Emma Hart

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EDUCATION

Emory University, Atlanta, GA — Present
Ph.D. in Mathematics

Colgate University, Hamilton, NY — May 2022
Bachelor of Arts; Major: Applied Mathematics; Minor: Educational Studies — GPA: 4.00/4.00

PAPERS

(Preprint) Soon Hoe Lim, Yijin Wang, Annan Yu, **Hart, E.**, Mahoney, M. W., Li, X. S., & Erichson, B. N. (2024). *Elucidating the design choice of probability paths in flow matching for forecasting.* Submitted electronically October 4, 2024. DOI: 2410.03229

Chung, M., **Hart, E.**, Chung, J., Peters, B., & Haber, E. (2024). *Paired autoencoders for likelihood-free estimation in inverse problems.* Machine Learning: Science and Technology, 5(4), 045055. DOI: 10.1088/2632-2153/ad95dd

Buser, E., **Hart, E.**, & Huenemann, B. (2022). *Comparison of atlas-based and neural-network-based semantic segmentation for DENSE MRI images.* SIURO, 15. Published electronically May 26, 2022. DOI: 10.1137/21S1448392

POSTERS AND PRESENTATIONS

(Invited) Graduate Seminar, Georgia Institute of Technology, Atlanta, GA. "PAIR," October, 2024

(Invited) SIAM Conference on Mathematics of Data Science, Atlanta, GA. "Paired Autoencoders for Inference and Regularization (PAIR)," October, 2024

UQIPI24: UQ for Inverse Problems and Imaging, ICMS Bayes Center, Edinburgh, UK. "Paired Autoencoders for Inference and Regularization," September 2024

ACMR Research Affiliate Poster Presentation, 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

DISC 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

DISC 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

COMPUTER PROFICIENCIES

Python, MATLAB, LaTeX, Powerpoint

RESEARCH

DOE Computational Sciences Graduate Fellow Fall 2023 - Present
Advisors: Julianne 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: Sherry Li
Explored flow matching for generative modeling and probabilistic time series forecasting, in particular exploring the effects of different probability paths

Colgate Undergraduate Senior Thesis 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

NSF REU at Emory University Summer 2021
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 EXPERIENCES

Emory University

MATH 111: Calculus I, Instructor of Record — Fall 2024
MATH 116: Life Sciences Calculus II, TA — *Primary Instructor Malena Sabate 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

MATH 260: Computational Mathematics, TA — *Primary Instructor Silvia Jiménez Bolaños*, Spring 2021, 2022
Writing Center Peer Consultant — *Writing and Speaking Center*, Fall 2019 - Spring 2022
Mathematics Peer Tutor — *Colgate Center for Learning, Teaching, and Research*, Fall 2021

OUTREACH

Emory Math Circle Middle School Section Instructor — Fall 2024
Volunteer Middle School Math Tutor — Rochester, NY, Summer 2021
Volunteer SAT Tutor — Hamilton High School, NY, Spring 2019
Volunteer High School Math Tutor — Webster Schroeder High School, NY, Summers 2016-2018

HONORS AND AWARDS

Computational Sciences Graduate Fellowship — Department of Energy
Women in Natural Sciences Fellowship — Emory University
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

OTHER CONFERENCES

DOE Annual Program Review, July 2024, Washington D.C.

Copper Mountain 18th Conference on Iterative Methods, April 2024, Copper Mountain, CO

Supercomputing (SC23), 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.

MDS22: SIAM Conference on Mathematics of Data Science, September 2022, San Francisco, CA (virtually)