Tianju Xue

Ph.D., Princeton University

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Research Interest

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

Professional Experience

01/2022- Now	**Postdoctoral Scholar**, *Northwestern University*. 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*, 2022.

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.Chiaramonte 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.Chiaramonte, 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

J.Shao, A.Samaei, **T.Xue**, X.Xie, S.Guo, J.Cao, E.MacDonald, Z.Gan, Additive friction stir deposition of metallic materials: process, structure and properties, *Progress in Materials Science* (Under Review).

C.Park, Y.Lu, S.Saha, **T.Xue**, J.Guo, S.Mojumder D. W.Apley, G.J.Wagner, W.K.Liu, Convolution Hierarchical Deep-learning Neural Network (C-HiDeNN) with Graphics Processing Unit (GPU) Acceleration, *Computational Mechanics* (Under Review).

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).

S.Liao, J.Jeong, R.Zha, **T.Xue**, J.Cao, Simulation-guided feedforward-feedback control of melt pool temperature in directed energy deposition (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**　　　*A highly prestigious award at Princeton University*

2016　**The Merit Student Model**　　　*Person of the year at Shanghai Jiao Tong University*

2015　**National Scholarship**　　　*Top scholarship for undergraduate students in China*

Software

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

Skills

Tools Matlab, LaTeX

Programming Languages Python, C/C++

Languages

Mandarin　　　　　　　　　　　　　　　　　　　　　*Native*

English　　　　　　　　　　　　　　　　　　　*TOEFL: 111/120*

References

Jian Cao, Cardiss Collins Professor, NAE Member.
Department of Mechanical Engineering,
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Sigrid Adriaenssens, Professor.
Department of Civil and Environmental Engineering,
Princeton University.
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Ryan P. Adams, Professor.
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Zhengtao Gan, Assistant Professor.
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The University of Texas at El Paso.
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