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CURRENT POSITION

Senior Postdoctoral Fellow, Alliance for Cardiovascular Diagnostic and Treatment Innovation (ADVANCE)
& Department of Biomedical Engineering, Johns Hopkins University, Advisor: Prof. Natalia Trayanova
Aug 2022 - Present

EDUCATION

Ph.D. , Biomedical Engineering, Brown University Advisor: Prof. George Em. Karniadakis	2018 - 2022
M.Sc. , Fluids and Thermal Sciences, Brown University Advisor: Prof. George Em. Karniadakis	2016 - 2018
B.S. , Aeronautical Engineering, Northwestern Polytechnical University, China Advisor: Prof. Weiwei Zhang	2012 - 2016

RESEARCH INTERESTS

Artificial Intelligence (AI), Machine Learning, Deep Learning, Data Science, Multimodal AI, Neural Operator, Shape Analysis, Reinforcement Learning, Cardiovascular Diseases, Cardiac Electrophysiology, Biomechanics, Multiscale Modeling

GRANTS

Rapid Impact Research Award, American Heart Association (AHA), "Individualized Risk Forecast of Ischemic Stroke in Patients with Atrial Fibrillation Using Multimodal AI". (Collaborator; the grant proposal was based on my NIH K99 proposal.)	2026
Kenneth M. Rosen Fellowship in Cardiac Pacing and Electrophysiology, Heart Rhythm Society	2023

HONORS AND AWARDS

Best PhD Thesis Award in Biomedical Engineering (Runner-Up), International Journal for Numerical Methods in Biomedical Engineering (IJNMBE)	2024
Kenneth M. Rosen Fellowship in Cardiac Pacing and Electrophysiology, Heart Rhythm Society	2023
Moore Inventor Fellows (Nominee), selected as an institutional nominee of Johns Hopkins University	2023
Travel Award, 17th U. S. National Congress on Computational Mechanics	2023
Distinguished Postdoctoral Fellowship Finalist, Department of Biomedical Engineering, Johns Hopkins University	2022
Chinese Government Award for Outstanding Self-Finance Students Abroad (1/600, globally)	2022
Robert J. Melosh Medal Competition Finalist	2022
Sigma Xi Honor Society Member	2021
Conference award, 16th U.S. National Congress on Computational Mechanics	2021

Travel award, SDSC summer institute on High-Performance Computing and Data Science	2019
Undergraduate Scholarship, Northwestern Polytechnical University	2014

PUBLICATIONS

Manuscripts Currently Under Preparation

M. Yin*, E. Hartman*, Z. Ahmad*, Y. Sukurdeep, S. Chen, J. Noh, L. Tran, N. Charon, M. Maggioni, E. Kholmovski, R. Bergers, D. Spragg, H. Calkins, N. Trayanova. Shape analysis reveals cardiac morphological difference in cardiovascular patients. In preparation for *Nature Biomedical Engineering*.

M. Yin*, K. Zhang*, J. Noh, M. Maggioni, N. Trayanova. AI forecasts drug-mediated electrical propagation on personalized hearts. In preparation for *Nature Biomedical Engineering*.

M. Yin, C. Lai, R. Yadav, J. A. Milstein, L. My Tran, C. O'Donnell, S. Schumacher, C. Cronin, R. Weinstein, C. Y. A. Pinto, Z. Ahmad, S. Chen, A. Lefebvre, J. Ryu, A. Lacy, A. Thi Yee, J. Noh, E. Kholmovski, D. Spragg, H. Calkins, N. Trayanova, Predicting the When: Multimodal AI for Time-to-Recurrence Analysis After Atrial Fibrillation Ablation. Under external review in *Circulation*.

Peer-Reviewed Publications

Z. Ahmed, **M. Yin**, N. Rottenberg, Y. Sukurdeep, E. Kholmovski, N. Trayanova. A computational pipeline for clustering left atrial appendage morphology via elastic shape analysis, *Computer and Biology in Medicine*, (2025): 110905

C. Lai, **M. Yin**, E. G. Kholmovski, M. M. Sani, N. A. Gilotra, J. Chrispin, N. A. Trayanova, Predicting Sudden Cardiac Death in Sarcoidosis Patients Using a Multimodal AI Model, *Journal of the American College of Cardiology: Clinical Electrophysiology* (2025):10.009

