Jixin Hou

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Education

University of Georgia 08/2022 - present
Ph.D. in Mechanical Engineering (Advisor: Xianqiao Wang)

Shanghai Jiao Tong University 09/2019 - 03/2022
M.S. in Applied Mechanics (Advisor: Fuyou Liang)

Tongji University 09/2015 - 07/2019
B.S. in Applied Mechanics (Advisor: Keke Tang)

Employment History

Research Assistant	@ University of Georgia	08/2022 - present
Teaching Assistant	@ University of Georgia	08/2023 - 05/2024

Research Interests

- **Brain biomechanics**, especially numerical simulation of cortical folding during early brain development.
- **Machine learning**, including data-driven constitutive modelling and ML/AI-driven brain development.
- **Morphogenesis**, particularly growth-induced shape transformation in biological systems.
- **Hemodynamics**, including cardiovascular biomechanics and medical apparatus design.

Research Projects

AI-driven brain reverse engineering 01/2026 - present
Developing AI-based frameworks to infer early-stage brain morphologies from later developmental configurations.

Whole brain folding simulations 01/2025 - 12/2025
Established a whole-brain mechanical modelling framework incorporating region-specific growth laws to reproduce anatomically realistic cortical folding.

Heterogeneous cortical growth modelling 07/2024 - 12/2024
Quantified developmental heterogeneity in fetal and neonatal human brains using large-scale MRI datasets and established region-specific growth functions to capture spatiotemporal developmental variability.

Data-driven brain constitutive model discovery 07/2023 - 06/2024
Applied symbolic regression and data-driven approaches to discover interpretable constitutive models for brain tissues based on experimental data.

Blueberry bruising evaluation 08/2022 - 06/2023
Constructed finite element models and conducted compressive experiments to evaluate post-harvest bruising mechanisms in blueberries.

Hemodynamic risk associated with sedentary behaviour 09/2020 - 03/2022

Constructed image-based CFD models of iliac arteries to evaluate sedentary behaviour-related hemodynamic risk, including wall shear stress, blood flow patterns, and the transport and deposition of atherosclerosis-associated low-density lipoprotein (LDL).

Aerodynamic analysis of chronic obstructive pulmonary disease (COPD) 07/2021 - 09/2021

Constructed finite element models of human airways and performed CFD-based airflow simulations to analyse COPD-related aerodynamic changes, with post-processing of wall shear stress and related biomechanical metrics to identify potential imaging biomarkers.

Peer-Reviewed Journal Publications

(author names listed last–first; equal contributions indicated with #)

