

Making a relation between strains and stresses is an important subject in the rock engineering field. Shear behaviors of rock fractures have been extensively investigated by different researchers. Literature mostly consists of constitutive models in the form of empirical functions that represent experimental data using mathematical regression techniques. As an alternative, this study aims to present a new integrated intelligent computing paradigm to form a constitutive model applicable to rock fractures. To this end, an RBFNN-GWO model is presented, which integrates the radial basis function neural network (RBFNN) with grey wolf optimization (GWO). In the proposed model, the hyperparameters and weights of RBFNN were tuned using the GWO algorithm. The efficiency of the designed RBFNN-GWO was examined comparing it with the RBFNN-GA model (a combination of RBFNN and the Genetic Algorithm). The proposed models were trained based on the results of a systematic set of 84 direct shear tests gathered from the literature. The finding of the current study demonstrated the efficiency of both the RBFNN-GA and RBFNN-GWO models in predicting the dilation angle, peak shear displacement, and stress as the rock fracture properties. Among the two models proposed in this study, the statistical results revealed the superiority of RBFNN-GWO over RBFNN-GA in terms of prediction accuracy