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Timing optimisation applied to neural network rainfall-runoff modelling of a large catchment in northern England

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The last fifteen years have witnessed a significant increase in the development and application of neural network rainfall-runoff models. The most recent investigations have either divided the problem into recognised subsets or explored the potential benefits of using more powerful optimisation tools and procedures e.g. model development based on neuroevolution packages or the use of more relevant hydrological objective functions. These modifications have provided improved forecasting capabilities but the quest for a model that can predict the magnitude of extreme events in a more accurate manner still remains as something of a 'grand challenge' to neurohydrologists.

Accurate timings are also important and are a critical factor in operational management and decision making activities related to high magnitude flood events. To provide a suitable warning period in which the authorities can implement their approved safeguarding measures and procedures is essential. Timing errors have however been identified as a problem in 'one-step-ahead' neural network rainfall-runoff models that use the last recorded observation as an input value to represent 'catchment state'.

This paper/poster will report various findings and unexpected benefits obtained from the application of a timing error correction procedure that was used to correct for forecasting lag errors in four neural network rainfall-runoff models. The procedure was implemented in a neuroevolution toolbox and is based on previous explorations that were intended to correct for timing lags in the output forecasts of a sun spot prediction model (Conway et al., 1998). The correction procedure is applied as an integrated part of the neural network optimisation process. Experiments were conducted using four

neural network rainfall-runoff models developed on different forecasting horizons for the River Ouse in Northern England (T+6, T+12, T+18 and T+24). The problematic timing errors in each model were more or less eliminated. The power of the models to predict higher magnitude flood events over longer forecasting horizons was also improved.