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Wan-Huan Zhou, Ankit Garg, Akhil Garg

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¹Wan-Huan Zhou, ²Ankit Garg, ³Akhil Garg

¹Department of Civil and Environmental Engineering, Faculty of Science and Technology, University of Macau, Macau, China

²Department of Civil Engineering, Indian Institute of Technology, Guwahati, India

³Department of Mechatronics Engineering, Shantou University, Shantou 515063, China

Abstract

The practical application of determination of the soil water retention curves (SWRC) is in seepage modeling in unsaturated soil. The models based on the physics behind the seepage mechanism has been developed for predicting the SWRC. However, those models rarely consider the combined effects of initial volumetric water content and soil density. One of the best routes to study these effects is to formulate the SWRC models/functional relations with volumetric water content as an output and the soil density, initial volumetric water content and soil suction as input parameters. In light of this, the present work introduces the advanced soft computing methods such as genetic programming (GP), artificial neural network and support vector regression (SVR) to formulate the volumetric water content models based on the suction, density and initial volumetric water content. The performance of the three models is compared based on the standard measures and goodness-of-fit tests. The findings from the statistical validation reveals that the GP model performs the best in generalizing the volumetric water content values based on the suction, density and initial water content. Further, the 2-D and 3-D plots, evaluating the main and the interaction effects of the three inputs on the volumetric water content are generated based on the parametric procedure of the best model. The study reveals that the volumetric water content values behave non-linearly with respect to soil suction because it first decreases till a certain point of soil suction and then increases suddenly.

Keywords: soil density; SWRC; soil suction; initial water content.

Corresponding author: Akhil Garg

Email: akhil@stu.edu.cn

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