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Comparison of different forms of the Multi-layer Feed-Forward Neural Network method used for river flow forecasting

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Abstract. The Multi-Layer Feed-Forward Neural Network (MLFFNN) is applied in the context of river flow forecast combination, where a number of rainfall-runoff models are used simultaneously to produce an overall combined river flow forecast. The operation of the MLFFNN depends not only on its neuron configuration but also on the choice of neuron transfer function adopted, which is non-linear for the hidden and output layers. These models, each having a different structure to simulate the perceived mechanisms of the runoff process, utilise the information carrying capacity of the model calibration data in different ways. Hence, in a discharge forecast combination procedure, the discharge forecasts of each model provide a source of information different from that of the other models used in the combination. In the present work, the significance of the choice of the transfer function type in the overall performance of the MLFFNN, when used in the river flow forecast combination context, is investigated critically. Five neuron transfer functions are used in this investigation, namely, the logistic function, the bipolar function, the hyperbolic tangent function, the arctan function and the scaled arctan function. The results indicate that the logistic function yields the best model forecast combination performance.

Keywords: River flow forecast combination, multi-layer feed-forward neural network, neuron transfer functions, rainfall-runoff models

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