



ME Seminar



Combustion dynamics through the lense of complex systems science

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ABSTRACT

Thermoacoustic instability in turbulent combustors is a nonlinear phenomenon resulting from the interaction between acoustics, hydrodynamics, and the unsteady flame. Over the years, there have been many attempts toward understanding, prognosis, and mitigation of thermoacoustic instabilities. In recent times, researchers have been focusing on the nonlinear dynamics related to the onset of thermoacoustic instability. We view the thermoacoustic system in a turbulent combustor as a complex system, and analyse dynamics exhibited by the system as emergent behaviours of this complex system. Complex systems are systems that are composed of various interacting elements. As a result of the interaction among the constituting elements, complex systems exhibit various emergent phenomena which are not readily predictable by examining the individual constituents that makeup the system. In this presentation, we will discuss how complex system theory can be used to prognose and mitigate thermoacoustic instability in a turbulent combustor.

ABOUT THE SPEAKER

Dr. Vishnu R. Unni is an Associate Research Scholar in Dept. of Mechanical and Aerospace Engineering, Princeton University working with Prof. C. K. Law. Prior to this, he was a Postdoctoral Fellow in Dept. of Mechanical and Aerospace Engineering at the University of California San Diego, working with Prof. Abhishek Saha (2018-2020). He received his dual degree (B. tech & M. tech) and PhD, both in Aerospace Engineering, from Indian Institute of Madras in 2013 and 2017, respectively. His PhD guide at IIT Madras was Prof. R. I. Sujith. His research interests include, combustion dynamics, nonlinear dynamics and complex systems theory.



November 13, 2020, 4:00 pm, Microsoft Teams