

DIGITALISATION FOR SUSTAINABLE AND RESILIENT UNDERGROUND INFRASTRUCTURE

Speaker

Prof. Qianbing Zhang

Monash University

Abstract

As cities grow denser and climate risks intensify, underground space is increasingly the strategy of choice for expanding capacity while reclaiming scarce surface land. The resulting infrastructure, such as tunnels, rock caverns, and utilities, must deliver not only structural safety but also long-term sustainability, resilience, and operational efficiency, and digital technologies are transforming how these assets are planned, designed, constructed, and managed across their lifecycle.

This presentation introduces an integrated digital engineering framework for sustainable and resilient underground infrastructure. It first examines the principal challenges posed by rapid urbanisation, ageing assets, and a changing climate. It then reviews recent advances in digital engineering that enable lifecycle information management and collaborative decision-making. Drawing on tunnel boring machine (TBM) tunnelling and rock cavern development as demonstration cases, it shows how these technologies, combined with advanced engineering analysis, can assess structural performance, lifecycle resilience, and environmental sustainability, including carbon footprint, to support data-driven decisions for the next generation of underground infrastructure.

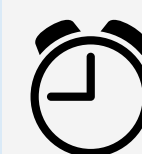
Biography

Dr Qian-Bing Zhang completed his PhD at EPFL (Swiss Federal Institute of Technology in Lausanne) in 2014 and undertook postdoctoral research at University of Cambridge before joining Monash University in 2015, where he is now an Associate Professor and Director of Research in the Department of Civil and Environmental Engineering. His research focuses on rock mechanics, underground engineering, and the digitalisation of geotechnical and tunnelling systems. He has served as Co-Editor-in-Chief of Elsevier Journal "Tunnelling and Underground Space Technology (TUST)" since 2019 and is Vice President of the International Society for Rock Mechanics and Rock Engineering (ISRM) in 2023-2027. A recipient of the prestigious John Booker Medal from the Australian Academy of Science (AAS) and a former ARC DECRA Fellow, he has published more than 150 peer-reviewed papers, attracting over 11,000 citations at an H-index of 55.



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**Room 3574 (Lift 27/28),
Civil Engineering
Conference Room, HKUST**

Enquiry:

Ms. Crystal Lau
cecystal@ust.hk