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Geoscientific Model Development Discussions

Interactive comment on "ClimateLearn: A machine-learning approach for climate prediction using network measures" *by* Q. Y. Feng et al.

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1. *Clearly define the capabilities of the Climate Learn package.*

   Indeed, relatively few details on the structure of the software itself were provided. In the revised version of the paper, the capabilities of the `ClimateLearn` package and updates will be described in a new section 3.3.

2. *Clearly state the contributions of the authors, in relationship to the integrated Weka and ECJ packages. What is new? What exactly did the authors contribute?*

   The ECJ package and Weka have been used to derive the results. Keras is the

   source of neural networks, and gplearn is the source of genetic programming algorithms. Regarding ECJ and genetic programming, we build some novel important features, like parameter optimization. However, our most important contribution is a full python implementation of these methods as will be explained in the new section 3.3.

3. *Why do you include time, t, as one of your attributes? Please motivate.*

   We consider the development of an El Niño event is a time dependent process, thus we include time t as one of our attributes. This will be mentioned in the revised paper.

4. *Why did you select these two particular methods (ANN, GP) for this application (and for the toolbox)? Why are those two methods particularly suitable? Right now this approach seems fairly unmotivated. Would simpler - and more transparent - methods not be able to achieve similar improvements? In my experience, it is usually best to use the simplest method that does the job - and the two proposed methods are neither very simple, nor very transparent.*

   The two selected methods have been experimentally chosen. We tried other simpler methods within the toolbox, such as linear regression and decision trees, however, none of them gave satisfactory results. Genetic programming and artificial neural networks are indeed the simplest methods which can give the best performance for forecasting El Niño events. This will be mentioned in the revised paper.

5. *I am not completely convinced by the results you present, given that the sample size of predicted events is so small (3-4). Rather than using just*

one partition for training/ testing, why not use several partitions, i.e. once leaving early events, once leaving late events out of the training set, and see how well the system predicts any of those? Furthermore, I think a comparison to just using simpler regression/fitting/supervised learning methods on top of the CN measures would be in order to justify using the more complex methods.

The main purpose of forecasting the occurrence of El Niño events is to show that our toolbox can provide better results without subjective decisions like the choice of thresholds, which is the foundation of the prediction method provided by Ludescher et al. (2014). Therefore, we keep using the same dataset over the same period, the same prediction lead time τ, and the same chronological way of presenting results as in Ludescher et al. (2014). Cross validation and comparison with other learning methods indeed can show how well the system predicts, however, that is out of scope of this work. A remark on this will be made in the revised paper.

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