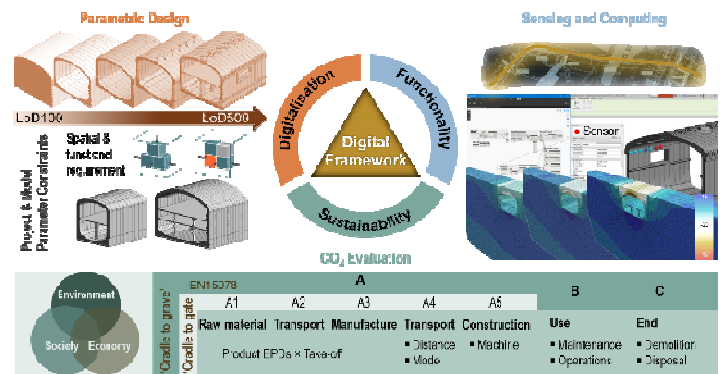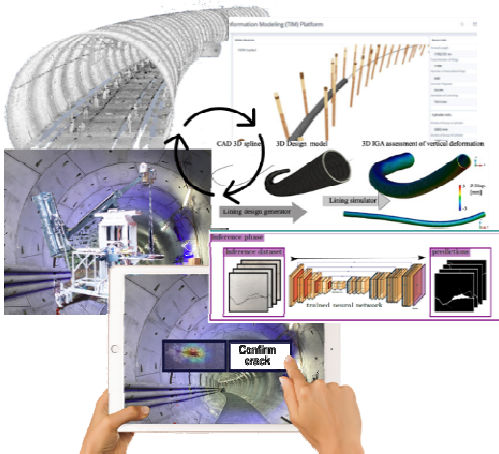# VISITING LECTURE

AUTOMATED RECONSTRUCTION OF DIGITAL TWINS FOR UNDERGROUND INFRASTRUCTURE

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Senior Lecturer in Digital Engineering
School of Engineering, University of Birmingham, UK

05.04.2024. 11^{00}-12^{00}
Room 141

Underground construction and development projects constitute complex, integrated and multi-disciplinary systems, which require building and construction information modelling as well as computational design assessment tools for decision making complete in project life cycle. The adoption of Building Information Modelling (BIM) in underground engineering has improved delivery and performance, fostered collaboration and innovation, and introduced opportunities for a new level of automation. This lecture will demonstrate adoption and adaptation of BIM for automated reconstruction of digital models, integrated assessment, real-time design optimisation, virtual control of construction and application of AI for inspection and maintenance. First, we will see how digital models for underground engineering can be reconstructed from diverse sources of data using parametric modelling and soft computing methods. Furthermore, we will demonstrate strategy for streamlined integration of BIM and high-fidelity numerical models that can transform geotechnical project planning by enabling efficient, computationally and digitally enhanced decision-making support, maximizing design flexibility and the potential for cost and CO_2 reduction. We will also discuss how ML-based meta models can be employed for real-time design assessment and the process control during construction. Finally, results on application of computer vision and deep learning for the inspection of infrastructure will be discussed.

After graduating from the Faculty of Civil Engineering at the University of Belgrade in 2008, Prof. Ninić worked as a Teaching Assistant at the Department of Geotechnical Engineering. In parallel, she worked at the "Jaroslav Černi" Water Institute as a researcher. In 2010 she moved to Ruhr University Bochum, Germany, where she obtained her PhD degree in 2015 "with distinction" in the field of numerical modelling of shield tunnelling. In 2016, Prof. Ninić obtained the Marie Curie individual fellowship "SATBIM" at the University of Nottingham, where she was appointed as Assistant Professor in Structural Engineering and Informatics in 2018. Since 2022, Prof. Ninić is Associate Professor in Digital Engineering in the School of Engineering at the University of Birmingham, UK.

Prof. Ninić focuses on the development and implementation of computational methods and tools to combine advanced numerical methods with novel information technologies, AI and digital modelling to study structural and geotechnical problems. Prof. Ninić combines intelligent computing, computer vision and machine learning, computational mechanics, and Building Information Modelling (BIM) with application to structural engineering, manufacturing and transport infrastructure problems. Applied to infrastructure problems, these methods provide design support throughout the complete lifecycle, from planning over design to construction.

Prof. Ninić has authored and co-authored over 80 academic papers. She is associate editor of "Tunnelling and Underground Space Technology" (TUST), UK representative and core member of the ISSMGE Technical Committee 222 Geotechnical BIM and Digital Twins, Executive Committee member of UK Association for Computational Mechanics (UKACM) and General Council member of International Association for Computational Mechanics (IACM).