

CHENGRU (ERIC) ZOU

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EDUCATION

BS in Applied Mathematics and Statistics
Emory University, Emory College of Art and Science

Atlanta, GA Aug 2022 – May 2026

- Cumulative GPA: 3.96/4.0; Honor: Dean’s List
- Expected Sum Cum Laude highest honor graduation (May 2026)

SKILLS AND INTERESTS

Research Interests: Scientific Machine Learning, Inverse Problem, Numerical Optimization
Skills: Python, Pytorch, Matlab, R, SQL, Git, Java, C, HTML
Toolkit: Docker, SSH, AWS

PUBLICATIONS

Journal

- Eric Zou**, Elle Buser, Zichao Wendy Di, and Yuanzhe Xi. *A Joint Variational Framework for Multimodal X-ray Ptychography and Fluorescence Reconstruction*. arXiv:2511.02153 [math.NA], 2025. arxiv.org/abs/2511.02153

Conference

- Erise He, Zhijiang Ye, **Chengru Zou**. “Quantitative Hybrid Structure Analysis of Equipment Wear under Dynamic Pressure based on Digital Intelligent Algorithm.” *Proceedings of the IEEE International Conference on Data Science and Intelligent Systems (ICDSIS)*, 2025, pp. 1–7. DOI: [link].

RESEARCH EXPERIENCE

Student Research Assistant
Argonne National Laboratory & Emory Math Department

Atlanta, GA Aug 2024 – Present

- Designed a physics-informed joint reconstruction framework for X-ray ptychography and fluorescence tomography under the guidance of Dr. Wendy Di and Dr. Yuanzhe Xi.
- Analyzed optimization behavior via loss surface and eigenspectrum to characterize the highly nonconvex objectives of both single and multi-modality reconstructions.
- Implemented (L-BFGS, Truncated Newton–Krylov, NLTGCR) with robust line search and stopping criteria in MATLAB for non-convex optimization.
- Demonstrated up to 50% lower MSE and 10% lower loss versus single-modality baselines on standard benchmarks; validated across overlap settings and noise levels.
- Submitted the manuscript to arXiv and in submission to *SIAM Journal on Imaging Sciences*.

Student Research Assistant
MIT-IBM Watson AI Lab

Atlanta, GA July 2024 – Present

- Developed *Multilevel Block Adapter (MBA)* for parameter-efficient fine-tuning, extending LoRA with multilevel and spectral clustering under the guidance of Dr. Jie Chen.
- Performed algorithmic analysis and experiments to derive task-specific learning-rate schedules for MBA.
- Implemented reproducible cloud experiments (SSH/Docker), published on Github with saved checkpoints and scripts.
- Reduced adapter parameters on RoBERTa-base/GPT-2 from 400k to 140k and achieved 2% higher scores on GLUE and E2E datasets.

PROJECTS

AI Chatbot Agent Development

Atlanta, GA June 2024 – Aug 2024

Emory Center for AI Learning, Emory University

- Built a graphical RAG LLM agent for Emory student course selection using Neo4j graphical database and LangChain prompt engineering.
- Improved query accuracy for graphical data, benefiting hundreds of Emory students for course selection.
- Published the report and gave a presentation in the Emory QTM department symposium.

Atlanta Affordable Housing

Atlanta, GA Sep 2023 – Jan 2024

City of Decatur: Affordable Housing Commission

- Collaborated with group leader and members to address housing complaints in partnership with the City of Decatur, GA.
- Utilized Geocoding and GIS to model racial and housing rate distributions in Decatur.
- Presented findings using Tableau, aiding over 100 local residents in making informed housing decisions.

AWARDS AND GRANTS

Mathematical Contest in Modeling (MCM), Meritorious Award

May 2025

Modeled stair erosion to estimate construction age under the supervision of Dr. Alessandro Veneziani; ranked in the top 5% among 20,000+ participating teams; published the award-winning paper at the *IEEE* conference.

Emory Pathway Global Internship Grant

May 2024

Awarded \$4,000 for outstanding summer internship performance

DataFest Competition, Finalist

April 2024

Analyzed real-life raw data from CourseKata Company; provided consulting advice that increased study efficiency for over 1,000 students.

Emory Phi Sigma, Member

May 2023

Recognition for outstanding academic achievement

IGEM Gold Medal

May 2021

Merit for excellent work in medical engineering and business advertisement

PROFESSIONAL SOCIETY MEMBERSHIP

Atlanta Preconditioning 2024

Student Volunteer

Helped to hold the academic conference at the Atlanta Area

Atlanta Mathematics of Data Science Bootcamp

Attendee

Explored a new algorithm (Lipschitz-regularized χ^2 -GAN) by combining χ^2 -GAN and WGAN.

Atlanta Science Festival – Exploration Exposition

Student Volunteer

Promoted mathematical knowledge to the public on behalf of the Emory Mathematics Department

ADDITIONAL

Activities: Emory China Care Club, ECSA

Hobbies: Chinese go, Badminton