MINGLANG YIN

Center for Biomedical Engineering, Brown University, Providence, RI, 02912

minglang_yin@brown.edu

DEGREES

Ph.D., Biomedical Engineering, Brown University 2018 - 2022
Advisor: George Em Karniadakis
Thesis: *Multiscale Modeling and Scientific Machine Learning for Cardiovascular Mechanics*

M.Sc., Fluids and Thermal Sciences, Brown University 2016 - 2018
Advisor: George Em Karniadakis
Thesis: *3D/1D Computed Fractional Flow Reserve Comparison in Coronary Artery Disease*

B.S., Aeronautical Engineering, Northwestern Polytechnical University 2012 - 2016
Advisor: Weiwei Zhang
Thesis: *Reduced-Order Aerodynamic Modeling and Study on Generalization Capability*

RESEARCH INTERESTS

Scientific Machine Learning, Computational Mechanics, Multiscale Modeling, Biofluids/Biomechanics, Cardiovascular System

POSITIONS

Jan. 2022 - Present, Consultant, Warren Alpert Medical School, Brown University, PI: Roy. K. Aaron

Jan. 2018 - Aug. 2022, Research Assistant, Division of Applied Mathematics, Brown University, Advisor: George Em. Karniadakis

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

Jan. - Jul. 2016, Research Assistant, School of Aeronautics, Northwestern Polytechnical University

EXPERIENCES

Referee

Journal of Computational Physics, Journal of The Royal Society Interface, Soft Matter, Computers and Structures, Computer Methods in Applied Mechanics and Engineering, Engineering with Computers

Projects

- Associations of Peripheral Arterial Disease with Osteoarthritis of the Knee, NIH, PI: Roy K. Aaron
- Multimodality Imaging-Driven Multifidelity Modeling Of Aortic Dissection, NIH, PI: Jay D. Humphrey

PUBLICATIONS

M. Yin, E. Zhang, Y. Yu, G.E. Karniadakis. Interfacing finite elements with deep neural operators for fast multiscale modeling of mechanics problems. (2022)

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. Blumers*, **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.

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

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.

CONFERENCES

Jun. 2022, USNC/TAM (Austin, TX), Interfacing finite elements with deep neural operators for fast multiscale modeling in mechanics

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

Apr. 2022, SIAM UQ (Online), Multiscale modeling with operator-regression neural networks

Nov. 2021, IMECE (Online), Predicting injection-caused delamination in aortic walls using DeepONet

Oct. 2021, IACM Computational Fluids Conference (Online), Imaging-driven inference of biomaterial properties with physics-informed neural networks

Jul. 2021, USNCCM16 (Online), Data-driven modeling of injection-caused delamination on aortic walls using DeepONet

Nov. 2020, APS DFD (Online), Non-invasive inference of thrombus material properties with physics-informed neural networks

Mar. 2020, Mach Conference (Accepted), Physics-informed neural networks for solving forward and inverse problem with phase field models

Nov. 2019, APS DFD (Seattle, WA), Comparison of multi-scale models for blood flow in zebrafish brain, APS Division of Fluid Dynamics

Oct. 2019, BMES Annual Meeting (Philadelphia, PA) (Poster), Numerical study on hemodynamics of brain vasculature in Early zebrafish Life

Jan. 2019, SIAM CSE (Spokane, WA), Parameter inference and uncertainty quantification in simulating blood flow in coronary arteries

INVITED TALKS

Jan. 2022, Johns Hopkins University, Department of Biomedical Engineering, (Online) Multiscale Modeling and Machine Learning for Biomedicine

Aug. 2021, Northwestern Polytechnical University, School of Areonautics, (Online), Physics-informed machine learning and its application in multiscale modeling

Aug. 2021, Parallel-in-Time (PinT) Workshop (Online), Time parallel in PDEs using machine learning tools

Apr. 2021, NVIDIA GTC (Online), Non-invasive inference of thrombus material properties with physics-informed neural networks

TRAINING

Jul. 2019, San Diego Supercomputing Center summer institute on High Performance Computing and Data Science, San Diego, CA

Oct. 2019, Integrating Machine Learning with Multiscale Modeling for Biomedical, Biological, and Behavioral Systems, Bethesda, MD

Aug. - Oct. 2021, Integrated Medical Sciences III: Cardiovascular, Warren Alpert Medical School, Brown University, RI

HONORS AND AWARDS

Distinguished Fellowship Finalist, Department of Biomedical Engineering, Johns Hopkins University 2022

Sigma Xi honor society member 2021

Conference award, 16th U.S. National Congress on Computational Mechanics 2021

Travel award, San Diego Supercomputing Center summer institute on High Performance Computing and Data Science 2019

Undergraduate Scholarship, Northwestern Polytechnical University 2014

COMPUTATIONAL

Programming Language: C/C++, Python, R, Julia, FORTRAN, Scripting language, Matlab

Parallel Computing: Message Passing Interface(MPI), CUDA, Extensive experience on Titan, SUMMIT, COMIT, Stampede II, and Frontera

Machine Learning Library: PyTorch, Tensorflow, Keras.

Meshing: Pointwise

Others: OVITO, VMD, Paraview, VMTK, Tecplot 360, MySQL

Current Research Allocations: Frontera, Stampede II