Hybridized Deep Learning Model for Perfobond Rib Shear Strength Connector Prediction

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Abstract:

Accurate and reliable prediction of Perfobond Rib Shear Strength Connector (PRSC) is considered as a major issue in the structural
engineering sector. Besides, selecting the most significant variables that have a major influence on PRSC in every important step for attaining economic and more accurate predictive models, this study investigates the capacity of deep learning neural network (DLNN) for shear strength prediction of PRSC. -e proposed DLNN model is validated against support vector regression (SVR), artificial neural network (ANN), and M5 tree model. In the second scenario, a comparable AI model hybridized with genetic algorithm (GA) as a robust bioinspired optimization approach for optimizing the related predictors for the PRSC is proposed.

Hybridizing AI models with GA as a selector tool is an attempt to acquire the best accuracy of predictions with the fewest possible related parameters. In accordance with quantitative analysis, it can be observed that the GA-DLNN models required only 7 input parameters and yielded the best prediction accuracy with highest correlation coefficient (R $\geq$ 0.96) and lowest value root mean square error (RMSE $\leq$ 0.03936 KN). However, the other comparable models such as GA-M5Tree, GA-ANN, and GA-SVR required 10 input parameters to obtain a relatively acceptable level of accuracy. Employing GA as a feature parameter selection technique improves the precision of almost all hybrid models by optimally removing redundant variables which decrease the efficiency of the model..