



# PHYSICS COLLOQUIUM:

## Wave Dynamics and Fluid–Structure Interaction in the Cardiovascular System



**Dr. Arian Aghilinejad**  
**Assistant Professor in Bioengineering**  
**University of California, Merced**

### About The Speaker:

Arian Aghilinejad is an Assistant Professor in the Department of Bioengineering at the University of California, Merced, which he joined in July 2025. Prior to his appointment at UC Merced, he was a postdoctoral research associate in the Division of Engineering and Applied Science at the California Institute of Technology (Caltech). He earned his B.S. in Mechanical Engineering from Sharif University of Technology, his M.S. in Mechanical engineering from Washington State University, and completed his Ph.D. at the University of Southern California (USC). His research interests include biomedical flows, fluid–structure interaction, the development of noninvasive diagnostic technologies, and the application of machine learning to hemodynamics and pulse wave analysis.

### Abstract:

Cardiovascular disease affects Americans at all stages of life, accounting for 17% of national health expenditures. Current preventive strategies primarily target high-risk individuals, yet many potentially at-risk individuals remain overlooked. This raises the critical question: How can engineering principles enhance the early diagnosis and monitoring of cardiovascular disease? My research addresses this question by exploring fundamental fluid physics and wave dynamics within the cardiovascular system, aiming to improve patient monitoring and clinical decision-making. In this talk, I will present my contributions using experimental and computational biofluid dynamics to clarify the understudied role of heart-aorta coupling in cardiovascular health. Specifically, I will introduce the Longitudinal Impedance Pump, a bio-inspired, valveless pump mechanism driven by wave propagation and reflection in compliant, fluid-filled tubes, with applications in assistive device design. Additionally, I will discuss my development and application of fluid-structure interaction models designed to simulate pulse wave dynamics, offering mechanistic insights into cardiovascular physiology.

### Date:

2/13/2026

### Time:

10:30 AM – 11:50 AM

### Location:

GRAN 135

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