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Neural Network Prediction of Elastic Unloading for Low and High Strength Steels

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The degradation of elastic modulus has been approximated as a function of plastic pre-strain through an empirical exponential model. In the present work, the degradation of a low-strength steels (Mild270), a bake hardenable steel (BH340) and an advanced high-strength steels (AHSS), DP590 were predicted by artificial neural network (ANN) approach. Based on the continuous loading-unloading-loading experimental data, the prediction model was acquired through back-propagation feed forward neural network method. The application of the method includes the selection of architecture, training algorithm, and parameters of the network. The evaluations of the empirical exponential model and feed forward neural network model have been compared in finite element simulations. The results show that the current approach is able to predict the degradation of elastic moduli for all tested materials with better accuracy.

Keywords: Elastic unloading, plastic pre-strain, degradation, neural network