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Hydrology and Earth System Sciences Discussions

Interactive comment on "Artificial Intelligence Techniques for river flow forecasting in theSeyhan River Catchment, Turkey" *by* M. Firat

Anonymous Referee #2

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General comment

The paper addresses an important topic in hydrology, namely river flow forecasting. In particular, four methods, Adaptive Neural Fuzzy Inference System (ANFIS), Feed Forward Neural Network (FFNN), Generalized Regression Neural Network (GRNN) and Autoregressive (AR) models, are used to forecast daily river flows and the performances of the four models are compared. The paper is relatively well written although it contains a number of English language errors, which must be abridged in the final version.

The main remark to the paper relates to the relatively low additional value brought in by the work in terms of knowledge. In fact, the proposed paper is very similar to the one by

the same author and Gungor published in Mathematics and Computers in Simulation (Firat and Gungor, 2007). In particular in Firat and Gungor (2007) an ANFIS technique is presented and used to forecast daily river flow and its performances are compared with the ones of a multiple regression model and of an ANN model (probably a Feed Forward Neural Network), as well as in the proposed paper. The results obtained, in terms of comparison of performances of the models are the same. Overall, the paper proposed for the publication in HESS doesn't appear to provide any new significant scientific contributions with respect to the one published in Mathematics and Computers in Simulation. It appears that the main difference between these two papers is the introduction in the comparison of the Generalized Regression Neural Network, but this improvement seems somewhat insubstantial. However, the paper addresses topics which are definitely within the scope of HESS and it could be considered for publication, provided that the author clearly conveys to the reader the relevance of the paper to the advancement of hydrological forecasting and highlights the differences and improvements with respect to the paper by Firat and Gungor (2007).

An other major comment is about the text. In fact not only the content and the scientific contribution of the paper are very similar to those of the paper by Firat and Gungor (2007), but also many paragraphs are copied by that paper (see, for example, p.1370, line 26, p.1371, lines 1-3, p.1371, lines 11-19, p.1371, lines 25-29 etc. and the description of the ANFIS, p.1372-1375).

The structure of the paper could be improved. The comparison is performed between four models, ANFIS, FFNN, GRNN and AR model, but the AR model is never cited in the first part of the paper. In particular, in the abstract (p.1370, lines 4-6) and in the introduction (p.1372, lines 4-5) only ANFIS, FFNN, GRNN are cited and in sections 2 and 3 (p.1372-1377) only these three models are described. The Autoregressive model is introduced for the first time at the end of the paper, in the case study (p.1382). The description of the AR model and, in particular, the analysis of its results, could be improved in order to provide the same level of details of the other three models.

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Finally, the comparison of the models is performed considering as input only the daily observed flows whereas other factors, like rainfall, are extremely important in forecasting daily river flows. Moreover, only one lag-time is considered for the output, i.e. only the average flow for the next day is forecasted. How do performances of the four models change in forecasting the river flows two days ahead, three days ahead etc.? The comparison should address these aspects considering other input variables and forecasting the flows at different lag-times.

Minor comments

Abstract, p.1370, lines 8-12: It is not clear how many river flow data are used for the training, testing and verification. See also Sec. 5.1, p.1378, lines 19-21.

Sec. 5.2, p.1379, line 20. A Bracket is missing in eq. 15.

Sec. 5.2.1, p.1380, line 19: Reference to figure 5 is wrong.

Sec. 5.2.1, p.1380, lines 19-20: This statement should be corrected. Probably RMSE at line 20 should be E.

Sec. 5.2.2, p.1381, line 18: Probably a "of RMSE" is missing: the value (of RMSE) of R-I M2 GRNN model is also lower than...

Sec. 5.2.4, p.1383, lines 19-22: This sentence has no meaning in this section.

Table 4 and Table 6: The titles are wrong. Moreover Table 4, 5 and 6 are quite repetitive. Just one table with the values of the statistics for training, testing and verification for the four models could be presented (for example adding the values of the statistics for the training data set to Table 6 and eliminating Table 4 and 5).

References

Firat, M. and Gungor, M.: River Flow Estimation using Adaptive Neuro-Fuzzy inference System, Mathematics and Computers in Simulation, in press, http://www.sciencedirect.com/science/journal/03784754, 2007.

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