

Tianyu Chen

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Work

University of Bristol

Research Associate

Bristol, UK

Sep. 2025 to present

The VIVO Hub for Enhanced Independent Living (thevivohub.com)

- Developing fundamental soft-actuation technologies to support mobility and independent living for older adults.
- Researching electrostatic actuation as a lightweight replacement for the bulky motors and pneumatic systems in current exosuits.

Education

Nanyang Technological University

Ph.D., Mechanical Engineering

Singapore

Sep. 2025

Thesis: Scale-Inspired Layered Structure for Variable Stiffness and Shape Morphing

Northwestern Polytechnical University

M.E., Solid Mechanics

Xi'an, P. R. China

Mar. 2020

Northwestern Polytechnical University

B.E., Engineering Mechanics

Xi'an, P. R. China

Jul. 2017

Research Experience

Nanyang Technological University

Graduate Student with Prof. Yifan Wang

Singapore

2021-2025

Development and application of the Scale-Inspired Layered Structure (SAILS), a soft robotic structure featuring inversely designed programmable surface patterns for simultaneous shape morphing and stiffness modulation.

- Developed computational algorithms and finite element models for the design and simulation of SAILS, leading to the successful fabrication of prototypes using 3D printing.
- Designed and implemented a SAILS-based soft amphibious robot with a custom mechatronic control system to achieve versatile locomotion across terrestrial and aquatic environments.
- Engineered a variable stiffness landing gear for drones based on SAILS, including design, performance evaluation using a custom drop test setup with piezoelectric force sensors, and integration into drone systems with in-flight control mechanisms for adaptive impact force mitigation.

Central South University

Research Assistant with Prof. Jianjun Li

Changsha, P. R. China

2020-2021

- Developed finite element models to investigate the frictional and mechanical behavior of gradient and bimodal nanostructured metals during scratch tests.
- Revealed strain delocalization mechanisms in heterogeneous nanostructures leading to improved tribological properties compared to homogeneous counterparts.

Northwestern Polytechnical University

Graduate Student with Prof. Chun Li

Xi'an, P. R. China

2017-2020

- Developed finite element models to investigate the deformation behavior of thin films on substrates, including metallic and metallic glass films.
- Revealed mechanisms for enhancing thin film ductility through substrate design and interfacial engineering, providing insights for improving the mechanical performance of thin film systems.

Publications

1. J. Pan[†], **T. Chen[†]** (equal contribution), J. Li, Y. Wang, Muscle Coactivation-Inspired Stiffness-Driven Control Strategy for Antagonistic Soft Robots, **Science Advances**, 12 (2026) eaeg3346.

2. **T. Chen**, X. Yang, Y. Wang, Design and Modeling of a Programmable Morphing Structure with Variable Stiffness Capability, **International Journal of Mechanical Sciences**, 284 (2024).
3. **T. Chen**, X. Yang, B. Zhang, J. Li, J. Pan, Y. Wang, Scale-Inspired Programmable Robotic Structures with Concurrent Shape Morphing and Stiffness Variation, **Science Robotics**, 9 (2024) eadl0307.
4. **T. Chen**, J. Li, Modelling the Shear Banding in Gradient Nano-Grained Metals, **Nanomaterials**, 11 (2021).
5. **T. Chen**, J. Li, S. Chen, C. Li, Shear Band Multiplication Induced Strong Strain Delocalization and High Tensile Ductility in Amorphous Thin Films by Metallic Substrates, **International Journal of Solids and Structures**, 195 (2020) 1-12.
6. **T. Chen**, W. Lu, J. Li, S. Chen, C. Li, G.J. Weng, Tailoring Tensile Ductility of Thin Film by Grain Size Graded Substrates, **International Journal of Solids and Structures**, 166 (2019) 124-134.
7. Y. Chen, X. Yang, J. Li, **T. Chen**, Yuzhe Wang, Yifan Wang, Suture-Inspired Interlocking Metamaterials for Energy-Efficient Morphing, **Advanced Functional Materials**, 36 (2026) e78343.
8. Y. Chen, X. Yang, **T. Chen**, J. Li, Y. Wang, Thermally Responsive Architected Actuators with Programmable Shape Morphing and Tunable Stiffness, **Advanced Intelligent Systems**, 7 (2025) 2500123.
9. J. Li, K. Wu, J. Xiao, **T. Chen**, X. Yang, J. Pan, Y. Chen, Y. Wang, Flexible Multichannel Muscle Impedance Sensors for Collaborative Human-Machine Interfaces, **Science Advances**, 11 (2025) eadv3359.
10. Z. Fu, **T. Chen**, H. Zou, Z. Zhu, Z. Deng, Y. Wang, Negative-Pressure Soft Pneumatic Actuators Enabled by Asymmetrically Distributed Bending Units, **Extreme Mechanics Letters**, 77 (2025).
11. B. Zhang, Z. Meng, X. Yang, Y. Zhang, **T. Chen**, Y. Chen, Y. Wang, Multistable Soft Robots Assembled from Bistable Auxetic Building Blocks, **Advanced Intelligent Systems**, (2024).
12. X. Yang, Y. Chen, **T. Chen**, J. Li, Y. Wang, Active Fabrics with Controllable Stiffness for Robotic Assistive Interfaces, **Advanced Materials**, (2024) e2404502.
13. X. Yang, M. Liu, **T. Chen**, Y. Chen, Y. Wang, Tunable Mechanics of Architected Composites from Particle Assemblies, **Extreme Mechanics Letters**, 67 (2024).
14. X. Yang, M. Liu, B. Zhang, Z. Wang, **T. Chen**, Y. Zhou, Y. Chen, K.J. Hsia, Y. Wang, Hierarchical Tessellation Enables Programmable Morphing Matter, **Matter**, 7 (2024) 603-619.
15. H.L. Wang, B. Zhang, **T. Chen**, W. Mao, Y. Wang, High-Efficiency Single-Droplet Energy Harvester for Self-Sustainable Environmental Intelligent Networks, **Advanced Energy Materials**, 13 (2023).
16. H.L. Wang, **T. Chen**, B. Zhang, G. Wang, X. Yang, K. Wu, Y. Wang, A Dual-Responsive Artificial Skin for Tactile and Touchless Interfaces, **Small**, (2023) e2206830.
17. X. Yang, Z. Wang, B. Zhang, **T. Chen**, C. Linghu, K. Wu, G. Wang, H. Wang, Y. Wang, Self-Sensing Robotic Structures from Architected Particle Assemblies, **Advanced Intelligent Systems**, 5 (2022).
18. J. Li, **T. Chen**, T. Chen, Z. Yun, X. Xia, Computational Modelling of Frictional Deformation of Bimodal Nanograined Metals, **International Journal of Mechanical Sciences**, 222 (2022).
19. J. Li, T. Chen, **T. Chen**, W. Lu, Enhanced Frictional Performance in Gradient Nanostructures by Strain Delocalization, **International Journal of Mechanical Sciences**, 201 (2021).
20. J. Li, W. Lu, J. Gibson, S. Zhang, **T. Chen**, S. Korte-Kerzel, D. Raabe, Eliminating Deformation Incompatibility in Composites by Gradient Nanolayer Architectures, **Scientific Reports**, 8 (2018) 16216.

