Reply on RC1_HESS Journal

Reviewer's comment	Reply
This manuscript explores the application of two widely known data-driven algorithms—XGBoost and LSTM—in both univariate and multivariate modes for daily and monthly inflow predictions at two key reservoirs in the Chao Phraya River Basin. The topic is timely and relevant in the context of AI-driven hydrological forecasting. However, the manuscript, in its current form, fails to meet the scientific standards and novelty threshold expected by Hydrology and Earth System Sciences. The work is largely confirmatory, methodologically simplistic, and lacks both theoretical depth and critical interpretation. It represents an incremental application of well-established techniques without significant advancement in methodology, theory, or hydrological insight. Below are my detailed comments:	Thank you very much for your insightful and helpful feedback on our manuscript. We appreciate your time scarification to carefully review our research work and provide detailed comments. We acknowledge the points raised regarding the scientific standards and novelty of our manuscript for Hydrology and Earth System Sciences. However, our study aimed to adopt modern AI-based techniques and integrate them with stochastic modeling concepts for hydrologic time series outlined in Salas, J.D., Delleur, J.W., Yevjevich, V., Lane, W.L., 1980. Applied Modelling of Hydrologic Time Series:Univariate And Multivariate Prediction, detailed in Chapter7: Multivariate Modelling of Hydrologic Time Series. We believe that the development of a hybrid approach that leverages the strengths of both data-driven AI incorporated with the inherent understanding of temporal dependencies in stochastic time series models offers novelty and valuable predictive option within this research area. Furthermore, recognizing that water resource systems with multiple reservoirs are often managed on a watershed basis, developing individual models for each reservoir's inflow in a complex system may not effectively support reservoir operators, particularly during critical events for rapid decision making. Therefore, our study proposes constructing a single prediction model to predict two outputs in the same watershed system by leveraging the capabilities of the LSTM algorithm. We understand your point that the application of XGBoost and LSTM algorithms in this context might appear largely confirmatory. Importantly, our intention is to share the concept of developing single model for multivariate prediction and compare its performance with the conventionally univariate model by adopting AI algorithms in a specific basin to explore the practical applicability and its predictive performances for watershed-based management support. However, we recognize that the current presentation may not adequately highlight specific challenges we encountered in this application.

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	We appreciate your feedback on the methodological simplicity. However, a key focus of our research is the integration of AI-driven techniques with a stochastic-based model for hydrological forecasting. Our selection of input features was carefully considered based on the physically-hydrological system and long-term time series data, aiming to capture the relevant hydrological phenomena in the basin. We believe this specific integration offers novelty in the area of hydrological prediction. For our revision or future work, we will certainly consider exploring more complex related methodologies and well-demonstrated algorithms. We recognize the importance of the theoretical depth and critical interpretation of our findings. For our revision, we will revisit and explore more on the existing literature and our results to provide a more in-depth discussion of the hydrological processes and the implications of our model predictive performance. We appreciate your feedback regarding insignificant advancement in methodology, theory, or hydrological insight. We are committed to explore more and to provide more profound hydrological insights based on our findings. Thank you again for your constructive criticism on our work. We are committed to revising the manuscript to meet the expectations of Hydrology and Earth System Sciences later.
1. Despite the claim of contributing to reservoir inflow forecasting through multivariate models, the study does not introduce any methodological innovation. The application of XGBoost and LSTM, both extensively used in hydrology, adds no novelty unless combined with a new model architecture, uncertainty treatment, explainability component, or integration with process-based models. The experimental setting is rudimentary, and the results primarily confirm what has already been established in dozens of prior studies. Moreover, the assertion that multivariate prediction of inflows has rarely been studied is not substantiated and contradicts recent literature. The references cited are selective and outdated, omitting more advanced hybrid or physics-informed ML approaches currently under development in the hydrological community.	We appreciate your detailed and critical feedback on our manuscript. We acknowledge your concerns regarding the methodological innovation and novelty of our work, as well as the experimental setup and literature review. However, we will address each of these points carefully in our response and revisions.
2. The manuscript fails to clearly define its scientific objectives or hypotheses. The rationale behind	We appreciate your feedback highlighting the lack of clearly defined scientific objectives,

