Yazhuo Liu

PhD candidate, George W. Woodruff School of Mechanical Engineering, Georgia Institute of Technology

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Education

Southern University of Science and Technology, Shenzhen, China — Sep. 2017 – Jun. 2021
B.Sc. in Theoretical and Applied Mechanics (solid mechanics)

Georgia Institute of Technology, Atlanta, USA — Jan. 2022 – Now
Ph.D. in Mechanical Engineering (mechanics of materials)

Experience

Cornell University, Ithaca, New York, USA — Jun. 2020 – Sep. 2020
Summer Research Intern. Advisor: Prof. Chung-Yuen Hui

Southern University of Science and Technology, Shenzhen, China — Jul. 2021 – Dec. 2021
Research Assistant. Supervisor: Prof. Wei Hong

Georgia Institute of Technology, Atlanta, Georgia, USA — Aug. 2025 – May. 2026
Instructor. Teaching COE3001 - Deformable Bodies

Publications

Liu, Y., Zhang, Y., Ding, K., Yang, Y., Barrios, A., Maeder, X., Pierron, O., Liu, X.*, & Zhu, T.* (2026). Phase-field modeling of abnormal grain growth. *Acta Materialia* (in progress)

Liu, Y., Ding, K., Birnbaum, A. J., Rawlings, A., Sun, A., Chen, W., McDowell, D. L., Michopoulos, J. G., & Zhu, T.* (2026). Surface plasticity in laser scanning of metals. *Acta Materialia*, 302, 121667.

Liu, Y., Feng, X., & Hong, W.* (2023). Non-affine dissipation in polymer fracture. *Extreme Mechanics Letters*, 59, 101955.

Liu, Y., Hui, C.-Y., & Hong, W.* (2021). A clean cut. *Extreme Mechanics Letters*, 46, 101343.

Patents

CN Patent No. CN202020206173.X: *"Logistics Unmanned Aerial Vehicle"*, October 27, 2020. (Shared)

Presentations

TMS 2024 Annual Meeting & Exhibition - oral presentation. *"Crystal plasticity modeling of thermo-elastic-plastic deformation during laser-based additive manufacturing"*, Orlando, Florida, USA

2025 SES Annual Technical Meeting - oral presentation. *"Abnormal grain growth under cyclic loading"*, Atlanta, Georgia, USA

2025 Physical Metallurgy Gordon Research Conference - poster. *"Driving force of abnormal grain growth"*, Easton, Massachusetts, USA

Awards & Honors

- *SUSTech Summa Cum Laude Graduates*, 2021.
- *CSTAM Finite Element Modeling Competition*, Third Prize, 2019.
- *COMAC 3D Printing Structure Optimization Competition*, Third Prize, 2018.
- *SUSTech Excellent Student*, First Class, 2018, 2019, 2020.

Projects

Dislocation-defect interactions Aug. 2025 - now

- The objective is to study the interaction between dislocations and prismatic loops, voids, and solute clusters in BCC crystals using molecular dynamics (MD), molecular statics (MS) and nudged elastic band (NEB) methods.
- Project still in progress

Stress induced phase separation of Li dendrite in LLZTO solid-state electrolyte Apr. 2025 - now

- Identified an early-stage, mesh-pattern morphology of Li dendrite growth in LLZTO under low-current short-circuit conditions through experimental observations.
- Developed a phase-field model to capture the stress-assisted phase separation and self-organization of Li and the subsequent evolution of the dendritic network structure.
- Revealed that the formation of the mesh-pattern arises from the minimization of elastic energy and the surface energy due to dendrite growth.

Laser-scanning-induced plastic deformation in metal 3D printing Apr. 2023 - Aug. 2025

- Investigated the influence of laser scanning on stress and plastic strain evolution in Ni single crystals, visualizing plastic deformation through surface slip traces and dislocation patterns.
- Developed a temperature-dependent crystal plasticity finite element (CPFE) model to simulate thermal effects and plastic deformation during laser scanning along various directions.
- Validated the CPFE model with experimental data, providing insights into controlling thermo-mechanical responses in laser-based additive manufacturing.

Abnormal grain growth in ultra-fine grained metals Sep. 2022 - Aug. 2025

- Developed a micromechanics-based analytical solution to predict grain boundary motion in thin-film metals using local stress-strain and crystallographic data.
- Utilized continuum phase field modeling to simulate multi-grain systems, capturing spatial and temporal evolution of grain structures under various loading conditions.
- Validated the phase field model through comparisons with analytical predictions and experimental data, demonstrating its accuracy in predicting grain growth behavior.

Energy dissipation mechanism in polymer fracture Feb. 2021 – Dec. 2021

- Revealed a significant energy dissipation mechanism in polymeric fracture, attributed to non-affine deformation near the crack tip, beyond traditional viscoelastic hysteresis.
- Demonstrated that reducing inter-chain friction through methods like lateral stretching or solvent dilution lowers fracture energy to intrinsic thresholds, while cyclic training maintains high fracture toughness.
- Identified non-affine dissipation as a key factor for developing soft materials with superior elasticity and fracture resistance, offering new design principles for advanced materials.

Effect of Friction in Cutting Soft Solids Jun. 2020 – Jun. 2021

- Investigated the role of friction and slicing motion in cutting soft solids, revealing how friction influences stress distribution and fracture initiation during the process.
- Developed a numerical model to analyze frictional contact and stress diversion, demonstrating how slicing minimizes vertical resistance and facilitates clean cutting.
- Studied the energetics of cutting by computing the energy landscape, showing that friction reduction lowers the energy barrier for crack opening and enhances cutting efficiency.