# Review of: "Flood Prediction Using Artificial Neural Networks: A Case Study in Temerloh, Pahang"

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Potential competing interests: No potential competing interests to declare.

Reviewer comments:

1. The abstract is lengthy. Authors are encouraged to provide a more concise and clarified abstract.

2. In the Abstract section, “The correlation analysis found that stream flow and water level...”. Replace “correlation analysis” with “linear correlation analysis.”

3. In the Abstract section, “The temperature is inversely related to floods with a -0.28 correlation value.” The linear correlation between temperature and floods is weak, or it can even be considered that there is no linear correlation. Authors are encouraged to clarify this in the text.

4. On Page 3, “Traditionally, flood prediction is done by using a hydrological rainfall and runoff model. However, this modelling is not very efficient as it requires precise topography, and the data need to be collected from rain precipitation over a certain period. Recent developments in technology have introduced a few techniques which improve flood prediction. One of the developments is a physical-based model that has high effectiveness in simulating possible multiple flood scenarios, but the model requires collecting data over an extended period and its complex prediction technique has led to the method not being preferable by many.” Authors are encouraged to cite some parts of this text.

5. Upon conducting a quick search on Google Scholar, numerous articles utilizing machine learning, particularly artificial neural networks (ANN), for flood forecasting can be found. Here are some examples: https://ascelibrary.org/doi/abs/10.1061/(ASCE)HE.1943-5584.0000040 , https://iwaponline.com/wpt/article/16/4/1194/83059/Flood-forecasting-and-flood-flow-modeling-in-a, https://link.springer.com/article/10.1007/s00521-013-1443-6. Therefore, authors are encouraged to delineate the innovation of their work compared to existing literature.

6. Other machine learning methods and those based on probability theory (such as Extreme Value Theory) employing time series analysis are also available. Authors are encouraged to incorporate some of these into the literature review section.

7. In the flowchart, the partition technique employed is not highly recommended to mitigate overfitting. A commonly used approach is cross-validation, where the partition involves three subsets: training, testing, and validation. Authors are encouraged to verify this.

9. In the Model development section, authors are encouraged to provide a brief mathematical description of the ANN model.

10. Authors are encouraged to provide a brief description (may be in a table) of performance evaluation measures such as: F1, RMSE, MSE, ROC, confusion matrix.

11. In the Data Pre-processing section, authors are encouraged to clarify the following: What type of data is being used? Is it time series data? What are the dimensions of the data? How is the process of defining model inputs conducted?

12. Floods are typically subject to temporal variation. Is the time factor disregarded in the modeling process, treating it solely as a classification problem? Authors are encouraged to consider all of these matters.

13. Authors are encouraged to present a descriptive analysis of the data.

14. “The neural network is constructed to have one input layer, two hidden layers with six neurons in each layer, and one output layer to balance between the model complexity and the process time and required machine capacity.” Which activation function is used? Authors are encouraged to clarify why they are considering these parameters. Have they employed any selection criteria? It is worth noting that the performance of machine learning models depends on the selection of their parameters.

15. In the results and discussion section. “The rainfall, water level, streamflow, and weather attributes are the inputs, while flood is the target variable for the experiment”. How are these entries managed? Are they treated as time series data? As mentioned earlier, it would be beneficial for the authors to provide clarification on this matter. Considering them as time series enables the assessment of return time in forecasting, which is crucial for decision-making.

16. In the results and discussion section. “Since the dataset is relatively small, the Holdout method is used to avoid overfitting, where the data is randomly split into training and testing sets numerous times...”. I find this reason unconvincing. When dealing with a relatively small dataset, regardless of the technique used, the model is prone to overfitting. In such cases, it is not advisable to apply an ANN model to limited data. For instance, Figure 3 suggests a potential overfitting scenario. It can be observed that for n>20 (n-epochs), the loss function for both the training and test data almost aligns, indicating that the model may have memorized the parameters. The expected behavior would be for the loss function to decrease, as it does initially. However, after a certain point, it should be expected that the loss function for the test set increases while continuing to decrease for the training set.

17. In the Results and Discussion section, authors are encouraged to include a discussion of the findings, such as validating the study and comparing it with other studies of similar nature. Currently, the authors only present the results without further discussion.