

Software bugs in previous papers – sources and solutions

On **March 2021**, Abambres found some bugs on his own ANN software, which had been used to yield ANN results for several papers published until that date, including this one. A not-so-severe bug was found in the definition of the 8th parametric sub-analysis, since it was not defined exactly as it was described in section “Parametric Analysis Results”. The critical bugs were found in non-ELM (non-Extreme Learning Machine) learning algorithms for "mini-batch" and "online" training modes, and unintendedly caused the “% Train - Valid - Test” ANN feature to become “100 - 0 - 0” during neural net design, thus affecting the generalization potential of the proposed ANN. The bug sources were the following:

- "trainlm", "traingd" and "traingda" training functions do not allow incremental (online or mini-batch) training when using MATLAB neural network toolbox – regardless the data format employed in *train(...)* arguments, only batch training will be used.
- if *net.divideMode* is not specified when using MATLAB neural net toolbox, the default value for feedforward ANNs is 'sample'. However, the implemented data division (train / valid / test) for incremental training uses timestep (instead of sample) indexes, which means the assignment *net.divideMode = 'time'* was missing right before *net.divideFcn = 'divideind'*.

In order to overcome the above cited issues, Abambres first explored MATLAB's training functions that are said to allow incremental training, but found several limitations (reported in [here https://archive.ph/r6Yw3](https://archive.ph/r6Yw3) and [here https://archive.ph/HsaC6](https://archive.ph/HsaC6)). Thus, Abambres' final decision was to redefine the ANN parametric analysis in order to (i) remove all incremental non-ELM learning algorithms, and (ii) increase the ELM-based simulations while improving their cross-validation.

Miguel Abambres

Final Note

For personal and professional reasons, I have decided not to write/publish (pro-bono) the new version of this paper for the results obtained with the debugged ANN software, even though the former were pretty satisfactory.

Miguel Abambres