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Hydrology and Earth System Sciences Discussions

Interactive comment on "Auto-control of pumping operations in sewerage systems by rule-based fuzzy neural networks" *by* Y.-M. Chiang et al.

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The paper presents a study aimed at verifying the performances of neural networks to predict the optimal number of pumps operating at a pivotal pumping station installed in the sewer system of Taipey city (Taiwan). In practice, the practical problem is to predict in real time, with an appropriate lead time, the number of pumps to activate in order to optimise the performances of the pumping station, therefore minimising the chances of experiencing overflows in the sewer system.

I think the paper is well written and organised. However, I believe there are two major issues the authors need to address. First of all, it is not clear what is the gain in performances provided by the proposed techniques with respect to traditional methods

for managing the pumping station. Second, I believe the presentation is not clear in some of the sections.

Concerning my first remark above, I think the paper suffers from a lack of comparison between the proposed neural network techniques and traditional management of the pumping station. The authors only present the comparison between two different types of neural networks, but the reader is left wondering if neural networks provide a real advantage with respect to traditional techniques. In other words, the paper misses the comparison with a baseline operating rule. How is the pumping station managed today? What would be an alternative technique to manage it if neural networks were not used? Are neural networks really providing a consistent advantage? In fact, it seems that neural networks are used to predict the number of operating pumps only, depending on aggregate inputs like the number of open gates. Usually, these systems are managed in practice by automatically activating the pumps when the water level reaches given thresholds. Is such kind of procedure currently used in Taipey City? I believe the reader needs more details and needs to know if neural networks are indeed providing an added value in this case.

Concerning my second remark above, I believe Section 2.1 is not clear. A sketch of the network would be useful here. What is the meaning of the weights in connection with the "if" and "then" rules? Also, the meaning of Δ in section 2.1.1 is not clear as well. Finally, it is not clear to me if the learning rates α and β are calibrated.

In Section 2.1.2, I do not understand whether the appropriateness of the Gaussian membership function is checked in some way, in comparison with alternative solutions.

The output from the neural network is the number of operating pumps. Would it be possible to disaggregate the output in some way? Are the pumps really operating in such way that the total number of working units is the only meaningful variable? The same reasoning applies for the input variable "total number of open gates". For a given number of open gates, is the sewer system not sensitive to the actual status of each

gate?

I believe the paper needs a major revision to address the main concerns I expressed above.

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