

A review for “Deep Learning for Bifurcation Detection: Extending Early Warning Signals to Dynamical Systems with Coloured Noise”

The aim of the article is to train a deep learning (DL) model using time series generated based on the normal forms of bifurcations, and to apply it for the early detection of tipping points. The study also evaluates the generalization capability and practical applicability of the model under conditions of white and coloured noise.

Suggested improvements to enhance the article:

1. A related work section should be included. It is necessary to provide an overview of how other scientific works have approached this problem and what results have been obtained.
2. In the implementation of the method, a CNN-LSTM architecture is used. However, no specific information is provided about the overall architecture. Although the architecture is illustrated in Figure 5, the article does not describe how optimal hyperparameters were selected, or which LSTM architecture produced the best results.
3. It is unclear whether experiments were conducted on the variation in the number of input time series. If such experiments were performed, there is no information on how changes in the length of input time series affect the results.
4. Detailed information about the generated dataset is not provided. Although a classification problem is addressed, the number of classes is not clearly stated. It is necessary to provide specific details about the structure of each artificially generated dataset.
5. Experiments should also be conducted using only the LSTM architecture, and results should be compared with the CNN-LSTM combination to see how their performances differ.
6. The model should be evaluated by training it on 70% to 85% portions of the dataset. These experiments can help assess the model's stability and determine how much data is sufficient for learning. The issue of overfitting should also be tested.
7. The term "DL classifier" is used in the article, but no classification performance metrics have been evaluated in the experiments.
8. Including a Conclusions section in the article is recommended. Clear and specific conclusions should be formulated there.
9. ROC graphs are not included in the article. However, the abstract states that results were obtained.