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Input sensitivity analysis of neural network flood event models for ungauged catchments

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Neural network solutions are seldom subjected to sensitivity analysis: a procedure that is used to examine the rate of change in one factor with respect to changes in another for the purposes of: (i) illustrating that a model is sensitive to actual variation in the environmental processes concerned – but will not produce ridiculous output under exceptional circumstances; (ii) demonstrating that in response to representative variation of input data and parameter values, realistic behaviour is experienced in the model (at least in a theoretical sense); and (iii) determining those model parameters or inputs to which the model is most sensitive (Howes & Anderson, 1988; see also McCuen, 1973). Models developed for predicting flood events in ungauged basins can be sensitive to changes in predictors - a problem that is also common to models that are over-parameterised, over-trained or too dependent on the training period and the choice of training dataset. In this paper a series of published neural network models for flood estimation at ungauged sites is explored. The models were developed to predict flood events based on catchment characteristics listed in the Flood Estimation Handbook. The annual maximum series for sites was used to estimate [a] the index flood and [b] selected T-year flood events (in cumecs) for each catchment (10, 20, 30, 50, 100 years) assuming a Gumbel Type 1 distribution. The different models are housed on an open-access web site that will permit users to model flood events on their own catchments. This paper discusses the differing sensitivities of the trained models to changes in their inputs.