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## **ADAPTIVE NEURO-FUZZY APPROACH FOR SAND PERMEABILITY ESTIMATION**

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### **Abstract**

Characterization of soil permeability is of great importance for several geotechnical analyses. In common practice, because of the difficulty in sampling of granular material, constant head permeability tests are usually employed on specimens having similar relative densities to those in the field. An alternative approach to permeability tests for granular soils is the prediction of permeability levels by means of empirical equations depending on several particle size distribution and shape parameters. Such numerical approaches have certain drawbacks and limitations coming from their generalization based philosophy. Nevertheless, these numerical methods are capable of making reasonable predictions for permeability coefficient, and widely used in numerous geotechnical analyses. In this study, permeability tests conducted on 20 different types of granular soils are used to generate a database to characterize the permeability behavior numerically, and then an adaptive neuro-fuzzy inference system (ANFIS) is trained with the database to predict the results of the permeability tests. In comparison with nonlinear multiple regression analyses results, it is revealed that ANFIS structure is comparatively successful in the prediction of the permeability utilizing particle shape and grain size distribution information. Therefore, this promising potential should be used by geotechnical engineers to develop precise and flexible permeability estimation models.

*Key words:* ANFIS, granular soil, particle shape, permeability

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