G. Wayne Tu

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Education

- **University of Michigan** *Sep. 2022 – June 2026*
  Ph.D. in Civil Engineering (Structures, Mechanics & Materials Track) Ann Arbor, MI
  - GPA: 3.95/4.00
  - Advisor: Prof. Evgueni Filipov (Deployable and Reconfigurable Structures Lab)
  - Thesis topic: Functional 3D woven structures and metamaterials
- **Shanghai Jiao Tong University** *Sep. 2019 – June 2022*
  M.S. in Mechanical Engineering Shanghai, CN
- **Chongqing University** *Sep. 2015 – June 2019*
  B.S. in Mechanical Engineering Chongqing, CN

Publications and Presentations

Journal Papers

During Ph.D.

[J.1] Tu, G.W. and Filipov, E.T. (2025). **Corner topology makes woven baskets into stiff, yet resilient metamaterials**. *Physical Review Research*, 2025, 7, 033193. [PDF] [Videos] [Media Coverage: Michigan News, Tech Xplore, Yahoo!News, Interesting Engineering, EurekAlert!, Engineering Designer, The Conversation]

[J.2] Tu, G.W. and Filipov, E.T. (2025). **Engineering snags for spatial curvature in weaves: Fabrication, mechanics, and inverse design**. *Soft Matter*, 2025, 21, 8793-8802. [PDF] (selected as the back cover)

[J.3] Tu, G.W. and Filipov, E.T. (2024). **Origami of multi-layered spaced sheets**. *Journal of the Mechanics and Physics of Solids*, p.105730. [PDF]

[J.4] Tu, G.W. and Filipov, E.T. (2025). **Integrating active material into 3D plain weaves for load-bearing robotic textiles**. *Soft Robotics* (submitted). [Videos]

[J.5] Krankel, J., Tu, G.W. and Filipov, E.T. (2025). **Stiffness and buckling behavior of plain-woven columns**. *Extreme Mechanics Letters* (submitted). [PDF]

[J.6] Chen, K., Tu, G.W., Dong, X., Huang, Y. and Peng, Z. (2023). **Multifunctional application of nonlinear metamaterial with two-dimensional bandgap**. *Science: Technological Sciences*, 66 (3), 869-880. [PDF]

[J.7] Chen, K., Dong, X., Gao, P., Zhang, J., Sun, Y., Tu, G.W. and Peng, Z. (2023). **Multifunctional applications of topological valley-locked elastic waves**. *International Journal of Mechanical Sciences*, 259, p.108589. [PDF]

Before Ph.D.

[J.8] Tu, G.W., Dong, X., Chen, S., Zhao, B., Hu, L. and Peng, Z. (2020). **Iterative nonlinear chirp mode decomposition: A Hilbert-Huang transform-like method in capturing intra-wave modulations of nonlinear responses**. *Journal of Sound and Vibration*, 485, p.115571. [PDF]

[J.9] Tu, G.W., Dong, X., Qian, C., Chen, S., Hu, L. and Peng, Z. (2021). **Intra-wave modulations in milling processes**. *International Journal of Machine Tools and Manufacture*, 163, p.103705. [PDF]

[J.10] Dong, X., Tu, G.W., Hu, L. and Peng, Z. (2024). **Suppress chatter in milling of thin-walled parts via fixture with active support**. *Journal of Vibration and Control*, 30(5-6), pp.1286-1296. [PDF]

[J.11] Dong, X., Tu, G.W., Wang, X. and Chen, S. (2021). **Real-time chatter detection via iterative Vold-Kalman filter and energy entropy**. *The International Journal of Advanced Manufacturing Technology*, 116, pp.2003-2019. [PDF]

[J.12] Chen, Q., Dong, X., Tu, G.W., Wang, D., Cheng, C., Zhao, B. and Peng, Z. (2024). **TFN: An interpretable neural network with time-frequency transform embedded for intelligent fault diagnosis**. *Mechanical Systems and Signal Processing*, 207, p.110952. [PDF]

[J.13] Zhao, B., Cheng, C., Tu, G.W., Peng, Z., He, Q. and Meng, G. (2021). **An interpretable denoising layer for neural networks based on reproducing kernel Hilbert space and its application in machine fault diagnosis**. *Journal of Mechanical Engineering*, 34(1), 1-11. [PDF]

[J.14] Huangfu, Y., Dong, X., Chen, K., Tu, G.W., Long, X. and Peng, Z. (2022). **A tribo-dynamic based pitting evolution model of planetary gear sets: A topographical updating approach**. *International Journal of Mechanical Sciences*, 220, p.107157. [PDF]

Conference Presentations

[C.1] Tu, G.W. and Filipov, E.T. (2025). **Corner topology of woven baskets inspires stiff, yet resilient metamaterials**. In *ASME International Mechanical Engineering Congress and Exposition (IMECE)*, November 16–20, Memphis, TN. (***Won ASME Student Travel Award***)

[C.2] Filipov, E.T. and Tu, G.W. (2025). **Basket weaving provides remarkable stiffness and resilience for functional structures**. In *European Solid Mechanics Conference*, July 7–11, Lyon, France.

