Department of Mechanical and Aerospace Engineering
Indian Institute of Technology Hyderabad
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MAE Seminar Series | Lecture 15

Title: Data-driven turbulence and transition model development for gas turbine applications

Speaker: Dr. Harshal Akolekar, IIT Jodhpur

Date, Day, Time: 10 September, Wednesday, 11.30 am to 12.30 pm

Venue: MAE 102 (MAE Seminar Room)

Abstract: Turbulence modelling continues to be the workhorse of industrial design, offering practical turnaround times but at the cost of accuracy compared to physics-rich high-fidelity simulations. Although advances in computing have made multi-physics simulations increasingly accessible, their computational expense prevents their widespread use as iterative design tools. Bridging this gap requires the intelligent use of high-fidelity and experimental datasets to extract meaningful physics-based insights that can inform and improve lower-fidelity models. In this talk, Dr. Harshal will demonstrate how such datasets can be leveraged to enhance the prediction of wake turbulence and separation-induced transition in both low- and high-pressure turbines. The approach employs a CFD-driven, multi-expression, multi-objective gene expression programming framework to develop improved closure models. These models have been shown to deliver accurate predictions across a range of operating conditions, thereby demonstrating both robustness and practical relevance for industrial design.

Speaker Biographical Details: Dr. Harshal Akolekar is currently an Assistant Professor in the Department of Mechanical Engineering and School of AI and Data Science, IIT Jodhpur. He currently develops turbulence and transition models using novel machine learning tools such as evolutionary and deep learning algorithms to improve the accuracy of low-fidelity gas turbine computational fluid dynamics (CFD) simulations. He also develops course content related to the integration of machine learning and fluid mechanics. Prior to joining IIT Jodhpur he worked in the submarine industry in Australia. He completed his ME and PhD in machine-learning based computational fluid dynamics (CFD) from the University of Melbourne, Australia, in collaboration with GE, Aerospace. He is an undergraduate in mechanical engineering from BITS, Pilani.