Wei-Yun XU, Ph.D.

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PROFESSIONAL EXPERIENCE

2025.02 — Present **Department of Civil & Environmental Engineering, UIUC**
Postdoc Research Associate (PI: Xiaojia Shelly Zhang)

2024.05 — 2025.02 **Department of Mechanical Engineering, Tsinghua University**
Postdoc Research Assistant, *Shuimu Tsinghua Scholar* (PI: Peng Wen)

2018.09 — 2024.06 **School of Mechanical Engineering, Shanghai Jiao Tong University**
MS and PhD joint program in ME (Advisor: Ping Zhu) GPA: 3.69 Rank: 3/108
Thesis: Energy-absorbing mechanism and design method of three-dimensional chiral mechanical metamaterials

2014.09 — 2018.06 **School of Mechanical Engineering, Shanghai Jiao Tong University**
Bachelor in Mechanical Engineering GPA: 3.95 Rank: 1/27

RESEARCH PUBLICATIONS

In Progress (Under Review)

1. **W.Y. Xu**, D. Hong, Z. Zhao, R.D. Kundu, and X.S. Zhang. **Delaying the transmission attenuation of local deformation in soft metamaterials via mechanical-impedance-based topology optimization**, 2026.
2. Y.B. Wang*, A.F. Ahmed*, W.C. Li, **W.Y. Xu**, and X.S. Zhang. **Precise digital-to-physical inverse design of programmable liquid crystal elastomer architectures**, 2026.
3. X.Y. Tai, **W.Y. Xu**, and P. Zhu. **Gradient metamaterials with moment-of-inertia-induced low-frequency vibration attenuation**, 2025.

Journal Articles

1. **W.Y. Xu***, H.L. Pang*, H.J. Xu, J.G. Liu, Y.F. Zheng, and P. Wen. **Process-driven microstructure design of 3D-printed porous magnesium alloy scaffolds with tunable biodegradation kinetics**, *Int. J. Mach. Tools Manuf.*, vol. 215, p. 104362, 2025.
2. J.M. Liu, B. Peng, **W.Y. Xu**, Y. Wei, and P. Wen. **Highly Efficient Discovery of 3D Mechanical Metamaterials via Monte Carlo Tree Search**, *Adv. Sci.*, vol. 12, p. e13771, 2025.
3. Z.Z. Song, **W.Y. Xu**, M.A. Valdebenito, and M.G.R. Faes. **Efficient forward and inverse uncertainty quantification for dynamical systems based on dimension reduction and Kriging surrogate modeling in functional space**, *Mech. Syst. Signal Pr.*, vol. 235, p. 112898, 2025.
4. Z.J. Pei*, H.J. Xu*, M.Z. Guo*, **W.Y. Xu**, Y. Wen, F.P. Sun, T.Y. Zhang, B. Peng, P.Q. Zhao, L.K. Huang, M.Y. Wang, Z.S. He, J.Z. Liu, Z.C. Yang, Z. Zhang, P. Wen, and L.Y. Wen. **A soft-hard hybrid scaffold for osteochondral regeneration through integration of composite hydrogel and biodegradable magnesium**, *Biomaterials*, vol. 324, p. 123493, 2025.
5. **W.Y. Xu**, C. Zhou, H.Y. Zhang, Z. Liu, and P. Zhu. **A flexible design framework for lattice-based chiral mechanical metamaterials considering dynamic energy absorption**, *Thin-Walled Struct.*, vol. 203, p. 112108, 2024.
6. **W.Y. Xu**, H.Y. Zhang, Z. Liu, and P Zhu. **Aperiodic design framework of chiral mechanical metamaterials considering crashworthiness**, *J. Mech. Eng.*, JME2023-1296, 2024. (In Chinese)
7. L. Zhang, **W.Y. Xu**, R.Y. Qiu, D.K. Xu, H.Y. Zhang, and P Zhu. **Multiscale-based multiaxial fatigue model of short fiber reinforced polymer composites under high-cycle proportional loading**, *Compos. Part B-Eng.*, vol. 275, p. 111308, 2024.
8. **W.Y. Xu**, L. Zhang, B.Q. Zhang, H.Y. Zhang, Z. Liu, and P. Zhu. **Crushing behavior of contact-aided AlSi10Mg sandwich structure based on chiral mechanical metamaterials**, *Int. J. Mech. Sci.*, vol. 260, p. 108636, 2023.
9. **W.Y. Xu***, L.W. Wang*, Z. Liu, and P. Zhu. **General assembly rules for metamaterials with scalable twist effects**, *Int. J. Mech. Sci.*, vol. 259, p. 108579, 2023.
10. **W.Y. Xu**, Z. Liu, L.W. Wang, and P. Zhu. **3D chiral metamaterial modular design with highly-tunable tension-twisting properties**, *Mater. Today Commun.*, vol. 30, p. 103006, 2022.

Conference Proceedings/Oral Presentations

1. **W.Y. Xu**, B. Peng, and P. Wen. **SD-DAL: Structure discovery of elastic metamaterials via deep active learning**, *APS Global Physics Summit 2025*, Anaheim, CA, USA, March 17-21, 2025.
2. **W.Y. Xu**, X.Y. Tai, and P. Zhu. **Bio-inspired Mechanical Metamaterials with Enhanced Energy Absorption**, *APS Global Physics Summit 2025*, Anaheim, CA, USA, March 17-21, 2025.
3. **W.Y. Xu**, W.J. Wang, and P. Zhu. **GNN-based inverse design of three-dimensional aperiodic metamaterials enabling programmable shapes**, *APS March Meeting 2024*, Minneapolis, MN, USA, March 3-8, 2024.
4. **W.Y. Xu**. **High temperature oxidation treatment of magnesium alloys in additive manufacturing**, *2024 Chinese Society for Biomaterials (CSBM) Annual Symposium*, Weihai, China, October 11-13, 2024.
5. **W.Y. Xu**, H.Y. Zhang, Z. Liu, and P. Zhu. **On the crashworthiness of aperiodic chiral mechanical metamaterials: design and modeling method** in *J. Phys. Conf. Ser.*, vol. 2639, p. 012029, 2023.

