Application of Fuzzy Neural Networks and Genetic Algorithm Neural Network in predicting water retention

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ABSTRACT

Soil water content at different negative potentials is a fundamental part of the characterization of the hydraulic properties of a soil. The water retention function is one of the most important input parameters in the majority of models, which related to agriculture, water and soil sciences. Pedotransfer functions (PTFs) predict the less readily available properties using easily collected soil parameters; so they have these advantages to be inexpensive and easy deriving.

Two important targets were designed in this paper. The target is performance evaluation of Fuzzy Neural Networks (Fuzzy-NN) and Genetic Algorithm Neural Network (GA-NN) in comparison routine neural networks, Multilayer Perceptrons (MLPs), in predicting moisture in predefined potential points. For achieving these targets, the water retention characteristics of 135 samples were determined at different matric potentials using sand box apparatus and pressure plates. The basic soil properties, organic matter content, soil texture and bulk density, were determined by common methods and modeling results from different networks were compared.

Results showed that the performance of all structures of neural networks was generally acceptable. In addition, according to results we can conclude that Fuzzy-NN could not improve the performance of MLPs but GA-NN does.

Keywords: pedotransfer functions, GA-NN, Fuzzy-NN, water retention characteristics.