

Interactive comment on “A comprehensive study of new hybrid models for Adaptive Neuro-Fuzzy Inference System (ANFIS) with Invasive Weed Optimization (IWO), Differential Evolution (DE), Firefly (FA), Particle Swarm Optimization (PSO) and Bees (BA) algorithms for spatial prediction of groundwater spring potential mapping” by Khabat Khosravi et al.

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Thank you so much for your positive and valuable comments. This document explains the changes made in the revised manuscript while dealing with the comments raised

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by the reviewers.

Comment 1: There are many grammatical mistakes appeared in the article. I strongly request that this manuscript should be totally edited by professional English editors for improving the English writing.

Answer: We have carefully checked and revised English in the manuscript.

Comment 2: In Figure 2, thirteen groundwater conditioning factors were served as input of hybrid models. The sensitivity analysis should be performed to investigate that which conditioning factor is most important factor to affect the output.

Answer: Thanks for your valuable suggestion. It was performed using one of the most widely used methods namely Information Gain Ration (IGR) as follows:

4.2. Determination of the most important parameters The most common method of information gain ratio (IGR) was applied to identification of the most important conditioning factors. Result shows that all thirteen conditioning factors are effective on groundwater occurrences as the land-use/landcover factor has the most important impact on groundwater (IGR=0.502) followed by lithology (IGR=0.465), rainfall (IGR=0.421), TWI (IGR=0.400), soil (IGR=0.370), TRI (IGR=0.337), slope degree (IGR=0.317), altitude (IGR=0.287), distance to river (IGR=0.139), aspect (IGR=0.066), plan curvature (IGR=0.0548), distance to fault (IGR=0.0482) and SPI (IGR=0.0323).

Comment 3: How many non-spring stations in the study area? Why are the numbers of non-spring stations should same with spring stations?

Answer: In the present study the same number of 2463 springs and non-springs location have been considered which stated in the paper. Number of non-springs location can be different from spring location (higher or less than), but it is better be the same, as the results of the models depend on them and also with testing dataset (30% of both of spring and non-springs location) the prediction ability of the model is evaluated, thus, for example, if there is a lot of non-spring location in compare to spring location,

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and may be this location located on the non-spring potential area, thus accuracy of the model would be increased in inaccuracy method. But for achieve the better and more accurate result it is better that has a same number.

Comment 4: In line 171, "In the current study, 14 conditioning factors.." should be "13 conditioning factors.."

Answer: Thank you for your precis attention; it was corrected.

Comment 5: I am wondering that Figures 4, 5, and 6 are necessary, because these figures are taken from other literature.

Answer: Thanks for your valuable comment, the authors agree with you and removed these three Figures from the paper.

Comment 6: In equation (1), what is "I"? The term "I" should be "i=1".

Answer: "I" is the index of each expert. We must write SWARA method completely in method. But, we added number of expert for determining the priority for each criterion.

Comment 7: Pages 12, 13, and 14, the authors spend many spaces to describe the algorithm of ANFIS model. Actually, we can find the same description in many referenes. I am also wondering that the description of ANFIS model is necessary. Should it move to Appendix.

Answer: Thanks for this valuable comment. The extra explanation has been removed and proper reference added for more details for ANFIS model.

Comment 8: In "Discussion" Section, lines 708-719, why are these sentences put here? These sentences seem to repeat again.

Answer: Thank you for your precis attention and valuable comment; it was removed from the paper as they are repeated.

Comment 9: Can the authors describe that how much time you spend to run for each

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hybrid ANFIS model in MATLAB environment?

Answer: Yes, we have proved a figure that show the processing time for each model in the revised manuscript (Fig.7).

Comment 10. The important factors to be adjusted for each hybrid ANFIS model should be listed with a Table.

Answer: Processing in Matlab shown in Figure 4. FIS is structure and many variants. Consequently, show all optimize parameters for each hybrid models are very difficult and get many space in paper if presented in table format. So, our suggestion is replacement of table of optimize parameters using figure 7 for describe processing. This Figure was added to the paper as well.

Dear Editor and reviewers: Thank you so much for your viewpoints and comments in regarding our manuscript. I hope the emendations caused to consent the respected reviewers and editor-in-chief and made my paper well qualified for publication.

Please also note the supplement to this comment:

<https://www.hydrol-earth-syst-sci-discuss.net/hess-2017-707/hess-2017-707-AC2-supplement.pdf>

Interactive comment on Hydrol. Earth Syst. Sci. Discuss., <https://doi.org/10.5194/hess-2017-707>, 2018.

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