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How can we deal with ANN in flood forecasting? As a simulation model or updating kernel!

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Flood forecasting and early warning, as a non-structural measure for flood control, is often considered to be the most effective and suitable alternative to mitigate the damage and human loss caused by flood. Forecast results which are output of hydrologic, hydraulic and/or black box models should secure accuracy of flood values and timing, especially for long lead time. The application of the artificial neural network (ANN) in flood forecasting has received extensive attentions in recent years due to its capability to capture the dynamics inherent in complex processes including flood. However, results obtained from executing plain ANN as simulation model demonstrate dramatic reduction in performance indices as lead time increases. This paper is intended to monitor the performance indices as it relates to flood forecasting and early warning using two different methodologies. While the first method employs a multilayer neural network trained using back-propagation scheme to forecast output hydrograph of a hypothetical river for various forecast lead time up to 6.0 hr, the second method uses 1D hydrodynamic MIKE11 model as forecasting model and multilayer neural network as updating kernel to monitor and assess the performance indices compared to ANN alone in light of increase in lead time. Results presented in both graphical and tabular format indicate superiority of MIKE11 coupled with ANN as updating kernel compared to ANN as simulation model alone. While plain ANN produces more accurate results for short lead time, the errors increase expeditiously for longer lead time. The second methodology provides more accurate and reliable results for longer forecast lead time.