Hydrol. Earth Syst. Sci. Discuss., 3, S147–S150, 2006
www.copernicus.org/EGU/hess/hessd/3/S147/
European Geosciences Union

Hydrology and Earth System Sciences Discussions

Interactive comment on "Classification of heterogeneous precipitation fields for the assessment and possible improvement of lumped neural network models for streamflow forecasts" *by* N. Lauzon et al.

D. Solomatine (Referee)

d.solomatine@unesco-ihe.org

Received and published: 17 April 2006

General comments

The paper covers an important topic of improving regression models for flow forecasting. The presented method involves using Kohonen network to cluster the precipitation data from 34 gauges, and to use this aggregated information as an input (or several inputs) to the ANN rainfall-runoff model.

It is well written and structured, includes relevant references. The narration is logical. The assumptions are tested by the experiments. Conclusions reflect the material cov-

ered in the paper. The paper contains the original material and can be recommended for publication in HESS, provided the comments and suggestions given below are addressed.

Specific comments

Typically Kohonen network is profiled as a clustering method, and not a classification one. Classification results in a learned machine that is able to attribute new data to one of the existing classes. The training data for such machine should include the known (observed) output, since this is a supervised learning method. On the contrary, clustering methods belong to the group of non-supervised learning methods since the output is not known. (Often, the clusters found by a clustering method can be interpreted as classes, data is labeled accordingly, and then a classifier is trained - but this was not done in the paper.) The task solved by Kohonen network in the paper is a clustering task. It is suggested to consider using the term “clustering” or “grouping” instead of “classification”.

On page 213 the authors term 1/3 of the whole dataset a validation dataset, but it is first used for model selection, and then to test the model (which was selected based on the same dataset). Such approach is methodologically questionable. Indeed, sometimes, in the situations of data shortage this is done. The authors are invited to present the justification for this matter.

During setting up the rainfall-runoff (RR) model for the considered cases study, there was an attempt made to use several lagged rainfalls. Through model optimization it appears that it is enough to use only one past rainfall. Such approach to input selection is acceptable, but a hydrologist may desire a more “physical” approach, for example determining the lags through studying the travel time through the catchement, or at least by studying the correlations, or mutual information between lagged rainfalls and flows. It is recommended at least to mention such possibilities.

Another problem of the models of the used structure is the high autocorrelation of flow,

HESSD

3, S147–S150, 2006

so that the current flow mainly depends on the flow of the previous day and much less on the precipitation. However, the most important use of such model is forecasting the increase of flow due to past precipitation, and they may be tuned to react to a strong (but physically uninteresting) signal of the past flow(s). This issue is not discussed, and it would be advisable at least to mention this problem.

The authors find the groups of rainfall gauges based on the proximity of the corresponding measurements. Such approach has certain advantages, and allows for detecting various classes of the precipitation events, but it leads to the loss of the causal relationship “rainfall - runoff” considered in the context of time (which is very important in forecasting). For example, two points (gauges) precipitation at which leads to the increase in flow downstream at different moments (i.e. the travel time for these points is different) could be grouped into one cluster, and their influence on flow is then averaged and the time (lag) structure thus lost. Such gauges can be seen on Fig. 5 (in text referred as Fig 7). An alternative approach (and in the opinion of this reviewer, a more logical one) would be trying to group the points based on the corresponding travel time thus creating groups of gauges with the similar influence on the flow downstream. In the present study, however, the data used does not have a high temporal resolution, so this could be the reason this alternative approach was not used. The authors are invited to consider strengthening the justification of clustering criterion they used that is based on the proximity of the precipitation values.

Figures 1 and 2 are missing and all further reference numbers to Figures are shifted by 2. Please correct.

Please improve readability of Figure 4 (plots, legends).

Units for RMSE for flow forecasts are [mm]; is this correct?

Technical corrections

P. 204, L.7: “determination of classes (i.e., calibration)”: not clear, please explain. L.

HESSD

3, S147–S150, 2006

10: for –> in. P. 205, L. 11: scale –> dimension L. 22: please define “application”, or change. P. 206, L. 21: “training is sufficient”: please define what is sufficient. P. 207, L. 14: Canon –> Cannon P. 208, L. 3: suggested to remove “to (6)”. P. 209: suggested to use definite article “the” with “first step”, “second step”. P. 210: lines 3-7: repetition of text? P. 215, L. 24: it is not clear what classification tree is meant. Please explain. P. 216, L. 13: afterward –> afterwards.

Interactive comment on Hydrology and Earth System Sciences Discussions, 3, 201, 2006.