Conference Presentations and Posters

1. **T. Chen**, Y. Wang. Presentation. Scale-Inspired Programmable Robotic Structures with Concurrent Shape Morphing and Stiffness Variation. **Society of Engineering Science Annual Technical Meeting (SES2024)**. Hangzhou, China (2024).
2. **T. Chen**, Y. Wang. Presentation. Scale-Inspired Programmable Robotic Structures with Concurrent Shape Morphing and Stiffness Variation. **International Conference on Computational & Experimental Engineering and Sciences (ICCES2024)**. Singapore (2024).
3. **T. Chen**, J. Li, C. Li. Poster. Shear band multiplication induced strong strain delocalization and high tensile ductility in amorphous thin films by metallic substrates. **The Chinese Congress of Theoretical and Applied Mechanics**. Hangzhou, China (2019).
4. **T. Chen**, W. Lu, J. Li, S. Chen, C. Li, G.J. Weng. Poster. Tailoring tensile ductility of thin film by grain size graded substrates. **2019 Gordon Research Conference on Heterogeneous Materials**. Hong Kong, China (2019).

5. **T. Chen**, J. Li, C. Li. Poster. Modulating tensile ductility of metallic glass film by coarse-grained substrates. **2018 National Conference on Solid Mechanics**. Harbin, China (2018).

Teaching Experience

Nanyang Technological University

Singapore

Teaching Assistant

2022-2025

- MA1008 - Introduction to Computational Thinking
- P3.3AE - Design and Implementation of Electrohydraulic Circuits
- MA1700 (A1.4) - Structural vibration analysis

Northwestern Polytechnical University

Xi'an, P. R. China

Teaching Assistant

2018-2019

- Theoretical Mechanics

Scholarships and Awards

NTU Research Scholarship, Nanyang Technological University (2021-2024)

Outstanding Master's Thesis Award, Northwestern Polytechnical University (2020)

Second-class academic scholarship for postgraduates, Northwestern Polytechnical University (2018)

First-class academic scholarship for postgraduates, Northwestern Polytechnical University (2017, 2019)

Third-class prize of the National Chou Pei-yuan Mechanics Competition for College Students (2015)

Second-class prize of the Programming Star Challenge, Northwestern Polytechnical University (2015)

Third-class prize of the Fifth Smartcar Competition, Northwestern Polytechnical University (2015)

Third-class prize of the Mathematical Modeling Competition, Northwestern Polytechnical University (2014)

Second-class scholarship, Honors College, Northwestern Polytechnical University (2014-2016)

Professional Skills

Programming Language: Python; MATLAB; C; Java; Fortran; AutoLisp

Software: Finite Element Analysis: ABAQUS

Computer-Aided Design: Solidworks; Rhino; FreeCAD; AutoCAD

Others: Origin Pro; Adobe Photoshop; Adobe Illustrator; Adobe Premiere Pro; Blender

Hardware and Equipment: FDM 3D Printer: Raise3D Pro 2; Qidi i-mate-S

SLA 3D Printer: Formlabs Form 2