

DEPARTMENT OF MECHANICAL ENGINEERING

WILLIAM MAXWELL REED SEMINAR SERIES

“Aerodynamic design optimization through machine and deep learning.”

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Abstract:

Aerodynamic design optimization plays a key role in aerospace industry. However, effectively defining the design space is a challenging task for conventional parameterization approaches. Plus, the optimization process is computationally expensive due to repeated evaluations of simulation models. To tackle these issues, we propose to advance aerodynamic design from various perspectives through machine and deep learning. First, we develop the B-spline based generative adversarial networks for intelligent airfoil parameterization. Second, we construct deep neural network surrogates to predict aerodynamic quantities for aerodynamic optimization. This work enables the fast interactive aerodynamic forward design. Third, we propose to capture the mapping from design requirements directly to optimal designs through dimensionality reduction and multi-fidelity modeling. The constructed model can realize aerodynamic design without running optimizations. All these works are of great generality for extension to other engineering fields.

Speaker Bio:

Xiaosong Du is a postdoctoral research fellow at the University of Michigan. He obtained his PhD degree at the Iowa State University, Master's at the Beijing University of Aeronautics and Astronautics, and Bachelor's at the Nanjing University of Aeronautics and Astronautics. His research has been focused on machine learning, deep learning, and surrogate-based analysis and design optimization since his PhD study. He has successfully introduced his research to broad engineering fields, such as aerodynamic design optimization and nondestructive testing systems.

Date: Wednesday, March 2, 2022
Place: Ralph G. Anderson, Room 203
Zoom: <https://uky.zoom.us/j/85862495850>

Time: 11:00 AM (EST) / 10:00 AM (CT)
Contact: Dr. Alexandre Martin 257-4462

Attendance open to all interested persons. Note, there will be limited seating, so please arrive early.