

DIGITAL AND INTELLIGENT SITE CHARACTERIZATION

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ABSTRACT

With the fast development of sensing and digitalisation technologies, recent years have seen an unprecedented growth of data, also known as big data, with salient characteristics of volume, velocity, variety, and veracity (e.g. uncertainty and incompleteness). The surge of big data accompanies a rapid development of machine learning methods that target to deal, in a computationally efficient manner, with a large volume of uncertain and incomplete (or even sparse) data in a variety of forms for extracting knowledge and value from the data and decision-making. There is an on-going paradigm shift from traditional physics-based models to machine learning models in digital intelligence and digital economy. Rather than relying only on physics, or insights into the mechanisms concerned, to develop models and hoping that the data in hand fit the models, a machine learning model is featured by its adaptability to data, and the model automatically adapts itself to fit the data in hand. Machine learning models, particularly data-driven and physics-informed hybrid learning, are probably most beneficial when the physical insights, or concerning mechanisms, are unclear or too complicated to model quantitatively. Some long-lasting challenges in geotechnical site characterization fall within this category, such as developing high-resolution three-dimensional (3D) subsurface ground models from sparse site investigation data (e.g., Shi and Wang 2022). Machine learning methods can provide not only the most probable 3D ground models, but also quantify the associated uncertainty, which can be further used to smartly optimize locations and number of investigation points (e.g., boreholes or CPTs) in an adaptive manner during site characterization.

This min-symposium aims to provide a forum for researchers, practitioners, and industrial professionals to share their latest findings, insights, and experiences on these emerging topics of digital and intelligent site characterization. It will cover a wide range of related topics, including but not limited to the following:

- Data driven site characterization
- Ground models: procedures and results
- Simulation aided site characterization
- Uncertainty and variability in site characterization

- Planning of site characterization
- Interpretation of in situ test results

REFERENCES (Not mandatory, maximum 2 references)

- [1] Shi, C. and Wang, Y. (2022). “Data-driven construction of three-dimensional subsurface geological models from limited site-specific boreholes and prior geological knowledge for underground digital twin.” *Tunnelling and Underground Space Technology*, 126, 104493.