1. Hou J, Wu Z, Jiang K, Wu T, Zhang L, Zhu D, Gao W, Razavi M J, Liu T, Kuhl E, Li G, Wang X. "Biophysical modeling of anatomically realistic prenatal cortical folding development". ***Nature Communications.*** 17: 8711, 2026.
2. Solhtalab A, Hou J#, Cao G, He Z, Pierotich L, Zhang T, Garcia E K, Wang X, Razavi M J. "A mechanical theory for the formation of short association fibers in the brain". ***Science Advances*** (under 2nd revision). 2026.
3. Gu B, Hou J, Tang K, Li H, Wang X. "Mechanistic Origins of Toughness in Random Fibrin Fiber Networks". ***Journal of the Mechanics and Physics of Solids***. 215: 106669, 2026.
4. Jiang K, Liao C, Jiang S, Lin H, Hou J, Liu T, Li G, Wu T, Mao Y, Kuhl E, Wang X. "Tau-induced atrophy drives functional connectivity disruption in Alzheimer's disease". *arXiv*. 2603:13598. 2026.
5. Wang Y, Zhang P, Xiang Y, Hou J, Chen X, Wang X, Tang K. "CNN-GAN based microstructure design for biphasic composites with balanced modulus and frequency". ***Computational Materials Science***. 265, 114513, 2026.
6. Hou J, Jiang K, Ramanathan A, Kumar AS, Zhang W, Zhao L, Wu T, Pidaparti R, Zhu D, Li G, Song K, Liu T, Razavi M J, Kuhl E, Wang X. "Mechanical Characterization of Brain Tissue: Experimental Techniques, Human Testing Considerations, and Perspectives". ***Acta Biomaterialia.*** 203: 181-213, 2025.
7. Hou J, Filla N, Chen X, Razavi M J, Zhu D, Liu T, Wang X. "Exploring hyperelastic material model discovery for human brain cortex: Multivariate analysis vs. artificial neural network approaches". ***Journal of the Mechanical Behavior of Biomedical Materials***. 165: 106934, 2025.
8. Hou J, Wu Z, Chen X, Wang L, Zhu D, Liu T, Li G, Wang X. "Role of data-driven regional growth model in shaping brain folding patterns". ***Soft Matter***. 21(4): 729-749, 2025.
9. Tian J, Sobczak MT, Patil D, Hou J, Pang L, Ramanathan A, Yang L, Chen X, Golan Y, Zhai X, Sun H, Song K, Wang X. "CrossMatAgent: AI-Assisted Design of Manufacturable Metamaterial Patterns via Multi-Agent Generative Framework". ***Advanced Intelligent Discovery***. 202500063, 2025.
10. Xiang Y, Hou J, Chen X, Tang K, Wang X. "Decoupled design of hybrid mechanical metamaterials via ensembled deep learning". ***International Journal of Mechanical Sciences***. 301: 110514, 2025.
11. Gu B, Hou J, Filla N, Li H, Wang X. "Rupture mechanics of blood clot fibrin fibers: A coarse-grained model study". ***Journal of the Mechanics and Physics of Solids***. 196: 105998, 2025.
12. Chambers LB, Zhu Y, Yu C, Crutchfield N, Hou J, Liang L, Wang X, Liu Y, Sobczak MT, Theobald T, Sun X, Stoll CR, Pulido TV, Yi J, Cornella JL, Mcllwee H, Handa H, Brisbois EJ, Lancaster JN, Song K. "3D printable biopolymers as pelvic floor scaffolds". ***Polymer Chemistry***. 16(3): 345-355, 2025.
13. Zhu Y, Liu S, Mei X, Lin Z, Pulido T V, Hou J, Remani S A, Patil D, Sobczak M T, Ramanathan A, Thummalapalli S V, Chambers L B, Yu C, Guo S, Zhao Y, Liu Y, Wang X, Lancaster J N, Zhang Y S, Chen X,

Song K. “3D Coaxial Printing of Small-Diameter Artificial Arteries”. ***Small Structures***. 6(2): 2400323, 2025.

