Geophysical Research Abstracts, Vol. 9, 09154, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-09154

Exhaustive optimization of modular ANN models in flow forecasting

G. Corzo, D.P. Solomatine
UNESCO-IHE Institute for Water Education ({g.corzo, d.solomatine}@unesco-ihe.org)

Combinations of models are becoming more and more popular in streamflow forecasting. One of the ways is to use ensembles, and another one – to build "local" models specialized in a particular sub-process of a modelled phenomenon. In this paper we consider committees of data-driven models based on the use of flow separation – this makes it possible to build separate models for base and high flow. As the main model we use an artificial neural network (ANN).

There are several methods known that allow for separation of base and high flow. In this paper, two of them were tested, and they are used to produce two time seria – for the base and the high flow. Two different ANNs are trained to forecast flow on the basis of past measurements of rainfall and flows; average mutual information is used to identify the proper lags. It is demonstrated that such modular model is more accurate than the model trained (calibrated) on the whole data set.

The focus of this presentation is overall optimization of the model structures consisting of the two specialised models. Three different model performance measures were analysed and two case studies were considered. Two optimization methods were employed: randomized search by GA of optimal filter coefficients, and exhaustive optimization through the space of possible ANN models. They are compared in effectiveness and efficiency.

The resulting hybrid of data-driven model combines advantages of a data-driven approach when the tedious task of building a non-linear regression is left to a machine learning method, with the proper use of hydrologic flow separation algorithms. We show that identification and separation of regimes improve the accuracy of ANN-based flow forecasting models. The use of flow separation together with the modular data-driven models introduces the hydrologic knowledge into a data-driven model in

a natural way, and thus helps an easier acceptance of such models by practitioners.