C. Lai, **M. Yin**, E. Kholmovski, D. Popescu, D. Lu, E. Scherer, E. Binka, S. Zimmerman, J. Chrispin, A. Hays, D. Phelan, R. Abraham, N. Trayanova. Multimodal AI to forecast arrhythmic death in hypertrophic cardiomyopathy, *Nature Cardiovascular Research*, 4, 891903 (2025) (Media coverage by JHU Hub, Johns Hopkins Medicine News, and New York Magazine)

M. Yin, N. Charon, R. Brody, L. Lu, N. Trayanova, M. Maggioni. A scalable framework for learning the geometry-dependent solution operators of partial differential equations. *Nature Computational Science*, 12 (2024): 928-940 (Wide media coverage by JHU Hub, NSF News, and MIT Technology Review; Online access ranked 99% in all journals)

N. Trayanova, **M. Yin**, A. Prakosa, Using computational modeling and artificial intelligence to uncover arrhythmogenic mechanisms and advance arrhythmia management, *Heart Rhythm*, 21 (11), (2024): 2368-2369

J. Olesen, **M. Yin**, T. Carruthers, D. Jenkins, G.E. Karniadakis, R.K. Aaron. Peripheral arterial pathology and osteoarthritis of the knee: US examination of arterial wall stiffness, thickness, and flow characteristics. *Osteoarthritis and Cartilage Open*, 6.4 (2024): 100537.

M. Yin*, Z. Zou*, E. Zhang, C. Cavinato, J.D. Humphrey, G.E. Karniadakis. A generative modeling framework for inferring families of biomechanical constitutive laws in data-sparse regimes. *Journal of the Mechanics and Physics of Solids*, (2023): 2023.105424.

M. Yin, E. Zhang, Y. Yu, G.E. Karniadakis. Interfacing finite elements with deep neural operators for fast multiscale modeling of mechanics problems. *Computer Methods in Applied Mechanics and Engineering*, (2022): 115027

M. Yin, E. Ban, E. Zhang, B. Rego, C. Cavinato, J.D. Humphrey, G.E. Karniadakis. Simulating progressive intramural damage leading to aortic dissection using an operator-regression neural network, *Journal of The Royal Society Interface*, (2022): 20210670.

S. Goswami, **M. Yin**, Y. Yu, G.E. Karniadakis. A physics-informed variational DeepONet for predicting the crack path in brittle materials, *Computer Methods in Applied Mechanics and Engineering*, 391 (2022): 114587.

S. Cai, Z. Mao, Z. Wang, **M. Yin**, G.E. Karniadakis, Physics-informed neural networks in fluid mechanics: A review, *Acta Mechanica Sinica* (2022): 1-12.

A. Blumens*, **M. Yin***, Y. Hasegawa, Z. Li, and G.E. Karniadakis. Multiscale parareal algorithm for long-time mesoscopic simulations of microvascular blood flow in zebrafish, *Computational Mechanics*, 68, 1131-1152 (2021).

M. Yin, X. Zheng, J.D. Humphrey, G.E. Karniadakis. Non-invasive inference of thrombus material properties with physics-informed neural networks, *Computer Methods in Applied Mechanics and Engineering*, 375 (2021): 113603.

M. Yin, A. Yazdani, and G.E. Karniadakis. One-dimensional modeling of fractional flow reserve in coronary artery disease: uncertainty quantification and bayesian optimization, *Computer Methods in Applied Mechanics and Engineering*, 353 (2019): 66-85.

D. Hopper, D. Jaganathan, J. Orr, J. Shi, F. Simeski, **M. Yin**, J.T.C. Liu. Heat transfer in nanofluid boundary layer near adiabatic wall, *Journal of Nanofluids*, 7.6 (2018): 1297-1302.

M. Yin, J. Kou, W. Zhang. A reduced-order aerodynamic model with high generalization capability based on neural network, *Acta Aerodynamica Sinica*, 35.02 (2017): 205-213.

J. Kou, W. Zhang, and **M. Yin**. Novel Wiener models with a time-delayed nonlinear block and their identification, *Nonlinear Dynamics*, 85.4 (2016): 2389-2404.

