Department of Systems Engineering
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Data-Efficient Learning for Future Smart Manufacturing: From Big Data to Small Data

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Abstract

In today's manufacturing landscape, the rise of Industry 4.0 has led to the collection of vast amounts of big data, enabling powerful modeling and control for manufacturing systems and processes. However, the challenge lies not just in accumulating this data but in harnessing it efficiently. For example, many industries are characterized by rapid upgrades and advancements, such as semiconductors, electronics, and electric vehicles. Collecting a large volume of data for customer preferences, prototype testing, production optimization and quality control is undesirable as this will lead to a lag in product release and disadvantage in capturing market share. To address these challenges, this talk introduces a concept of data-efficient learning, which aims to develop reliable decision-making models with significantly reduced data requirement. Specifically, the speaker will present the newly developed data-efficient learning methods tailored for advanced manufacturing problems with improved physical interpretability, reliability, and generalizability. Concluding the presentation, the speaker will outline the future research plans to further advance smart manufacturing.

About the Speaker

Dr. Yuquan Meng received his B.S. in Mechanical Engineering from the University of Science and Technology of China (USTC) in 2017, and his Ph.D in Mechanical Engineering from University of Illinois of Urbana-Champaign (UIUC) in 2023. After graduation, he continued his research as a Postdoctoral Associate at UIUC. Dr. Meng's expertise lies in data-efficient learning, physics-informed learning and intelligent monitoring of advanced manufacturing processes, including ultrasonic metal welding, resistance spot welding, rotating machinery and additive manufacturing.

Enquiry: 3442 8422 | All are welcome