Patents

1. **W.Y. Xu**, P. Zhu, Z. Liu, and Y.F. Li. **Chiral mechanical metamaterial sandwich structures with size-effect-free twist and the applications**, China Patent CN115691719B, Jul. 29, 2025. (Authorized)
2. P. Zhu, L. Zhang, Z. Liu, **W.Y. Xu**, and Z.Z. Song. **Stiffness-based mixed rapid prediction method for fatigue life of SFRP**, China Patent CN116305990B, Jul. 22, 2025. (Authorized)
3. P. Zhu, **W.Y. Xu**, Z. Liu, L.W. Wang, and L. Zhang. **Automatic simulation system and method for strut-based metamaterial under multiple working conditions**, China Patent CN114297877B, Nov. 5, 2024. (Authorized)
4. P. Zhu, **W.Y. Xu**, Z. Liu, and M.S. Li. **Mesoscopic structural optimization methods**, China Patent CN110362912B, Nov. 8, 2022. (Authorized)
5. **W.Y. Xu**, P. Zhu, and W.Z. Guo. **Foldable multi-form electric vehicle**, China Patent CN109178180B, May 5, 2020. (Authorized)
6. H.Y. Zhang, **W.Y. Xu**, Z. Liu, and P. Zhu. **Implementation method for aperiodic chiral mechanical metamaterial**, China Patent CN120781587A, Oct. 14, 2025. (Pending)
7. Z. Liu, **W.Y. Xu**, and P. Zhu. **Twist angle measurement fixture for compression-torsional testing of chiral mechanical metamaterial**, China Patent CN116026678A, Apr. 28, 2023. (Pending)

Book and Chapter

1. P. Zhu. **Advanced design theory and methodology**. Beijing, China: China Machine Press, 2023, ISBN: 978-7-111-71470-5. (in Chinese) **(Chapter 3 and 7)**

MISCELLANEOUS EXPERIENCE

Representative Research Funding Acquisition

- **National Natural Science Foundation of China (Grant No. 12472119)** 2025.01 — 2028.12
  Energy absorption mechanism and design of 3D chiral mechanical metamaterials based on PINN
- **Shanghai Natural Science Foundation (Grant No. 23ZR1431600)** 2023.04 — 2026.03
  Research on energy absorption mechanism and optimization design method of 3D chiral metamaterials
- **Shanghai Natural Science Foundation (Grant No. 21ZR1431500)** 2021.04 — 2024.03
  Research on data-driven multi-scale optimization design method of mechanical metamaterial

Teaching Assistant

- 2021-2022 Undergraduate Course *Open Source and Modeling*
- 2019-2023 Undergraduate Course *Fundamentals of Manufacturing Processes*
- 2015-2016 Undergraduate Course *The Way To Success*

Certification

- 2025 Scholarship and Teaching for Engineering Postdocs (STEP) Program, GCOE, UIUC
- 2020 Student President of Graduate Union, Shanghai Jiao Tong University
- 2016 Certified Volunteer in Shanghai International Marathon

Awards and Achievements

- 2017/2019/2023 **National Scholarship** (1%), Ministry of Education of P. R. China
- 2016 **National Inspirational Scholarship**, Ministry of Education of P. R. China
- 2017 **Merit Student Award**, Shanghai Jiao Tong University
- 2018 **Outstanding Graduate Award**, Shanghai Jiao Tong University
- 2018 **Excellent Graduation Design Award**, School of Mechanical Engineering, SJTU
- 2018 **1st Place in Road Test Competition of PACE**, General Motors (North America) Ltd.
- 2019 **2nd Place of 30th International Design Contest ROBOCON,** MIT
- 2020 **Inspirational Individual Award**, Shanghai Jiao Tong University
- 2020 **Excellence Teaching Assistant Award**, Shanghai Jiao Tong University
- 2024 **Shanghai PhD Outstanding Graduate Award**, Shanghai Jiao Tong University
- 2024 **APS DMP Ovshinsky Travel Award**, APS Division of Materials Physics
- 2024 **APS FGSA Graduate Research Excellence Travel Award**, APS FGSA
- 2024 **Class D Municipal High-level Talent**, Ganzhou, Jiangxi Province, P. R. China
- 2024 **Shuimu Tsinghua Scholar Fellowship**, Tsinghua University
- 2025 **Excellent PhD Dissertation**, School of Mechanical Engineering, SJTU

SKILLS

- **Languages** Strong reading, writing, and speaking competencies for English and Mandarin Chinese.
- **Coding** Java, Python, C/C++, SQL (Postgres), JavaScript, MATLAB, Latex.
- **CAD** Solidworks, Unigraphics NX, AutoCAD, Blender, nTopology, ParaView
- **CAE** ABAQUS, ANSYS, COMSOL Multiphysics, LS-DYNA, Hypermesh, FEnicsX
- **Hardware** Arduino, STM8/STM32, Raspberry Pi
- **Manufacturing** CNC, Casting, Additive Manufacturing (FDM, SLA, SLM, SLS), DIY 3D-Printer