Conference Articles

Z. Ahmad, S. Chen, **M. Yin**, A. Kumar, N. Charon, N. Trayanova, M. Maggioni. Diffeomorphic Latent Neural Operator Learning for Data-Efficient Predictions of Solutions to Partial Differential Equations, *AAAI Conference*, 2025

A. Kumar, X. Zhi, Z. Ahmad, **M. Yin**, A. Manbachi. Convolutional Deep Operator Networks for Learning Nonlinear Focused Ultrasound Wave Propagation in Heterogeneous Spinal Cord Anatomy, *AAAI Conference*, 2025

J. Noh, **M. Yin**, N. Trayanova. Predicting Electrical Wave Propagation on Personalized Left Atria Using Deep Learning, *International Conference on Computational and Mathematical Biomedical Engineering*, 2024

E. Zhang, **M. Yin**, G.E. Karniadakis. Physics-informed neural networks for nonhomogeneous material identification in elasticity imaging, *AAAI Conference*, 2020.

Conference Abstracts

M. Yin, et al. AI predicts electrical propagation patterns in personalized heart digital twins with different electrophysiological properties, *Heart Rhythm* (2026)

M. Yin, et al. Multimodal Artificial Intelligence for Predicting Atrial Fibrillation Recurrence Using Pre-procedural Data, *Heart Rhythm* 22 (4), S591, (2025)

M. Yin, et al. AI-based Shape Analysis Correlates Left Atrial Appendage Morphology with Stroke Risk in Patients with Atrial Fibrillation, *Heart Rhythm* 22 (4), S590-S591, (2025)

M. Yin, et al. Predicting Personalized Cardiac Electrophysiology Using Deep Learning, *Heart Rhythm*, 21.5 (2024): S13

C. Lai, **M. Yin**, et al. MAARS-HCM: Multi-modal Artificial Intelligence for Ventricular Arrhythmia Risk Stratification in Hypertrophic Cardiomyopathy Patients, *Heart Rhythm*, 21.5 (2024): S300

M. Yin, et al. A novel deep learning model for patient-specific computational modeling of cardiac electrophysiology. *Heart Rhythm* 20.5 (2023): S163.

C. Lai, **M. Yin**, et al. MARS-HCM: Multi-modal deep learning method for ventricular arrhythmia (VA) risk stratification in hypertrophic cardiomyopathy (HCM) patients. *Heart Rhythm* 20.5 (2023): S46-S47.

Patents

Heart Digital Twins For Drug Safety and Discovery, and Predicting Heart Disease Trajectory, Johns Hopkins Technology Ventures, 2025

MARS-HCM: Multi-modal deep learning method for ventricular arrhythmia (VA) risk stratification in hypertrophic cardiomyopathy (HCM) patients, Johns Hopkins Technology Ventures, 2023

Thesis

Ph.D. Thesis: Hybrid Computational-Machine Learning Models with Uncertainty Quantification for Aortic Dissection, Advisor: Dr. George Em Karniadaki

M.S. Thesis: 3D/1D Computed Fractional Flow Reserve Comparison in Coronary Artery Disease, Advisor: Dr. George Em Karniadakis

B.S. Thesis: Reduced-Order Aerodynamic Modeling and Study on Generalization Capability, Advisor: Dr. Weiwei Zhang

CONFERENCE PRESENTATIONS

Clinical Conferences

Heart Rhythm 2026 (Chicago, IL), **Poster Presentation**, AI predicts electrical propagation patterns in personalized heart digital twins with different electrophysiological properties 2026

Heart Rhythm 2025 (San Diego, CA), **Poster Presentation**, Multimodal Artificial Intelligence for Predicting Atrial Fibrillation Recurrence Using Pre-procedural Data, 2025

Heart Rhythm 2025 (San Diego, CA), **Poster Presentation**, AI-based Shape Analysis Correlates Left Atrial Appendage Morphology with Stroke Risk in Patients with Atrial Fibrillation,, 2025

Ann Theodore Foundation Fourth Investigators Meeting 2025 (Boston, MA), **Oral Presentation**, Multimodal AI Predicts Sudden Cardiac Death in Sarcoidosis 2025

Heart Rhythm 2024 (Boston, MA), **Oral Presentation**, Multimodal Artificial Intelligence for Predicting Atrial Fibrillation Recurrence Post-Ablation 2024

Heart Rhythm 2024 (Boston, MA), **Oral Presentation**, Predicting Personalized Cardiac Electrophysiology using Deep Learning 2024

Heart Rhythm 2024 (Boston, MA), **Poster**, MAARS-HCM: Multi-Modal Artificial Intelligence (AI) for Ventricular Arrhythmia (VA) Risk Stratification in Hypertrophic Cardiomyopathy (HCM) Patients 2024

