



PhD Course: Seminars in Biomedical Engineering 2025

Scientific machine learning in blood flow modeling: From no data to large data

Scientific Area: BIOMECHANICS

Prof. Amir Arzani, PhD

Scientific Computing and Imaging (SCI) Institute and Mechanical Engineering Department, University of Utah, Utah

Webex link: Webex Alberto Redaelli meeting room



March 24, 2025

5:00 pm

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ABSTRACT

SHORT BIOGRAPHY

Computational and experimental modeling in cardiovascular fluid mechanics has provided valuable fluid mechanics-based biomarkers that can be used in evaluating cardiovascular disease severity and treatment planning. Given the limitations of these experimental and computational models, there is growing interest in using machine learning to address these limitations. In this talk, I will summarize some of our group's recent work in scientific machine learning and their applications in blood flow modeling. I will focus on different data regimes ranging from large data to no data. I will discuss different appropriate machine learning approaches and the associated challenges. Specifically, I will present examples related to data-driven reduced-order modeling (ROM), deep learning, physics-informed machine learning, and differentiable programming.

Dr. Amirhossein (Amir) Arzani is a tenured Associate Professor at the University of Utah (Scientific Computing and Imaging Institute and Mechanical Eng. Department). He obtained his BSc, MSc, and PhD degrees in mechanical engineering from Isfahan University of Technology, Illinois Institute of Technology, and UC Berkeley, respectively. He is the director of the Computational Biomechanics Group at Utah (<https://bio.mech.utah.edu/>) and a recipient of the NSF CAREER and NIH Trailblazer awards. Recently, he received the prestigious Presidential Early Career Award for Scientists and Engineers (PECASE) from President Biden. His research utilizes various computational mechanics and data-driven techniques to study biological flows and soft tissue mechanics.

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