14. Xiang Y, Hou J, Chen X, Pidaparti R, Song K, Tang K, Wang X. “A GAN-based stepwise full-field mechanical prediction model for architected metamaterials”. ***International Journal of Mechanical Sciences***. 284: 109771, 2024.
15. Filla N, Gu B, Hou J, Song K, Li H, Liu N, Wang X. “Hyperelasticity of blood clots: Bridging the gap between microscopic and continuum scales”. ***Journal of the Mechanics and Physics of Solids***. 190: 105750, 2024.
16. Gong X, Zhang J, Gan Q, Teng Y, Hou J, Lyu Y, Liu Z, Wu Z, Dai R, Zou Y, Wang X, Zhu D, Zhu H, Liu T, Yan Y. “Advancing microbial production through artificial intelligence-aided biology”. ***Biotechnology Advances***. 74: 108399, 2024.
17. Hou J, Chen X, Wu T, Kuhl E, Wang X. “Automated data-driven discovery of material models based on symbolic regression: A case study on the human brain cortex”. ***Acta Biomaterialia***. 188: 276-296, 2024.
18. Tang K, Xiang Y, Tian J, Hou J, Chen X, Wang X, Zhong Z. “Machine learning-based morphological and mechanical prediction of kirigami-inspired active composites”. ***International Journal of Mechanical Sciences***. 266:108956, 2024.
19. Hou J, Park B, Li C, Wang X. “A multiscale computation study on bruise susceptibility of blueberries from mechanical impact”. ***Postharvest Biology and Technology***. 208:112660, 2024.
20. Zhang D, Guan Y, Zhou X, Zhang M, Pu Y, Gu P, Xia Y, Lu Y, Chen J, Tu W, Huang K, Hou J, Yang H, Fu C, Fang W, He C, Liu S, Fan L. “Aerodynamic simulation of small airway resistance: a new imaging biomarker for chronic obstructive pulmonary disease”. ***International Journal of Chronic Obstructive Pulmonary Disease***. 31:1167-75, 2024.
21. Tian J, Hou J[#], Wu Z, Shu P, Liu Z, Xiang Y, Gu B, Filla N, Li Y, Liu N, Chen X, Tang K, Liu T, Wang X. “Assessing large language models in mechanical engineering education: A study on mechanics-focused conceptual understanding”. *ArXiv*. 2401:12983. 2024. (Citation: 39).
22. Filla N, Hou J, Liu T, Budday S, Wang X. “Accuracy meets simplicity: A constitutive model for heterogenous brain tissue”. ***Journal of the Mechanical Behavior of Biomedical Materials***. 150:106271, 2024.
23. Becton M, Hou J, Zhao Y, Wang X. “Dynamic Clustering and Scaling Behavior of Active Particles under Confinement”. ***Nanomaterials***. 14(2):144, 2024.
24. Liu Y, Hou J, Li C, Wang X. “Intelligent Soft Robotic Grippers for Agricultural and Food Product Handling: A Brief Review with a Focus on Design and Control”. ***Advanced Intelligent Systems***. 5(12):2300233, 2023.
25. Filla N, Hou J, Li H, Wang X. “A multiscale framework for modeling fibrin fiber networks: Theory development and validation”. ***Journal of the Mechanics and Physics of Solids***. 179:105392, 2023.
26. Chavoshnejad P, Chen L, Yu X, Hou J, Filla N, Zhu D, Liu T, Li G, Razavi MJ, Wang X. “An integrated finite element method and machine learning algorithm for brain morphology prediction”, ***Cerebral Cortex***, 33(15):9354-9366, 2023.
27. Hou J, Li X, Li Z, Yin L, Chen X, Liang F. “An In Vivo Data-Based Computational Study on Sitting-Induced Hemodynamic Changes in the External Iliac Artery”. ***Journal of Biomechanical Engineering***. 144(2):021007, 2021.
28. Tang K, Du Z, Wu B, Hou J. “Fatigue behavior prediction of metal alloys based on a unified multiscale crack growth model”. ***Engineering Fracture Mechanics***. 235:107132, 2020.
29. Hou J, Tang K, Wu H. “Short review on multiscale short fatigue crack growth model”. ***Material Design & Processing Communications***. 2(1):e93, 2019.

Conference Presentations

1. Hou J and Wang X. “From prenatal images to predictive brain folding: regional growth and brain developmental health. ***Precision One Health***, 2025. [Poster]
2. Hou J and Wang X. “Role of data-driven regional growth model in shaping brain folding patterns”. ***18th U.S. National Congress on Computational Mechanics***, 2025. [Presentation]
3. Wang X and Hou J. “Machine learning-assisted finite element simulations for characterizing human brain morphology”. ***The Society of Engineering Science Technical Meeting***, 2023. [Presentation]
4. Hou J and Wang X. “Exploring hyperelastic material model discovery for human brain cortex: multiple regression vs. artificial neural network approaches”. ***The Society of Engineering Science Technical Meeting***, 2023. [Presentation]
5. Hou J, Li Z, Chen X and Liang F, “Numerical simulation of hemodynamics and mass transport in iliac arteries under different postures”. ***The 13th National Biomechanics Conference***, 2021. [Poster]
6. Hou J, Du Z and Tang K. “Study on fatigue small crack test and multiscale propagation model base on grain characteristics”. ***Chinese Congress of Theoretical and Applied Mechanics***, 2019. [Presentation]

Peer Review Experiences

Acta Biomaterialia; Thin-wall Structure; Biomechanics and Modeling in Mechanobiology; Measurement; Frontiers in Plant Science.

Grants & Awards

- Outstanding Graduate Student Research Award (University of Georgia) 03/2026
- Summer research grant (University of Georgia) 05/2024
- Outstanding Graduate (Shanghai Jiao Tong University) 03/2022
- Outstanding Undergraduate Graduate of Shanghai (Tongji University) 06/2019
- National Scholarship (China) 06/2017

Competences & Skills

Language:	Native in Mandarin, Fluent in English
Programming:	C/C++, MATLAB, Python, Julia
Techniques:	Computational Mechanics, Biomechanics, Continuum Mechanics, FEM, ANSYS FLUENT, ABAQUS, MRI Imaging Processing