



Neural network emulation of a rainfall-runoff model

R.J. Abrahart (1) and L.M. See (2)

(1) University of Nottingham, (2) University of Leeds (Email: bob.abrahart@nottingham.ac.uk)

Non-linear transformation is a fundamental aspect of most hydrological modelling applications. Gaume & Gosset (2003) showed that a neural network model can sometimes produce results that are similar to a weighted linear model. Their results are nevertheless problematic since the context in which a comparison exercise is performed is a critical matter and the solution that is developed will correspond to the nature of the relationship that is being modelled. The selection of input and output variables will control that relationship and the extent to which a successful model can be produced. If the problem that is to be modelled is defined in terms of linear or near-linear relationships it is axiomatic that weighted linear models and trained neural network models will produce similar results. The latter will extract the linear relationships that are contained in the datasets and attempt to develop a linear solution; whereas in the case of non-linear relationships it would attempt to develop a non-linear solution. This poster will demonstrate the capabilities of an artificial neural network model to produce a non-linear solution in a non-linear modelling situation. Neural network solutions were developed to emulate a recognised non-linear rainfall-runoff model. The model was formulated as a single equation that had a small number of inputs and no temporal component. The inputs to the rainfall-runoff transformation process were produced with a statistical pattern generator. This cloning operation has facilitated a direct comparison with the computed mathematical relationship. It has also provided more general information on the power of a neural network tool to model non-linear relationships. The results are compared to multiple linear regression models developed on the same datasets. Neural solutions were also developed on a reduced number of inputs and on different mathematical outputs.