Heart Rhythm 2023 (New Orleans, LA), **Poster**, A Novel Deep Learning Model for Patient-Specific Computational Modeling of Cardiac Electrophysiology 2023

Computational/Applied Mathematics Conferences

SIAM CSE 2025 (Dallas, TX), Learning the Geometry-Dependent Solution Operators of Partial Differential Equations with Deep Learning 2025

SIAM MDS (Atlanta, GA), Learning the Geometry-Dependent Solution Operators of PDEs 2024

CMBE 2024 (Arlington, VA), Predicting Personalized Cardiac Electrophysiology using AI 2024

USNCCM17 (Albuquerque, NM), A Neural Operator for Parametric Geometries 2023

The Platform for Advanced Scientific Computing (PASC) Conference (Online), A Novel Deep Learning Model for Patient-Specific Computational Modeling of Cardiac Electrophysiology 2023

USNC/TAM (Austin, TX), Multiscale Modeling with Operator-Learning Neural Networks 2022

USNC/TAM (Austin, TX), Imaging-Driven Modeling of Dissection Progression in the Aorta 2022

SIAM UQ, Multiscale modeling with operator-regression neural networks 2022

IMECE, Predicting injection-caused delamination in aortic walls using DeepONet 2021

IACM Computational Fluids Conference, Imaging-driven inference of biomaterial properties with physics-informed neural networks	2021
USNCCM16, Data-driven modeling of injection-caused delamination on aortic walls using DeepONet	2021
APS DFD, Non-invasive inference of thrombus material properties with physics-informed neural networks	2020
APS DFD (Seattle, WA), Comparison of multi-scale models for blood flow in zebrafish brain, APS Division of Fluid Dynamics	2019
BMES Annual Meeting (Philadelphia, PA) (Poster), Numerical study on hemodynamics of brain vasculature in Early zebrafish Life	2019
SIAM CSE (Spokane, WA), Parameter inference and uncertainty quantification in simulating blood flow in coronary arteries	2019

INVITED TALKS

91Life, NYC	2025
Pasteur Labs, NYC	2025
Healthcare, Intelligence, and Technology (HIT) Webinar	2025
Presentation for the Kenneth M. Rosen Fellowship, Heart Rhythm Society	2024
Lu's group, Yale University	2024
CIS/MINDS seminar, Johns Hopkins University	2023
School of Medicine/Whiting School of Engineering Research Retreat, Invited Lightning Talk, Johns Hopkins University	2023
Distinguished Fellowship Presentation, Department of Biomedical Engineering, Johns Hopkins University	2022
Robert J. Melosh Competition, Civil & Environmental Engineering, Duke University	2022
Complex Fluids and Soft Matters (CFSM) seminar series, Department of Mechanical Engineering, Clemson University	2022
School of Aeronautics, Northwestern Polytechnical University	2021
Parallel-in-Time (PinT) Workshop	2021
NVIDIA GTC	2021

EXPERIENCES

Reviewer

- Nature Machine Intelligence
- Nature Cardiovascular Research
- Nature Communications
- Journal of Computational Physics
- Computer Methods in Applied Mechanics and Engineering
- Engineering with Computers
- International Journal of Heat and Mass Transfer
- Scientific Reports
- Annals of Biomedical Engineering
- IEEE Computational Intelligence Magazine
- Acta Biomaterialia

Teaching

- Lecturer, Pre-college program, Introduction to Mechanical Engineering, Brown University 2017

Co-Supervising

- Master students:
 - Srinithi Srinivasan (Data Science JHU),
- Undergraduates:
 - Ojas Chahal (BME JHU, Provost Undergraduate Research Award, MD/PhD student)
 - Jiwoo Noh (BME/CS JHU, Provost Undergraduate Research Award, PhD student in BME JHU)
 - Alana Yee (BME JHU, Provost Undergraduate Research Award)
 - Noam Rotenberg (BME JHU, MD/PhD student at Yale, Class of 2033)
 - Jooyoung Ryu (BME JHU)

Additional Training

- Integrated Medical Sciences III: Cardiovascular, Warren Alpert Medical School, Brown University, RI 2021
- Workshop: Integrating Machine Learning with Multiscale Modeling for Biomedical, Biological, and Behavioral Systems, Bethesda, MD 2019
- San Diego Supercomputing Center Summer Institute on High-Performance Computing and Data Science, San Diego, CA 2019