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Committee of machine learning predictors of hydrological models uncertainty

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In prediction of uncertainty based on machine learning methods, the results of various sampling schemes namely, Monte Carlo sampling (MCS), generalized likelihood uncertainty estimation (GLUE), Markov chain Monte Carlo (MCMC), shuffled complex evolution metropolis algorithm (SCEMUA), differential evolution adaptive metropolis (DREAM), particle swarm optimization (PSO) and adaptive cluster covering (ACCO)[1] used to build a predictive models. These models predict the uncertainty (quantiles of pdf) of a deterministic output from hydrological model [2]. Inputs to these models are the specially identified representative variables (past events precipitation and flows). The trained machine learning models are then employed to predict the model output uncertainty which is specific for the new input data. For each sampling scheme three machine learning methods namely, artificial neural networks, model tree, locally weighted regression are applied to predict output uncertainties. The problem here is that different sampling algorithms result in different data sets used to train different machine learning models which leads to several models (21 predictive uncertainty models). There is no clear evidence which model is the best since there is no basis for comparison. A solution could be to form a committee of all models and to sue a dynamic averaging scheme to generate the final output [3]. This approach is applied to estimate uncertainty of streamflows simulation from a conceptual hydrological model HBV in the Nzoia catchment in Kenya.

[1] N. Kayastha, D. L. Shrestha and D. P. Solomatine. Experiments with several methods of parameter uncertainty estimation in hydrological modeling. Proc. 9th Intern. Conf. on Hydroinformatics, Tianjin, China, September 2010.

[2] D. L. Shrestha, N. Kayastha, and D. P. Solomatine, and R. Price. Encapsulation of parameteric uncertainty statistics by various predictive machine learning models: MLUE method, Journal of Hydroinformatic, in press, 2013.

[3] N., Kayastha, J. Ye, F. Fenicia, V. Kuzmin, and D. P. Solomatine. Fuzzy committees of specialized rainfall-runoff models: further enhancements and tests. Hydrol. Earth Syst. Sci., 17, 4441-4451, 2013