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Research Article

Comparison of Regression and Artificial Neural Network Models for Surface Roughness Prediction with the Cutting Parameters in CNC Turning

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Abstract

Surface roughness, an indicator of surface quality, is one of the most specified customer requirements in machining of parts. In this study, the experimental results corresponding to the effects of different insert nose radii of cutting tools (0.4, 0.8, 1.2 mm), various depth of cuts (0.75, 1.25, 1.75, 2.25, 2.75 mm), and different feedrates (100, 130, 160, 190, 220 mm/min) on the surface quality of the AISI 1030 steel workpieces have been investigated using multiple regression analysis and artificial neural networks (ANN). Regression analysis and neural network-based models used for the prediction of surface roughness were compared for various cutting conditions in turning. The data set obtained from the measurements of surface roughness was employed to and tests the neural network model. The trained neural network models were used in predicting surface roughness for cutting conditions. A comparison of neural network models with regression model was carried out. Coefficient of determination was 0.98 in multiple regression model. The scaled conjugate gradient (SCG) model with 9 neurons in hidden layer has produced absolute fraction of variance (R2) values of 0.999 for the training data, and 0.998 for the test data. Predictive neural network model showed better predictions than various regression models for surface roughness. However, both methods can be used for the prediction of surface roughness in turning.