A Hybrid Model of a Flexible Rough Neural Network and Genetic Algorithm (FRNN-GA) in Numerical Weather Forecasting Using Emotional Learning Strategy

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Abstract

The forecast of atmospheric processes is of great importance in planning and management. Meteorological parameters are highly nonlinear phenomena, varying with time and location, and many climatic factors affect their changes. In this paper, a hybrid method consisting of a flexible rough neural network (FRNN) and a genetic algorithm (GA) proposed for forecasting meteorological parameters. Emotional learning process used for learning rough neural network parameters by having memories of previous learning history parameters. The forecasting parameters used in this study are temperature, pressure, relative humidity, wind speed, dew point, and visibility. In FRNN neurons, instead of using an activating function, a combination of three different sigmoid, tangent hyperbolic and linear functions is used to add neuron flexibility. The genetic algorithm has also been used to select the number and type of network input parameters. It expected that the proposed method will work well for a chaotic system of uncertainty. To evaluate the performance of the proposed hybrid method, data from the Tehran Meteorological Database from 2008 to 2012 used. The results of the implementation demonstrate the effective efficiency of FRNN-GA in forecasting meteorological parameters compared to similar methods, and using emotional learning increased the accuracy.

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