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Evaluation of two different methods for using the antecedent precipitation index in neural network river stage forecasting

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This paper examines two potential uses of the antecedent precipitation index for neural network rainfall-runoff modelling. This index is a simple number derived from rainfall depth which can be compared with, or used to estimate, soil moisture. It is a derived variable could be incorporated into the modeling process as either a traditional 'input driver' or a specialist 'output hint'. Earlier reported hydrological studies have shown that that the internal processing units within artificial neural networks appear to become specialised. It has also been argued that these internal units are mimicking physical processes represented inside a hydrological model. In order to further strengthen such internal configurations and hopefully, as a consequence, improve model performance, further investigations have explored the use of output catalyst hints to develop solutions in which the internal structures become 'more specialised'. This paper will contrast the different hidden unit functionalities that arise from using the antecedent precipitation index as an input driver and as an output catalyst hint using rainfall and runoff datasets for the River Ouse in North Yorkshire, UK. Winter period data at 6-hourly time steps were used to construct neural network models for forecasting river stage (m) with lead times of 6 hours and 24 hours ahead. The resultant models are further compared with previous neural network models that were developed on the same datasets to evaluate the effectiveness of using this index in a more general sense.