, in particular exploring the effects of different probability paths.

Colgate Undergraduate High Honors Thesis Student

Fall 2021

Advisor: Dan Schult

Developed a three step reaction model and simulated a system of partial differential equations to explore transitions between combustion states.

Advisor: Lars Ruthotto

Compared how well different semantic segmentation approaches could identify regions of interest in a given MR image and produce a biomarker to be used in the diagnosis of Chiari Malformation.

TEACHING

Emory University

MATH 112: Calculus II, Instructor of Record

Fall 2025

MATH 111: Calculus I, Instructor of Record

Fall 2024, Spring 2025

MATH 116: Life Sciences Calculus II, TA

Primary Instructor Malena Sabaté Landman, Spring 2024

MATH 212: Differential Equations, Grader

Primary Instructor Manuela Manetta, Spring 2023

MATH 112: Calculus II, Grader

Primary Instructor Jim Nagy, Fall 2022

Colgate University

Writing Peer Consultant

Writing and Speaking Center, Fall 2019 - Spring 2022

MATH260: Computational Mathematics, TA

Primary Instructor Silvia Jiménez Bolaños, Spring 2022

Mathematics Peer Tutor

Center for Learning, Teaching, and Research, Fall 2021

MATH260: Computational Mathematics, TA

Primary Instructor Silvia Jiménez Bolaños, Spring 2021

POSTERS AND PRESENTATIONS

- (Invited) *SIAM Conference on Uncertainty Quantification*, Minneapolis, MN, "Autoencoders for Inverse Problems," March 2026
- *Bayesian Inverse Problems and UQ Workshop*, ICERM, Providence, RI, "Latent Space Inference via Paired Autoencoders," March 2026
- (Invited) *SIAM Annual Meeting*, "Autoencoders for Inverse Problems," Montreal, Canada. July, 2025
- (Invited) *Georgia Tech SIAM Student Seminar*, Georgia Institute of Technology, Atlanta, GA. "Autoencoders for Inverse Problems," October 2024
- (Invited) *SIAM Conference on Mathematics of Data Science*, Atlanta, GA. "Paired Autoencoders for Inference and Regularization (PAIR)," October 2024
- *UQIP124: UQ for Inverse Problems and Imaging*, ICMS Bayes Center, Edinburgh, UK. "Paired Autoencoders for Inference and Regularization," September 2024
- *ACMR Research Affiliate Poster Session*, Lawrence Berkeley National Lab, Berkeley, CA, "Uncertainty Quantification for Forecasting Tasks Using Conditional Flow Matching," August 2024
- (Invited) *SIAM Conference on Imaging Science*, Atlanta, GA, "Low-rank Approaches for Reduced Networks in Inverse Problems," May 2024
- *Discussions in Scientific Computing Graduate Seminar*, Emory University, Atlanta, GA. "Autoencoders for Inverse Problems" March 2024
- *Georgia Scientific Computing Symposium*, Emory University, Atlanta, GA, "Paired Autoencoders for Inference and Regularization in Inverse Problems," February 2024
- *Discussions in Scientific Computing Graduate Seminar*, Emory University, Atlanta, GA. "Image Registration for Diagnosis of Chiari Malformation," October 2022
- *Georgia Scientific Computing Symposium*, Georgia Institute of Technology, Atlanta, GA, "Image-Based Diagnosis of Type I Chiari Malformation," February 2022
- *Hudson River Undergraduate Mathematics Conference*, Keene State College, Keene, NH, "On Ash Trees in the Green Mountain Region," April 2021

OUTREACH

Co-Organized SIAM AN25 Mini-symposium	Montreal, CA, 2025
SIAM Student Chapter Website Manager	Emory University, Atlanta, GA, Fall 2025 - Present
Atlanta Science Festival Volunteer	Atlanta, GA, Spring 2025
Math Circle Middle School Section Volunteer Instructor	Emory University, Atlanta, GA, Fall 2024
Julia Robinson Mathematics Festival Volunteer	Emory University, Atlanta, GA, Fall 2024
Volunteer Middle School Math Tutor	Rochester, NY, Summer 2021
Volunteer SAT Tutor	Hamilton High School, Hamilton, NY, Spring 2019
Volunteer High School Math Tutor	Webster-Schroeder High School, Rochester NY, Summers 2016-2018

COMPUTER PROFICIENCIES

Python, MATLAB, $\text{\LaTeX}$, PowerPoint, Word

FELLOWSHIPS AND AWARDS

Computational Sciences Graduate Fellowship	Department of Energy, 2023 - Present
Women in Natural Sciences Fellowship	Emory University, 2022 - Present
SIAM Student Travel Award	National Science Foundation, 2026
SIAM Student Travel Award	National Science Foundation, 2025
Graduate School Access Funding	Colgate University, 2022
Dean's Award for Academic Excellence with Distinction	Colgate University, all semesters
Osborne Mathematics Prize, for achievement in mathematics	Colgate University, Spring 2021
Sisson Mathematics Prize, for achievement in mathematics	Colgate University, Spring 2020
Charles A. Dana Scholar, for academic achievement and leadership	Colgate University, Spring 2020
Liberal Arts Core Curriculum Prize, voted best CORE research paper	Colgate University, Spring 2020
Liberal Arts Core Curriculum Prize, voted best CORE analytical paper	Colgate University, Spring 2019

ADDITIONAL CONFERENCES, WORKSHOPS, AND ACTIVITY GROUPS

- DOE Annual Program Review, July 2026, Washington D.C.
- SIAM Student Chapter Graduate Website Tutorial, September 2025, Emory University, Atlanta GA
- DOE Annual Program Review, July 2025, Washington D.C.
- SIAM Activity Group on Data Science: Teaching the Mathematics of Data Science, May 2024, Webinar
- DOE Annual Program Review, July 2024, Washington D.C.
- Copper Mountain 18th Conference on Iterative Methods, April 2024, Copper Mountain, CO
- Supercomputing, November 2023, Denver, CO (virtually)
- DOE Annual Program Review, July 2023, Washington D.C.
- AMS Southeastern Sectional Meeting, March 2023, Georgia Institute of Technology, Atlanta, GA.
- SIAM Conference on Mathematics of Data Science, September 2022, San Francisco, CA (virtually)
- Nebraska Conference for Undergraduate Women in Mathematics, January 2021, Lincoln, NE (virtually)
- First Annual Project Fibonacci STEAM Conference, July 2015, Rome, NY