[C.3] Tu, G.W. and Filipov, E.T. (2025). **How corner topology makes woven baskets ultra-stiff, yet ultra-resilient**. In *American Physical Society (APS) March Meeting*, March 16–21, Anaheim, CA. (***Won APS DMP Ovshinsky Travel Award***)

[C.4] Tu, G.W. and Filipov, E.T. (2024). **Origami of multi-layered spaced sheets**. In *ASCE Engineering Mechanics Institute Conference and Probabilistic Mechanics & Reliability Conference (EMI/PMC)*, May 28–31, Chicago, IL. (***Won Best Elasticity Student Paper Award***)

[C.5] Tu, G.W. and Filipov, E.T. (2023). **Kinematics of spaced origami sheets**. In *ASME International Design Engineering Technical Conferences & Computers and Information in Engineering Conference (IDETC-CIE)*, August 20–23, Boston, MA.

Poster Presentations

[P.1] Tu, G.W. and Filipov, E.T. (2025). **How corner topology of woven baskets inspires stiff, yet resilient metamaterials**. In *ASME International Mechanical Engineering Congress and Exposition (IMECE)*, November 16–20, Memphis, TN.

[P.2] Tu, G.W. and Filipov, E.T. (2025). **Corner topology makes woven baskets into stiff, yet resilient metamaterials**. In *Michigan Materials Research Institute Annual Summit*, June 3–4, Ann Arbor, MI.

[P.3] Tu, G.W., Yi Z. and Filipov, E.T. (2024). **Design of modular origami structures for multifunctional cloaking and protection**. In *Automotive Research Center Annual Program Review*, June 5–7, Ann Arbor, MI.

Research Experience

- **Research Assistant at Deployable and Reconfigurable Structures Lab** *Sep 2022 – June 2026*
  University of Michigan | Advisor: Prof. Evgueni Filipov
  - Integrated active materials into 3D woven structures to create load-bearing robotic textiles.
  - Proposed a general woven corner platform to modularly build ultra-stiff yet ultra-resilient woven metamaterials.
  - Designed meter-scale deployable acoustic cloaks and thermal shields based on multi-layered origami.
- **Research Assistant at Smart Materials and Structures Lab** *Sep. 2019 – June 2022*
  Shanghai Jiao Tong University | Advisors: Prof. Xingjian Dong & Prof. Zhike Peng
  - Designed a novel metastructure inspired by ancient window lattices to isolate low-frequency vibration.
  - Developed an actively controlled smart spindle system to suppress chatter instability in milling.
  - Proposed a new algorithm to quantify the nonlinearity of dynamical systems.

Mentoring and Teaching Experience

- **Graduate Student Mentor for Summer Undergraduate Research Program (SURE 2025)** *Summer 2025*
  University of Michigan | Mentee: Jaimie Krankel
  - Codeveloped a theoretical model for predicting stiffness and buckling loads of woven columns.
  - Coauthored a paper submitted to Extreme Mechanics Letters.
- **Graduate Student Instructor for Civil Engineering Materials (CEE 351)** *Fall 2023*
  University of Michigan | Instructor: Dr. Mengjun Hou
  - Taught labs on experimental testing of engineering materials including concrete, steel, and wood.
  - Received 4.5/5.0 in graduate student instructor evaluation from students.
  - Course topic: Discussion of basic mechanical and physical properties of a variety of important civil and environmental engineering materials such as concrete, steel, plastic, asphalt, wood and fiber composites.

Honors and Awards

- **Rackham Graduate School International Student Fellowship** *2025*
  University of Michigan
- **IMECE Student Travel Award** *2025*
  American Society of Mechanical Engineers (ASME) Applied Mechanics Division
- **Stanford R. Ovshinsky Student Travel Award** *2025*
  American Physical Society (APS) Division of Materials Physics
- **Richard and Eleanor Towner Prize for Outstanding Ph.D. Research** *2025*
  University of Michigan
- **Best Elasticity Student Paper Award** *2024*
  American Society of Civil Engineers (ASCE) Engineering Mechanics Institute
- **Michigan Institute of Computational Discovery & Engineering (MICDE) Fellowship** *2022*
  University of Michigan
- **Outstanding Graduate Award** (Top 1%) *2022*
  Shanghai Jiao Tong University
- **Best Master Thesis Award** (20 out of 5,000+) *2022*
  Shanghai Jiao Tong University
- **National Scholarship** (Awarded Twice, Top 0.1%) *2020, 2019*
  Chinese Government