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Irregular Step of Changing for Neural Network Data Sets Improves the Accuracy of Resistive Sensors Calculation

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Abstract

A linear multiport is considered as a model of multiwire communication lines with resistive sensors of physical quantities or as a model of the sensors themselves. The calculation of sensor resistance from measured input currents using a neural network as an approximation problem is investigated. To demonstrate such a problem, using the parameters of multiports with one and two sensor loads, the corresponding number of input currents for a particular set of loads is calculated in a given range of changes in their values. The input and target vectors are composed in this way. The dimension of the input vector is equal to the number of input currents. Numerical experiments were carried out in the MATLAB Deep Learning package for the feed-forward network. The trained model is further tested on the control data set to ensure the given computation accuracy conditionally for "all possible" load values. The data sets generation is carried out with both the traditionally constant and an irregular or variable step of change in values. For the irregular step, in the divided data into training, test and validation sets, an internal pattern is excluded and the network shows a greater ability to generalize. The same control data set shows a reduction in relative error for a series of numerical experiments. The repeatability of training results with preset value of relative error is introduced, as special index for quantitative assessment of training quality when comparing training results of neural networks with generated training data. The obtained results provide the basis for the study

of both chains with a large number of loads, as well as other approximation and regression problems.

Keywords: resistive sensors, neural networks, data set, relative errors

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