



Department of
Systems Engineering

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Engineering lightweight multifunctional composites for next-generation robotic systems: additive manufacturing and computational design



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Abstract

Additive manufacturing has garnered significant attention for its ability to rapidly and efficiently produce products with diverse materials, complex geometries, and multifunctional capabilities. Among these innovations, continuous fiber-reinforced composite 3D/4D printing is emerging as a promising approach for developing lightweight, multifunctional components for next-generation robotic systems. This talk explores the design opportunities and challenges that this technology offers in advancing structural-functional innovations in composite materials for robotics. We discuss how the collaboration between structure and process can optimize designs, enhancing both the mechanical performance and manufacturability of composite components. Additionally, we explore how integrated design framework, combining design, manufacturing, and control can be leveraged to develop high-performance, load-bearing, and customizable thermoelectric origami structures. These advancements are particularly relevant for applications in emerging fields such as morphable metamaterials, multimodal robotics, and intelligent aerospace systems.

About the Speaker

Dr. Xiong Yi is an assistant professor in the School of System Design and Intelligent Manufacturing at Southern University of Science and Technology (SUSTech). He received his Ph.D. degree in Engineering Design and Production from Aalto University, Finland, in 2016. His research interests include computational design and fabrication, additive manufacturing of composites, design for additive manufacturing, smart materials and structures. Dr. Xiong has over ten years of international R&D experience, working with several projects funded by EU FP7, National Research Foundation (Singapore), Research Foundations Flanders (Belgium), and Academy of Finland. He has successively presided over projects such as the National Natural Science Foundation of China and the National Key R&D Program of the Ministry of Science and Technology. He has authored more than forty peer-reviewed scientific publications, including Nature Communications.