

Shaoyun Wang

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EDUCATION

University of Missouri

PhD, Mechanical Engineering

Columbia, MO

Expected Jul. 2025

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

Ningbo University

MS, Theoretical Physics

Ningbo, China

Sep. 2016 – Jun. 2019

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

Ningbo University

BS, Engineering Mechanics

Ningbo, China

Sep. 2012 – Jun. 2016

RESEARCH EXPERIENCE

University of Missouri

Jan. 2020 – Present

Wave propagation in time-varying and space-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, nonlinear, 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 in non-Hermitian lattices
- Design elastic structures to observe spectral flow with Frieze Group symmetries

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

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

Use FEA to study multiphysics fields of soft materials and electronics (Prof. Zheng Yan and Jian Lin)

- Simulate large deformation, contact interactions, thermal-flow couplings, and multi-phase flow dynamics

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

2022 – 2024

- Lead interactive MATLAB coding, 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

2021

- Guide students in conducting research projects, providing advice and answering questions.

Undergraduate Capstone Project Advisor, University of Missouri

Designing jumping shoes by using lattice structures

Spring 2021

- Provide theoretical advising on designing principle and guide students in mathematical modeling.
- Assist in building CAD models, conducting FEA simulations, and validating designs by MTS and DIC systems.

SELECTED PUBLICATIONS

- 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. [PDF](#)
- 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. *Nature Communications*. (Revising manuscript after reviewer comments) [PDF](#)
- Wang, S.**, & Huang, G. Effective medium theory for nonlocal Non-Hermitian Willis metabeams. (To be submitted) [PDF](#)
- Wang, S., Cao, Z., Wu, Q., Chen, J., Cai, Y., **Wang, S.***, & Huang, G*. Dissipative locally resonant metasurfaces for low-frequency Rayleigh wave mitigation. *International Journal of Mechanical Science*. (Revising manuscript after reviewer comments) [PDF](#)
- Wu, Q., **Wang, S.**, Qian, H., Wang, Y., & Huang, G. (2024). 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*, 105907. [PDF](#)
- Lux, F. R., Stoiber, T., **Wang, S.**, Huang, G., & Prodan, E. (2024). Topological spectral bands with frieze groups. *Journal of Mathematical Physics*, 65(6). [PDF](#)
- 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. [PDF](#)
- 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. [PDF](#)
- Chen, H., **Wang, S.**, Li, X., & Huang, G. (2022). Two-dimensional microtwist modeling of topological polarization in Kagome lattices and its experimental validation. *International Journal of Solids and Structures*, 254, 111891. [PDF](#)
- 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) [PDF](#)
- Xie, L., **Wang, S.**, Ding, J., Banerjee, J. R., & Wang, J. (2020). An accurate beam theory and its first-order approximation in free vibration analysis. *Journal of Sound and Vibration*, 485, 115567. [PDF](#)

*Corresponding author.

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

Professor Guoliang Huang College of Engineering Peking University Beijing 100871, PR China 573-953-8845 guohuang@pku.edu.cn	Professor Emil Prodan Department of Physics and Department of Mathematical Sciences Yeshiva University New York, New York 10016 212-340-7831 prodan@yu.edu	Professor Hussein Nassar Mechanical and Aerospace Engineering University of Missouri Columbia, MO 65211 573-884-8408 nassarh@missouri.edu
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