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Prediction of CBR for coarse- and fine-grained soils using the GMDH model

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ABSTRACT

This study presents the prediction of the California Bearing Ratio (CBR) of coarse- and fine-grained soils using the group method of data handling (GMDH) model. The GMDH algorithm, a nonlinear regression method, is an artificial neural network-based model that enables examining the relationship between dependent and independent variables. In this study, the total number of data was 124 and they consist of two data sets including training (80%) and testing (20%). Gravel content (G), sand content (S), fine material ratio (FG), optimum moisture content (OMC), and maximum dry density (MDD) parameters were chosen as independent variables in the determination of the CBR value for the coarse-grained soils. For the fine-grained soils, liquid limit (LL), plastic limit (PL), plasticity index (PI), OMC, and MDD were used to inputs as independent variables. The performance of the models was evaluated with the regression coefficient, root-mean square error (RMSE), and mean absolute error (MAE) criteria for the entire data set. The results obtained from the designed GMDH-type neural networks were compared with the traditional regression models such as linear, support vector, and multilayer perceptron. The predicted CBR polynomial equations which obtained using the proposed GMDH-type neural network algorithm, have the maximum regression coefficients of 0.94 and 0.83 for coarse- and fine-grained soils, respectively. The results showed that the GMDH-type neural network models are more effective than the

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traditional regression models in order to predict the CBR value.