

Friday, Feb 3, 2023 11 AM – 12 PM
Klug Memorial Seminar Room, 8500 Boelter



Flow control a la mode: Controlling flow interactions to improve performance in aerodynamic systems

Maziar Hemati

Associate Professor
Aerospace Engineering and Mechanics
University of Minnesota

ABSTRACT: Flow control is the notion of manipulating the evolution of a fluid flow to achieve a desired outcome using passive or active means. Flow control technologies can enhance performance and efficiency in engineering systems, ranging from airplanes to underwater robots to wind turbines. Ongoing efforts aim to improve the reliability and performance of these systems by “feeding back” sensed information about the evolution of a flow to determine how to actuate the flow in an optimal manner. Achieving effective flow control often requires reliable and efficient models for the complex dynamics of fluid flows; estimators that can infer knowledge about the evolution of these flows from a limited set of sensor measurements; and control policies and algorithms that use these inferences to actively and reliably manipulate the evolution of fluid flows to achieve specified performance objectives. This talk will provide an overview of past and ongoing research related to the various modeling, analysis, and design challenges associated with controlling flow interactions in aerodynamic systems. Focus will be given to how control theory, system dynamics, optimization, and applied mathematics can be used to reveal essential flow interactions and harness them to achieve a performance benefit.

BIO: Maziar Hemati is an Associate Professor in the Department of Aerospace Engineering and Mechanics at the University of Minnesota. His research brings together perspectives from control theory, system dynamics, optimization, and applied mathematics to tackle challenging problems in fluid dynamics and aerospace engineering. He is a recipient of the 2020 NSF CAREER Award and the 2019 AFOSR Young Investigator Award. In 2021, he was awarded the George W. Taylor Award in recognition of exceptional contributions to teaching by a candidate for tenure at the University of Minnesota. He is an Associate Fellow of the American Institute of Aeronautics and Astronautics. Prior to joining the faculty at the University of Minnesota, he served as a Post-Doctoral Research Associate in the Department of Mechanical and Aerospace Engineering at Princeton University. He earned his Ph.D. and M.S. in Mechanical Engineering and his B.S. in Aerospace Engineering, all from UCLA.