CHENGRU (ERIC) ZOU

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EDUCATION

BS in Applied Mathematics and Statistics   *Atlanta, GA   Aug 2022 – May 2026*
Emory University, Emory College of Art and Science

- 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

- **Chengru 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   *Atlanta, GA   Aug 2024 – Present*
Argonne National Laboratory & Emory Math Department

- 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   *Atlanta, GA   July 2024 – Present*
MIT-IBM Watson AI Lab

- 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