



College of Engineering
UNIVERSITY OF GEORGIA

Lecture Series

Spectroscopic-based Predictions of Fuel Properties and Sensing for Engine Control



Dr. Patrick T. Lynch

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The high energy density of liquid fuels suggests that they will be used in aircraft propulsion for some time. Despite standards, fuels have variability, and this variability will only increase with the uptake in sustainable aviation fuels. Predicting the physicochemical properties of fuels, including their ignition behavior is very important for their use, especially in nontraditional applications. In this talk, I will focus upon using vibrational spectroscopy for property prediction and highlight extensive efforts for predicting cetane number (an ignition property). There are several archetypes of models that can be employed for this prediction, many of them machine learning models that are highly data driven. I will discuss how those models are made, their performances, limitations, and insights we can gain from them. A critical performance metric is accuracy of predictions for previously unseen fuels. Finally, I will discuss the performance of some of the recent prototype sensors (some miniaturized others miniaturizable) developed for cetane number prediction that may be used on-board as part of feed forward control.

Friday

November 8, 2024

12:40 – 1:30 P

**Driftmier
Engineering
Center**

**Room 1453
(Auditorium)**

Patrick Lynch is an Associate Professor of Mechanical Engineering at the University of Illinois Chicago. His work focuses upon sensing and diagnostics for propulsion and combustion, which has lately also lent itself towards machine learning and optimization. Recent applications include physiochemical properties of fuels, particularly for aviation fuels. Lynch also works in high temperature chemical kinetics and has expertise in shock tube design and experimentation including high repetition rate shock tubes. He has authored more than 40 archival publications and 75 presentations, and his research has been supported by the ACS, NSF, DOE, ARL, and AFOSR.