Natural Hazards and Earth System Sciences Discussions

Nat. Hazards Earth Syst. Sci. Discuss., author comment AC1
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Reply on CC1

Zongjia Zhang et al.

Author comment on "A multi-strategy-mode waterlogging-prediction framework for urban flood depth" by Zongjia Zhang et al., Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2022-36-AC1, 2022

Thank you very much for your insightful comments. Please find our responses as follows.

A1□Current research on prediction and early warning of urban waterlogging disaster is mainly based on physically based models, statistical methods and data-driven models. The physically based models have the advantage of interpretability, but they have strong requirements on the data of urban underlying surface and rely on complicated calculation, and thus have difficulties in large-scale applications. Statistical methods have low requirements for urban underlying surface data, but the weight settings of each factor will greatly affect the final results. The framework proposed in this paper is based on the data-driven model, which takes the advantage of the machine learning methods and the availability of huge amount of sensor-generated data. Hossein et al. presented a flood simulation framework, which used a random forest classification model and a multilayer perceptron model to identify wet or dry nodes over the domain, then estimate river depth in wet nodes. The flood simulation framework cannot predict the depth of waterlogging in real time because it is based on different relative flow grades. Our framework is based on the data-driven model, which has fitted many years of real data and has a good performance in terms of prediction accuracy and calculation efficiency.

A2□The prediction strategies used in this paper are indeed commonly used strategies in time series forecasting. However, in this paper we focus on the evaluation of these strategies with respect to the problem of urban waterlogging prediction to shed light on which strategy is more applicable and can provide more accurate results. For example, in the literature "A review and comparison of strategies for multi-step ahead time series forecasting based on the NN5 forecasting competition", Ben Taieb et al. compared the performance of some common prediction strategies for the prediction of daily cash money withdrawal amounts at ATM machines. In their paper, the experiment results showed that the multi-step strategy achieved the best performance, while the Rec strategy achieved the worst performance. However, in the physical process of the change of waterlogging depth, the curve is monotonous, and therefore the Rec strategy is more adaptable.

A3□The 86.1% accuracy is the result of Rec prediction strategy. The multi-strategy here means that this framework includes the steps to select the optimal strategy, and the applicability of each prediction strategy is verified through multiple groups of experiments. The accuracy and principle of the optimal prediction strategy in the application of waterlogging prediction are explained. This is different from the concept of "coupling strategies" and does not mean that multiple strategies are combined into a new one. In

future studies, we will consider coupling different strategies, modes and algorithms to improve the framework.

A4□In the literature, the accuracy of some data-driven models is below 85% in 30-minute prediction. For example, Jing H et al. proposed a novel approach to measure urban waterlogging depth by Mask R-CNN. its accuracy rate can reach 80.52%(video) and 81.38%(image). However, since the experiment setting is not the same, this conclusion may not be accurate. We will modify the manuscript to clear the confusion.

Please also note the supplement to this comment:
https://nhess.copernicus.org/preprints/nhess-2022-36/nhess-2022-36-AC1-supplement.pdf