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Soil texture reclassification by an ensemble model

Milan Cisty and Kamila Hlavcova

Slovak University of Technology, Faculty of Civil Engineering, Dept. of Land and Water Resources Management, Bratislava, Slovakia (hlavcova@svf.stuba.sk)

Many environmental problems in which soil data serves as an inputs to simulation models are not restricted to national boundaries and therefore require international cooperation if solutions are to be found. The classification of soils according to their texture is one of the basic methods used for soil description.
The term “soil texture“ indicates the distribution of soil particles in the soil according to their size (diameter). The most preferred representation of texture classification is a grading curve. Because not all countries use the same classification system, databases from these countries cannot provide us with uniform data, which can serve as the inputs for various computations or models.
This study deals with a description of a texture system reclassification to USDA classification system by the proposed model on a data set from Slovakia originally labeled by Slovakian national classification system. However, the authors of the paper suppose that the methodology proposed could be used more generally and that the information provided is also applicable when dealing with other existing soil texture classification systems.
Some researchers have already proposed to fit the measured PSDs by various continuous parametric grading curves. When gaining such a relationship, it is possible to obtain a granular fraction‘s percentage ratio in the sample under consideration for any size of the particle diameter, which means that it is possible to get the values necessary for accomplishing a translation from one texture classification system to another. Several authors have conducted comparative studies on various PSD models in order to determine the best model for the soil groups selected for their studies (Nemes et al., 1999; Hwang, 2004; Botula et al., 2013).
The reported findings of the abovementioned works somewhat differ from each other, and there is no generally suitable PSD model available. Because the transformation of a soil texture system is usually only a prerequisite for solving some subsequent task, this bias is propagated to the subsequent modelling or other work. Therefore, for the sake of achieving more general and precise outputs while solving such tasks, the authors of the present paper are proposing a hybrid approach, which has the potential for obtaining improved results. Although the authors continue recommending the use of the mentioned parametric PSD models in the proposed methodology, the final prediction is made by an ensemble machine learning algorithm based on regression trees, the so–called Random Forest algorithm, which is built on top of the outputs of such models, which serves as an ensemble members. An improvement in precision was proved, and it is documented in the paper that the ensemble model worked better than any of its constituents.

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