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Combinations of specilaized conceptual and neural network rainfall-runoff models: comparison of performance

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A single hydrological model (process-based or data driven) might not equally well describe the characteristic of a complex rainfall-runoff relationship. One possibility here is building several specialized (local) models which can be specifically oriented at a particular process in the same model structure and combining them using weighting scheme the result can be called a multi-model, or a committee model. In this approach first we build the individual specialized models which are mainly calibrated on various regimes corresponding to hydrological sub-processes for example, low flow and high flow, and combining their outputs using the ideas of a fuzzy membership with various parameterisations.

This experiment explores the several committee models of specialized hydrological models [1, 2] which are employed for rainfall-runoff model prediction. Comparison of three committee models are demonstrated which constructed from specialized models: (1) processes-based conceptual HBV rainfall-runoff model (CRRM) (2) rainfall-runoff model based on artificial neural networks (ANN) and (3) combination of CRRM and ANN. The weights assigned to each specialized model's output are based on fuzzy membership functions which are different at every time step depending on the current value of flow. Comparison results indicated that committee model CRRM-ANN built from the high flow HBV model and low flow ANN model outperformed other models. Bagmati catchment in Nepal and Leaf catchment in USA are considered as case studies.

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