

Shaoyun Wang

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EDUCATION

University of Missouri

Columbia, MO

PhD, Mechanical Engineering

Expected Jul. 2025

Dissertation: "Wave propagation in elastic time-varying media"

Ningbo University

Ningbo, China

MS, Theoretical Physics

Sep. 2016 – Jun. 2019

Dissertation: "Simulation of mixing charged brushes under external electric fields"

Ningbo University

Ningbo, China

BS, Engineering Mechanics

Sep. 2012 – Jun. 2016

RESEARCH EXPERIENCE

University of Missouri

Jun. 2020 – Present

Wave propagation in time-varying media (Prof. Guoliang Huang)

- Utilize the WKB method to develop ray theory for wave propagation in time-varying media
- Observe temporal refraction and reflection of flexural waves
- Establish the Chern number of k-bands and design a platform to observe temporal edge modes
- Develop adiabatic theory and design structures for observing topological pumping of surface waves

Non-Hermitian and topological physics (Prof. Guoliang Huang and Emil Prodan)

- Design active metamaterials to achieve odd mass density
- Develop theoretical frameworks of topological mode and skin mode morphing in non-Hermitian lattices
- Design elastic structures to observe spectral flow with Frieze Group symmetries

Use FEA to study mechanical behavior soft materials and electronics (Prof. Zheng Yan and Jian Lin)

Developing homogenization theory for lattice and active Materials (Prof. Guoliang Huang)

- Formulate source-driven homogenization for active non-Hermitian Willis metabeams
- Develop the homogenization of lattice material through micro-inertia media
- Create a 2D microtwist theory for modeling hinged Kagome lattices

Ningbo University

2016 – 2019

Molecular dynamics and Monte Carlo simulation of charged brushes (Prof. Chaohui Tong)

- Develop comprehensive MD and MC programs in Fortran, each consisting of nearly 5000 lines of code
- Develop a cell list algorithm for MC simulation, incorporating particle creation and annihilation

Mindlin plate theory with temperature biasing field (Prof. Ji Wang)

- Identify optimal quartz cuts for stable temperature performance
- Investigate the aging behavior of quartz resonators

TEACHING EXPERIENCE

Teaching Assistant, University of Missouri

MAE 3100: Computational methods for engineering design (Prof. Hussein Nassar)

2022 – 2024

- Lead interactive MATLAB sessions, using coding examples and whiteboard to explain complex concepts.
- Assist students in completing programming projects, providing guidance and code reviews.
- Facilitate Q&A sessions to address student queries and reinforce their understanding of course material.

MAE 4990: Undergraduate research in mechanical and aerospace engineering (Prof. Michael Poehlman)

2021

- Guide students in conducting research projects, providing advice and answering questions.
- Mentore students in developing methodologies, using simulation tools and experimental tools.

Undergraduate Capstone Project Advisor, University of Missouri

Designing jumping shoes by using lattice structures (Prof. Guoliang Huang)

Spring 2021

- Provide theoretical advising on designing principle and guide students in mathematical modeling.
- Assist in building CAD models and conducting FEA simulations to evaluate strain and stress distribution.
- Instruct the use of MTS and DIC systems to measure stress and strain, validating designs experimentally.

SELECTED PUBLICATIONS

- Wang, S.**, & Huang, G. A source-driven homogenization of active non-Hermitian Willis metabeam. In preparation.
- Wang, S.**, Zhu, R., & Huang, G. Micro-inertia Continuum Modeling of Macroscopic Behavior of Elastic Metamaterials with Microstructures. In preparation.
- Wang, S.**, Shao, N., Chen, H., Chen, J., Qian, H., Wu, Q., & Huang, G. Temporal refraction and reflection in modulated mechanical metabeams: theory and physical observation. To be submitted.
- Wu, Q., **Wang, S.**, Qian, H., & Huang, G. Understanding of topological mode and skin mode morphing in 1D and 2D non-Hermitian resonance-based meta-lattices. *Journal of the Mechanics and Physics of Solids*. Under second revision.
- Zhao, G., Chen, Z., **Wang, S.**, Chen, S., Zhang, F., Andrabi, S., ... & Yan, Z. Sustainable Nanofibril Interfaces for Strain-Resilient and Multimodal Porous Bioelectronics. *Advanced Materials*. Under second revision.
- Lux, F. R., Stoiber, T., **Wang, S.**, Huang, G., & Prodan, E. (2024). Topological spectral bands with frieze groups. *Journal of Mathematical Physics*, 65(6).
- Zheng, B., Xie, Y., Xu, S., Meng, A. C., **Wang, S.**, ... & Lin, J. (2024). Programmed multimaterial assembly by synergized 3D printing and freeform laser induction. *Nature Communications*, 15(1), 4541.
- Wang, S.**, Hu, Z., Wu, Q., Chen, H., Prodan, E., Zhu, R., & Huang, G. (2023). Smart patterning for topological pumping of elastic surface waves. *Science Advances*, 9(30), eadh4310.
- Wu, Q., Xu, X., Qian, H., **Wang, S.**, Zhu, R., Yan, Z., ... & Huang, G. (2023). Active metamaterials for realizing odd mass density. *Proceedings of the National Academy of Sciences*, 120(21), e2209829120.
- Chen, H., **Wang, S.**, Li, X., & Huang, G. (2022). Two-dimensional microtwist modeling of topological polarization in hinged Kagome lattices and its experimental validation. *International Journal of Solids and Structures*, 254, 111891.
- Wang, S.**, & Tong, C. (2020). Surface switching of mixed polyelectrolyte brushes made of 4-arm stars and linear chains: MD simulations. *Journal of Applied Physics*, 127(7). (Editor's pick)
- Zhang, F., **Wang, S.**, Ding, H., & Tong, C. (2019). Simulations of 3-arm polyelectrolyte star brushes under external electric fields. *Soft Matter*, 15(12), 2560-2570. (Back cover)

AWARDS & ACHIEVEMENTS

Second Place in the ASME Noise Control and Acoustics Division Student Paper Competition	2023
Student best paper finalists, Academic Forum of Mechanics between Ningbo University and Zhejiang University	2018
Student best paper finalists, Symposium on Piezoelectricity Acoustical Theory and Device Application	2016

PRESENTATIONS

Topological surface acoustic wave, International Mechanical Engineering Congress Exposition, New Orleans	Oct. 2023
Smart patterning for topological pumping of surface waves, SPIE Smart Structures + NDE, Los Angeles	Mar. 2023

SKILLS

Languages: MATLAB, Fortran, Python, Jupyter, C/C++, Latex, HTML/CSS
Software: COMSOL, ANSYS, ABAQUS, SOLIDWORKS, Multisim, Simulink
Hardware: Microcontroller, Electric Circuits, DIC, MTS Testing Machine, Laser Vibrometers

REFERENCES

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Professor Zheng Yan
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