DEPARTMENT OF MECHANICAL & AEROSPACE ENGINEERING
WILLIAM MAXWELL REED SEMINAR SERIES

"Mutation++: Multicomponent Thermodynamic And Transport properties for IONized gases in C++."

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Abstract:
In this seminar, I will present the Multicomponent Thermodynamic and Transport properties for IONized gases in C++ (Mutation++) library. Mutation++ provides accurate and efficient computation of physicochemical properties associated with partially ionized gases in various degrees of thermal nonequilibrium. With v1.0.0, users can compute thermodynamic and transport properties, multiphase linearly-constrained equilibria, chemical production rates, energy transfer rates, and gas-surface interactions. The framework is based on an object-oriented design in C++, allowing users to plug-and-play various models, algorithms, and data as necessary. Mutation++ is available open-source under the GNU Lesser General Public License v3.0. The talk will provide an overview of the library and demonstrate some of its key features.

Speaker Bio:
Dr. James Scoggins is a Research Aerospace Engineer in the Aerothermodynamics Branch of NASA Langley Research Center. He received a B.S. in Aerospace Engineering from North Carolina State University in 2009, where he went on to earn a M.S. in Aerospace Engineering and a Graduate Minor in Mathematics in 2011. His master's thesis, funded by a NASA Graduate Student Research Program Fellowship, focused on modeling ablation and pyrolysis processes in carbon phenolic thermal protection systems for atmospheric entry vehicles. In 2017, he earned a Ph.D. in Aerospace Engineering jointly from the von Karman Institute for Fluid Dynamics in Brussels, Belgium, and Ecole Centrale in Paris, France, with a thesis entitled "Development of numerical methods and study of coupled flow, radiation, and ablation phenomena for atmospheric entry." Dr. Scoggins is the creator and main developer of the open-source library called Mutation++, which provides thermodynamic, transport, and kinetic data for ionized gases. In 2018, Dr. Scoggins began a post-doc at the Center for Applied Mathematics at Ecole Polytechnique focused on developing machine learning techniques for computational physics applications. His research primarily focused on Physics Informed Neural Networks and Machine Learning Moment Methods applied to polydisperse spray modeling and was funded by a Fondation Mathématique Jacques Hadamard Postdoctoral Fellowship, awarded in 2019. Since 2021, Dr. Scoggins has been at NASA LaRC full-time, where his research interests include aerothermodynamics, machine learning, and multi-fidelity modeling approaches.

Date: Friday, December 2, 2022 **Time: 11:00 AM EST**
Place: Virtual **Contact: Dr. Jesse Hoagg**
Virtual: https://uky.zoom.us/j/89917065253?pwd=WXB3aTZLWWhJRyt5WHNDQmJFNVloUT09

- **Password: 188014**

Attendance open to all interested persons

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