

Research Interest

Computational Mechanics (High Performance Computing; Topology Optimization)
Additive Manufacturing (Multi-scale Multi-physics Simulation; Metamaterial Design)
Machine Learning (Automatic Differentiation; Bayesian Methods)

Professional Experience

01/2022- **Postdoctoral Scholar**, Northwestern University.
Now Mechanical Engineering, Advisor: Prof. *Jian Cao*

Education

2017–2022 **Ph.D.**, Princeton University.
Civil Engineering, Advisor: Prof. *Sigrid Adriaenssens*
Computer Science, Advisor: Prof. *Ryan P. Adams*

2013–2017 **B.Sc.**, Shanghai Jiao Tong University.
Mechanical Engineering (UM-SJTU Joint Institute), GPA - 3.80/4.0 (ranking 1/53)

2016 **Exchange Student**, The University of Hong Kong.
Mechanical Engineering

Peer-reviewed Publications

- 2022 S.Liao, **T.Xue**, J.Jeong, S.Webster, K.Ehmann, J.Cao, Hybrid full-field thermal characterization of additive manufacturing processes using physics-informed neural networks with data, *Computational Mechanics*, (Accepted).
- 2022 M.Mozaffar, S.Liao, J.Jeong, **T.Xue**, J.Cao, Differentiable Simulation for Material Thermal Response Design in Additive Manufacturing Processes, *Additive Manufacturing*, 2022.
- 2022 **T.Xue**, S.Mao, Learning the nonlinear dynamics of soft mechanical metamaterials with graph networks, *International Journal of Mechanical Sciences*, 2022.
- 2022 **T.Xue**, Z.Gan, S.Liao, J.Cao, Physics-embedded graph network for accelerating phase-field simulation of microstructure evolution in additive manufacturing, *npj Computational Materials*, 2022.
- 2022 **T.Xue**, S.Mao, Mapped shape optimization method for rational design of cellular mechanical metamaterials under large deformation, *International Journal for Numerical Methods in Engineering*, 2022.
- 2021 X.Sun, **T.Xue**, S.M. Rusinkiewicz, R.P.Adams, Amortized Synthesis of Constrained Configurations Using a Differentiable Surrogate, *NeurIPS*, 2021.
- 2021 **T.Xue**, S.Adriaenssens, S.Mao, Mapped phase field method for brittle fracture, *Computer Methods in Applied Mechanics and Engineering*, 2021.
- 2021 **T.Xue**, W.C.Sun, S.Adriaenssens, Y.Wei, C.Liu, A new finite element level set reinitialization method based on the shifted boundary method, *Journal of Computational Physics*, 2021.
- 2020 A.Beatson, J.T.Ash, G.Roeder, **T.Xue**, R.P.Adams, Learning Composable Energy Surrogates for PDE Order Reduction, *NeurIPS*, 2020.

- 2020 **T.Xue**, T.J.Wallin, Y.Menguc, S.Adriaenssens, M.Chiaromonte Machine learning generative models for automatic design of multi-material 3D printed composite solids, *Extreme Mechanics Letters*, 2020.
- 2020 **T.Xue**, A.Beatson, S.Adriaenssens, R.P.Adams, Amortized Finite Element Analysis for Fast PDE-Constrained Optimization, *ICML*, 2020.
- 2020 **T.Xue**, A.Beatson, M.Chiaromonte, G.Roeder, J.T.Ash, Y.Menguc, S.Adriaenssens, R.P.Adams, S.Mao, A data-driven computational scheme for the nonlinear mechanical properties of cellular mechanical metamaterials under large deformation, *Soft Matter*, 2020.
- 2019 Y.Wan, **T.Xue**, Y.Shen, The successive node snapping scheme for an evolving branched curve in 2D and 3D, *Computer-Aided Design*, 2019.
- 2019 Y.Wan, **T.Xue**, Y.Shen, The successive node snapping scheme: A method to obtain conforming meshes for an evolving curve in 2D and 3D, *Finite Elements in Analysis and Design*, 2019.
- 2017 M.Ma, **T.Xue**, S.Chen, Y.Guo, Y.Chen, H.Liu, Features of structural relaxation in diblock copolymers, *Polymer Testing*, 2017.

Ongoing Works

T.Xue, S.Liao, Z.Gan, C.Park, X.Xie, W.K.Liu, J.Cao, JAX-FEM: A differentiable GPU-accelerated 3D finite element solver for automatic inverse design and mechanistic data science (Submitted).

Teaching

- 2017-2021 **Graduate Teaching Assistant**, Princeton University.
SML201 Introduction to Data Science
COS424 Fundamentals of Machine Learning
CEE205 Mechanics of Solids
- 2013-2017 **Undergraduate Teaching Assistant**, Shanghai Jiao Tong University.
VM382 Mechanical Behaviour of Materials
VP140 Physics

Internship

- 2020 **Quantitative Researcher**, Sixie Capital, Shanghai.
Statistical analysis of market data: Seeking investment alpha
- 2019 **Research Intern**, Facebook, Inc., Redmond.
AR/VR at Facebook Reality Labs: Deep learning for 3D printing material design
- 2017 **Product Design Engineer**, Apple, Inc., Shanghai.
Apple accessories team: Keyboard design and manufacturing

Presentations

- 2022 Annual International Solid Freeform Fabrication Symposium
- 2021 USACM Workshop on New Trends and Open Challenges in Computational Mechanics: from Nano to Macroscale
- 2020 ICLR Workshop on Integration of Deep Neural Models and Differential Equations
- 2018 13th World Congress on Computational Mechanics

Reviewing

Nature Materials; *Npj Computational Materials*; *Extreme Mechanics Letters*; *NeurIPS*

Selected Honors

2017	Gordon Y.S. Wu Fellowships	<i>A highly prestigious award at Princeton University</i>
2016	The Merit Student Model	<i>Person of the year at Shanghai Jiao Tong University</i>
2015	National Scholarship	<i>Top scholarship for undergraduate students in China</i>

Software

JAX-AM An open-source Python library for numerical simulations in additive manufacturing with GPU acceleration and automatic sensitivity analysis.

Skills

Tools Matlab, L^AT_EX

Programming Languages Python, C/C++

Languages

Mandarin

Native

English

TOEFL: 111/120

References

Jian Cao, Cardiss Collins Professor, NAE Member.
Department of Mechanical Engineering,
Northwestern University.
E-mail: jcao@northwestern.edu

Sigrid Adriaenssens, Professor.
Department of Civil and Environmental Engineering,
Princeton University.
E-mail: sadriaen@princeton.edu

Ryan P. Adams, Professor.
Department of Computer Science,
Princeton University.
E-mail: rpa@princeton.edu

Zhengtao Gan, Assistant Professor.
Department of Aerospace & Mechanical Engineering,
The University of Texas at El Paso.
E-mail: zgan@utep.edu