流体科学研究所特別講演会のお知らせ

Bandung Institute of Technology の Palar 博士の特別講演会を下記要領にて開催いたします．氏は，航空宇宙流体問題のための機械学習モデルに関する研究に従事されております．この度，東北大学流体科学研究所の令和 4 年度一般公募共同研究における活動の一環で来所されるため，この機会にご講演をお願いしました．どうぞ，奮ってご参加ください．

日時: 令和 5 年 1 月 10 日 (火) 15:00–16:00

場所: 東北大学流体科学研究所 1 号館会議室

オンラインでご聴講をご希望の方は，下記の問い合わせ先までご連絡ください．

演題: **Explainable Surrogate Model: A Novel Framework for Engineering Design Optimization and Exploration**

講師: **Pramudita Satria Palar, Ph.D.**

(Assistant Professor, Faculty of Mechanical and Aerospace Engineering, Bandung Institute of Technology)

Surrogate models are indispensable tools in engineering optimization, uncertainty quantification, and global sensitivity analysis. Analyzing the inner mechanics of a surrogate model can help engineers to further understand the relationship between the input variables and the output of interest. However, although most surrogate models can provide good predictions, they are difficult to interpret without post-processing tools. With the rise of explainable artificial intelligence (XAI), there is currently a renewed interest in data mining to aid designers in drawing important design insight from the system being investigated. This talk will introduce the concept of "explainable surrogate model" that leverages modern tools in XAI to "dissect" a high-dimensional surrogate model for extracting important information. In particular, this talk will discuss how an explainable surrogate model can assist the process of design exploration and uncertainty quantification through visualization of the input-output relationship and ranking the importance of input variables. This talk will focus on Shapley Additive Explanations (SHAP), an interesting concept that originated from game theory and is now routinely used in the general machine learning context. In addition, this talk will also discuss how to analytically compute SHAP from a polynomial chaos expansion (PCE) model by exploiting the orthogonal nature of its bases. Several applications on engineering functions will be demonstrated to show the capability of an explainable surrogate model in practical design optimization.

Pramudita Satria Palar is an Assistant Professor at the Faculty of Mechanical and Aerospace Engineering, Bandung Institute of Technology, Indonesia. He completed his PhD from the Department of Aeronautics and Astronautics, University of Tokyo, in 2015 and his MSc and BSc from Bandung Institute of Technology. His PhD study was fully supported by the Japan International Cooperation Agency (JICA). Prior to his current position, he was a research fellow at the Institute of Fluid Science, Tohoku University, from 2016 to 2018. He was also a visiting researcher at the University of Cambridge in 2014 and Leiden University in 2017 and 2018. His research interests lie in the intersection between aerospace engineering and machine learning, which includes aerodynamic design optimization, surrogate-based optimization, and probabilistic design. He has published 16 journal and 33 conference papers on the development and application of optimization and machine learning techniques in various scientific fields, including aerospace engineering, civil engineering, biomedical engineering, and material science.

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