

## ADVANCED NUMERICAL AND DATA-DRIVEN METHODS IN GEOTECHNICAL ENGINEERING

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### ABSTRACT

The increasing demand for sustainable and resilient geo-structures, as well as the repurposing and reuse of existing ones, presents significant challenges for geo-engineers and geo-scientists. They are tasked with designing complex projects while optimising available resources. Computational modelling and data-driven approaches have become fundamental tools in the design and back-analysis of geotechnical structures such as tunnels, deep basements, slopes, dams, retaining walls, and foundations. Recent advancements in numerical methods and data-driven techniques have revolutionised traditional approaches, enhancing the accuracy, efficiency, and reliability of ground engineering-related projects, and extending their application beyond experts to a broader range of engineers and geo-scientists. This minisymposia (MS) aims to collect advanced and stabilised/robust numerical and data-driven models dealing with geotechnical and ground engineering problems.

This MS will cover a range of cutting-edge subtopics, including but not limited to:

- Application of physics-enhanced machine learning in ground engineering problems
- Model- and data- driven techniques including model update, inverse problems, fusion of models and data and virtual control for ground engineering problems
- Advanced numerical methods: boundary-fitted, i.e., mesh-based and boundary-unfitted discretisation technique, i.e., CutFEM, including meshless methods; Material Point Method (MPM); Isogeometric analysis (IGA)
- Robust constitutive modelling techniques, e.g. sub-stepping, for tunnel and foundation engineering
- Advanced numerical methods and data-driven models for elastic and acoustic wave propagation problems
- Advanced sensing and monitoring technologies for geotechnical applications: data- and physics- driven interpretations and predictive analytics

## REFERENCES

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