

## Artificial Neural Network in Predicting the Soil Response in the Discrete Element Method Simulation

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**Abstract :** This paper attempts to bridge the soil properties and the mechanical response of soil in the discrete element method (DEM) simulation. The artificial neural network (ANN) was therefore adopted, aiming to reproduce the stress-strain-volumetric response when soil properties are given. 31 biaxial shearing tests with varying soil parameters (e.g., initial void ratio and interparticle friction coefficient) were generated using the DEM simulations. Based on these 45 sets of training data, a three-layer neural network was established which can output the entire stress-strain-volumetric curve during the shearing process from the input soil parameters. Beyond the training data, 2 additional sets of data were generated to examine the validity of the network, and the stress-strain-volumetric curves for both cases were well reproduced using this network. Overall, the ANN was found promising in predicting the soil behavior and reducing repetitive simulation work.

**Keywords :** artificial neural network, discrete element method, soil properties, stress-strain-volumetric response

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