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comparing univariate and multivariate approaches is weakly stated and not embedded in a theoretical or operational framework. The problem formulation is generic and reads more like a technical report than a scientific investigation.	hypotheses, and a strong rationale within a theoretical or operational framework. For our revision, we will clearly define scientific objectives, explicitly state the hypotheses and robust rational of our works. These focused efforts will be made to enhance the quality and scientific investigation of our work.
3. The literature review is overly descriptive and lacks synthesis. It resembles an annotated bibliography rather than a critical narrative. Foundational works on multivariate time series modeling, ensemble learning, recent benchmarks on hybrid models, and the emerging field of physics-informed ML in hydrology are all missing. Furthermore, no discussion is provided on model explainability, uncertainty quantification, or generalization capacity, all of which are central themes in the current hydrological ML research agenda.	We appreciate your detailed and critical feedback on our literature review. we will thoroughly revise to develop robust literature review and address these shortcomings comprehensively following your valuable feedback.
4. The methodology exhibits some critical flaws: - No hyperparameter optimization strategy is described beyond brute-force listing of combinations. - Feature selection is based solely on Pearson correlation, ignoring non-linear dependencies or mutual information approaches. - The study does not address overfitting or generalization. Despite LSTM being known for susceptibility to overfitting, no regularization, dropout, or model selection strategy is employed. - No benchmark model is used for reference, which is standard in HESS-level contributions.	We appreciate your critical feedback highlighting several important flaws in our methodology. We acknowledge the shortcomings regarding hyperparameter optimization, feature selection, the lack of measures to address overfitting and generalization, and the absence of a benchmark model. We recognize the significance of these issues and will thoroughly revise our methodology to strengthen our work.
5. The manuscript presents no discussion of data quality, treatment of missing values, stationarity, or outlier detection.	We appreciate your feedback pointing out the absence of any discussion regarding data quality, treatment of missing values, stationarity, or outlier detection in our manuscript. We acknowledge that these are critical aspects of hydrological data analysis and modeling, and their omission is a significant oversight. We will thoroughly address these points in our revised manuscript. In particular, we will add a section of data quality assessment covering data quality, treatment of missing values, stationarity analysis, and outlier detection.
6. The results section is overly descriptive, listing metrics without proper analysis or critical discussion. Additionally, the model performances reported are relatively modest, especially for monthly inflow prediction, yet are uncritically presented as acceptable.	We are thankful for your feedback pointing out that our results section is overly descriptive, lacking proper analysis and critical discussion, and that the relatively modest model performances, particularly for monthly inflow prediction, were presented uncritically. We acknowledge these valid concerns and will

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	thoroughly revise this section to address them carefully in our revision.
7. The discussion does not provide new hydrological or methodological insight. There is no exploration of why certain models perform better under given conditions, nor any effort to relate findings to hydrological processes. The difference in performance between the two dams, for instance, is acknowledged but not explained.	We appreciate your feedback pointing out the lack of new hydrological or methodological insight in our discussion, the absence of exploration into why certain models perform better under specific conditions, and the lack of connection to underlying hydrological processes. We also acknowledge that the performance differences between the two dams were not adequately explained. For our revision, we will strengthen these as significant limitations and will address them carefully.
8. The implications for operational decision-making—often emphasized in the introduction—are not convincingly revisited.	Thank you so much for your insightful feedback. Since the implications for operational decision-making, which we emphasized in the introduction, were not convincingly revisited in the later sections of the manuscript, particularly the discussion and conclusion. So, we acknowledge this oversight and will address it directly in our revision.
9. The conclusions are largely a restatement of the results, without any critical reflection or forward-looking perspective. The authors do not acknowledge the substantial limitations of their study—particularly the lack of generalization, interpretability, and robustness of the models.	We appreciate your feedback pointing out that our conclusions largely restate the results and lack critical reflection, a forward-looking perspective, an acknowledgment of the study's limitations, and robustness of the models. We recognize the importance of a more robust and insightful conclusion and will thoroughly revise this section corresponding to your detailed comments.
10. The manuscript suffers from structural repetition and verbosity. Some figures (e.g., radar plots) are poorly designed and do not enhance interpretability.	We appreciate your feedback regarding the structural repetition, verbosity, and the design of some figures. We acknowledge these shortcomings and will address them carefully in our revision. For the structural repetition and verbosity: we will thoroughly review the manuscript to erase any instances of unnecessary repetition. For figure design (e.g., radar plots): some figures, such as the radar plots, may not be effectively enhancing interpretability. We will redesign these figures with a focus on clarity and visual communication later.