OS10 –
AI and Machine Learning in Fluid Machinery

Organizers: Mehrdad Zangeneh, Kie Okabayashi,
and Donghyuk Kang

This organized session focuses on the rapidly evolving intersection of artificial intelligence (AI), machine learning (ML), and fluid machinery. With continuing advances in computational power and the growing availability of data, AI/ML techniques are becoming indispensable tools for the design, analysis, and operation of complex fluid systems. The session aims to provide a premier forum for researchers and engineers to present and discuss innovative data-driven approaches, including flow-field reconstruction from sparse measurements, physics-informed surrogate modeling, and design optimization. Through interdisciplinary discussions, the session seeks to bridge fundamental fluid mechanics and data science, addressing contemporary challenges related to performance, stability, and the long-term reliability of fluid machinery.

Non-exhaustive list of suggested topics

- Data-driven flow field reconstruction and sparse sensing

- Reduced-order modeling for fluid systems

- Digital twins and cyber-physical systems for turbomachinery safety

- Machine learning applications in complex flow analysis

- AI-based design optimization for pumps, fans, turbines, and compressors

- Deep learning for complex flow

- Predictive maintenance and instability detection using AI.

Organizers

Kie Okabayashi is an Assistant Professor in Department of Mechanical Engineering, The University of Osaka. She got doctoral degree in Mechanical Engineering from Osaka University, specializing the CFD of cavitating turbulent flow. She has been in her current position since 2016 and has recently been focusing on the data-driven approach and optimization methods using machine learning.

Donghyuk Kang is an Associate Professor in the Department of Mechanical Engineering at Saitama University, Japan. He received his Ph.D. from Osaka University, specializing in cavitation instabilities. Recently, his research focuses on data-driven fluid mechanics, sparse sensing, and the development of digital twins using dynamic mode decomposition.

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