Elliot and symmetric elliot extreme learning machines for Gaussian noisy industrial thermal modelling

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This research proposes an Elliot-based Extreme Learning Machine approach for industrial thermal processes regression. The main contribution of this paper is to propose an Extreme Learning Machine model with Elliot and Symmetric Elliot activation functions that will look for the fittest number of neurons in the hidden layer. The methodological proposal is tested on an industrial thermal drying process. The thermal drying process is relevant in many industrial processes such as the food industry, biofuels production, detergents and dyes in powder production, pharmaceutical industry, reprography applications, textile industries and others. The methodological proposal of this paper outperforms the following techniques: Linear Regression, k-Nearest Neighbours regression, Regression Trees, Random Forest and Support Vector Regression. In addition, all the experiments have been benchmarked using four error measurements (MAE, MSE, MEADE, R 2).

Extreme learning machines

Gaussian noise

Industrial drying

Machine learning

Decision trees

Drying

Gaussian noise (electronic)

Industrial research

Knowledge acquisition

Learning systems

Nearest neighbor search

Regression analysis

Soaps (detergents)

Textile industry

Activation functions

Biofuels production

Error measurements

Extreme learning machine

Industrial processs

K-nearest neighbours

Pharmaceutical industry

Support vector regression (SVR)

Thermal processing (foods)