

# **Advanced Sensing and Computational Techniques for Infrastructure and Environmental Monitoring**

## **Preface**

Sensing technologies and computational methodologies play a crucial role in understanding the condition of civil structures and ensuring the safe use of these facilities in the field of measurement. This special issue journal primarily features papers that introduce the latest smart measurement technologies, which were presented at “The 2024 World Congress on Advances in Civil, Environmental & Materials Research (ACEM24) / The 2024 Structures Congress (Structures24),” held in Seoul from August 19 to 22, 2024. The selected papers focus particularly on applications in the field of geotechnical engineering.

This special issue journal comprises eight papers, organized around three primary themes: 1) Advanced Sensing Technologies for Soil and Structural Analysis, 2) Computational Techniques for Predictive Monitoring and Data Analysis, and 3) Integrated Approaches in Environmental and Infrastructure Monitoring. The first theme presents the latest sensing techniques designed to understand the behavior of soil materials and biopolymer solutions, highlighting their potential applications. The second theme explores the application of a Multilayer Neural Network for assessing the integrity of rock bolts and discusses the use of oversampling algorithms. Furthermore, this theme investigates eXplainable AI techniques that utilize the waveform of time domain reflectometry to identify key influencing factors. The final theme includes temperature measurement techniques using Fiber Bragg Gratings sensors to validate the effects of geothermal energy. Additionally, this section covers a smart instrumented dynamic penetrometer, which is capable of measuring and analyzing various geotechnical properties. Notably, this paper was also presented as a keynote lecture during the main events of the ACEM24/Structures24 conference.

The research presented in this special issue is closely aligned with the interdisciplinary approaches and innovative solutions highlighted in the Smart Structures and Systems journal. These studies are intended to serve as a valuable reference for researchers engaged in cutting-edge work, with the goal of fostering more advanced and promising developments in the field.

Prof. Jong-Sub Lee  
*Professor, School of Civil, Environmental and Architectural Engineering,  
Korea University, Seoul, Republic of Korea  
Email: jongsu@korea.ac.kr*