

Yulong Liu

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RESEARCH INTERESTS

Computational Mechanics | **Artificial Intelligence** | **Implicit neural representation** | **Poromechanics**

EDUCATION

Ph.D. in Geophysics – Cornell University 2024 – Present
B.S. in Mining Engineering – Northeastern University 2024

RESEARCH EXPERIENCE

Ph.D. Student – Dept. of Earth and Atmospheric Sciences, Cornell University Aug. 2024 – Present
Advisor: Chloé Arson Ithaca, NY

Project: Computational mechanics, implicit neural representations, and poromechanics for coupled multiphysics problems in Earth science

- Develop computational mechanics models for subsurface systems using the MOOSE finite element framework.
- Build physics-informed neural networks, implicit neural representations, and operator-learning surrogates for geometry-aware, physics-aware prediction in Earth science and mechanics problems.
- Study poromechanics and multiscale transport in porous subsurface media, with growing interests in homogenization theory and surrogate modeling.

Undergraduate Researcher – Northeastern University (CN) Sep. 2020 – Jun. 2024
B.S. in Mining Engineering Shenyang, China

Thesis: A Unified Model for Microseismic Signal Classification and Arrival-Time Picking Based on Deep Learning

- Conducted undergraduate research in mining engineering on hydraulic fracturing, triaxial testing, AI-driven microseismic signal processing, and TBMs.
- Developed deep-learning-based approaches for microseismic signal classification and arrival-time picking.
- Received the Outstanding Thesis Award for thesis research, and National Scholarship for overall performance.

PUBLICATIONS

Selected Papers

- **Yulong Liu**^{*,†}, Zhenghan Song, et al. *Your Simulation Runs but Solves the Wrong Physics: PDE-Grounded Intent Verification for LLM-Generated Multiphysics Simulation Code*. Under review at NeurIPS 2026.
- **Yulong Liu**[†], Jonah Botvinick-Greenhouse, Yunan Yang, Chloé Arson. *Operator Learning Surrogate Modeling of Hydraulically Fractured Geothermal Injection-Production Systems: A Cornell Case Study*. ARMA 2026, Tucson.
- **Yulong Liu**, Chloé Arson. *A Physics-Informed Neural Network for Modeling Pressurized Cavities of Arbitrary Smooth Shape Embedded in Heterogeneous Rock*. Research Square preprint, 2026. Currently under review.
- M. Belachew, **Yulong Liu**, J. D. Frost, Chloé Arson. *Numerical Assessment of Plasticity Development and Energy Expenditure of Ant-Like Microtunnelling. Tunnelling and Underground Space Technology*, 172, 107501, 2026.
- **Yulong Liu**[†], Chloé Arson. *Physics-Informed Neural Network Surrogate Modeling of Pressurized Cavity in Homogeneous and Bilayered Media*. ARMA US Rock Mechanics/Geomechanics Symposium, D022S018R006, 2025.

Thesis

- **Yulong Liu**. *A Unified Model for Microseismic Signal Classification and Arrival-Time Picking Based on Deep Learning*. Undergraduate thesis, Northeastern University, 2024.

* Co-first author † Corresponding author

CONFERENCES AND PRESENTATIONS

Invited talk: 20th Phase Field Methods workshop <i>Center for Hierarchical Materials Design, Northwestern University</i>	May. 2026
Oral presentation, 60th US Rock Mechanics/Geomechanics Symposium (ARMA) <i>American Rock Mechanics Association (ARMA), Tucson, AZ, USA</i>	Jun. 2026
Poster presentation, Cornell CEE Graduate Research Symposium <i>Cornell University, Ithaca, NY, USA</i>	Apr. 2026
Invited seminar: “Physics-Informed AI Optimization of Heterogeneous Rock Systems” <i>Invited seminar – Southwest Petroleum University seminar series, Chengdu, China</i>	Dec. 2025
Poster presentation, 59th US Rock Mechanics/Geomechanics Symposium (ARMA) <i>American Rock Mechanics Association (ARMA), Santa Fe, NM, USA</i>	Jun. 2025

FELLOWSHIPS AND AWARDS

Estwing Hammer Award – Outstanding EAS Graduate Student of 2024, Cornell University	2025
Cornell University Travel Grant , Cornell University	2025
Outstanding Thesis , Northeastern University	2024
National Scholarship , Ministry of Education, China	2024
First Class Scholarship , Northeastern University	2023
Autumn Scholarship , Northeastern University	2022
Golden Seed Scholarship , Northeastern University	2022

ACADEMIC SERVICE

- Reviewer, *Rock Mechanics and Rock Engineering*
- Reviewer, *Computers and Geotechnics*
- Reviewer, *International Conference on Artificial Neural Networks*
- Reviewer, *Geothermal Rising Conference*

SKILLS

Programming & Scientific Computing: Python, C++, R, MOOSE finite element framework

Modeling & Simulation: finite element modeling, multiphysics simulation, CAD (e.g., AutoCAD, SolidWorks)

Machine Learning: Machine learning for PDEs, implicit neural representations (INRs), surrogate modeling, data-driven modeling for scientific computing

Experimental Methods: rock mechanics testing (e.g., triaxial compression), laboratory instrumentation

Research Areas: computational mechanics, poromechanics, multiscale transport in porous media

Scientific Writing: L^AT_EX / Overleaf

PROFESSIONAL MEMBERSHIPS

- Member, American Rock Mechanics Association (ARMA), 2025–Present
- Member, International Society for Rock Mechanics and Rock Engineering (ISRM), 2025–Present
- Member, Chinese Society for Rock Mechanics and Engineering (CSRME), 2024–Present
- Member, Geothermal Rising, 2025–Present