香港科技大學
THE HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY

土木及環境工程學系
DEPARTMENT OF CIVIL AND ENVIRONMENTAL ENGINEERING

SEMINAR

AI-ENABLED GEOMETRIC DIGITAL TWINS FOR BUILDINGS AND INFRASTRUCTURE

Speaker

Dr. Mudan WANG

Assistant Research Professor
Department of Engineering, University of Cambridge

Abstract

This seminar presents work on AI-enabled automated generation of geometric digital twins for the built environment, with applications in building retrofitting and infrastructure assessment. Existing built assets often lack up-to-date information about their current physical state, including information about hidden structural components. Addressing these challenges requires methods that can transform sensing data into structured digital representations. The research developed AI-enabled automated workflows to transform point clouds and images into graph-based and IFC representations of existing buildings. It further explored LLM-enabled interaction with these graph representations to enable access to geometry, object information, and spatial relationships. Another research project investigated the automated geometric reconstruction of hidden internal structures. Muon Flux Tomography, a deep non-destructive inspection method, was used to capture information about internal structures. The research developed an AI-based automated reconstruction framework that processed Muon Flux Tomography data to reconstruct reinforcement geometry and converted the results into IFC models for structural assessment. These studies are funded by the Horizon Europe AEGIR project and the Innovate UK M-TABS project. The presented work advances AI-enabled automated digital twin generation towards a more complete representation and understanding of both visible and hidden aspects of the built environment.

Biography

Dr Mudan Wang is an Assistant Research Professor in the Department of Engineering at the University of Cambridge. Dr Wang's research focuses on intelligent construction, digital twins, spatial sensing, and artificial intelligence. Dr Wang leads the Digital Twin Construction Group, with PhD students and visiting scholars, and has secured research funding from Horizon Europe, Innovate UK, and the Royal Society, alongside an industry-funded research collaboration. She also serves as the IAARC Cambridge Chapter Chair and a Youth Editor of The Innovation Informatics, and is an Associate Fellow of Advance HE. Dr Wang received her PhD from the University of New South Wales (UNSW Sydney) and her BSc and MEng degrees from Huazhong University of Science and Technology.

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Enquiry:

Ms. Rebecca Yau
cerebeca@ust.hk