

Dynamic Evolving Neuro-Fuzzy Inference System (DENFIS): Online learning and Application for Time-Series Prediction

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Abstract – Dynamic Evolving Neuro-Fuzzy Inference System, proposed by Song and Kasabov (2002) is used to perform the prediction of the reduced NN3 time-series prediction datasets.

I. INTRODUCTION

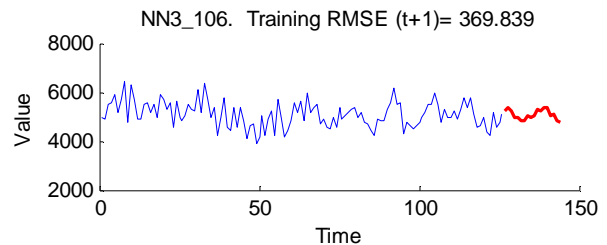
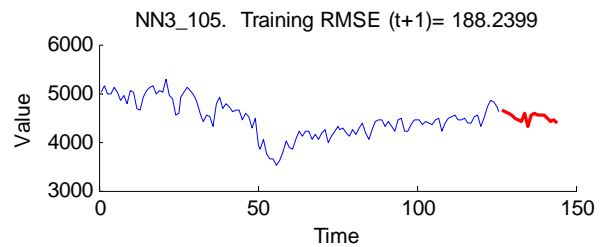
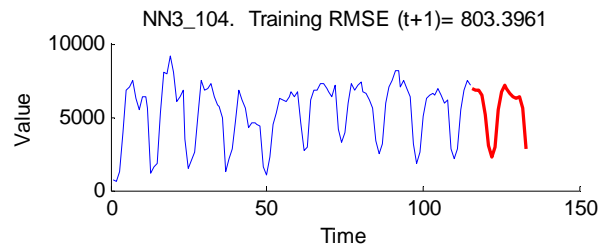
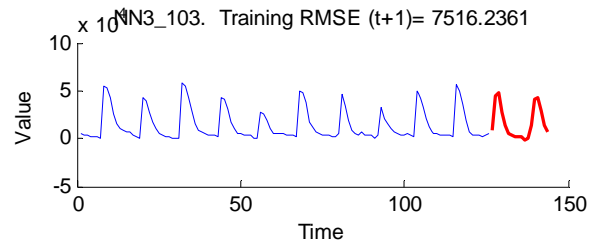
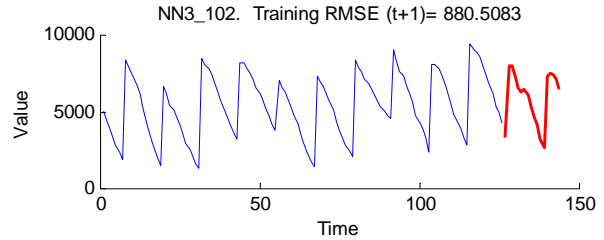
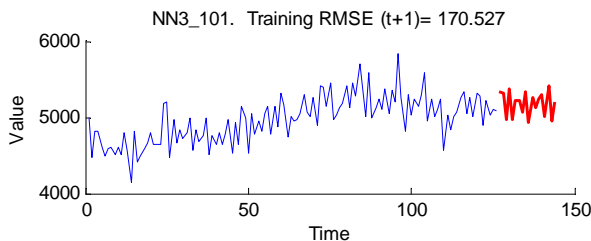
DENFIS [1,2] evolve through incremental, hybrid (supervised/unsupervised), learning and accommodate new input data, including new features, new classes, etc. through local element tuning. New fuzzy rules are created and updated during the operation of the system. At each time moment the output of DENFIS is calculated through a fuzzy inference system based on m -most activated fuzzy rules which are dynamically chosen from a fuzzy rule set. An approach is proposed for a dynamic creation of a first order Takagi-Sugeno type fuzzy rule set for the DENFIS model. The fuzzy rules can be inserted into DENFIS before, or during its learning process, and the rules can also be extracted from DENFIS during, or after its learning process. An evolving clustering method (ECM[2]), which is employed in the DENFIS model, is also introduced. It is demonstrated that DENFIS can effectively learn complex temporal sequences in an adaptive way and outperform some existing models.

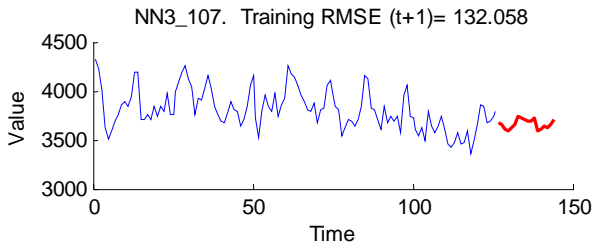
II. DATA PREPARATION

We have decided to use t to $t-11$ as the input (12 columns) to predict the future values. 18 DENFIS models were derived from 18 datasets, one for each future time point using the t to $t-11$ as input and $(t+1$ to $t+18)$ as output.

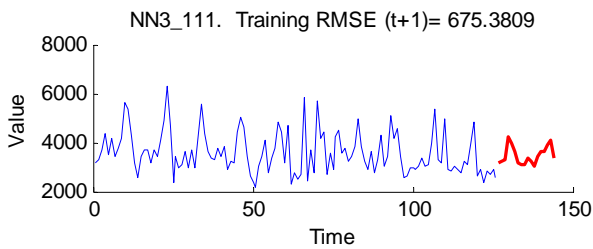
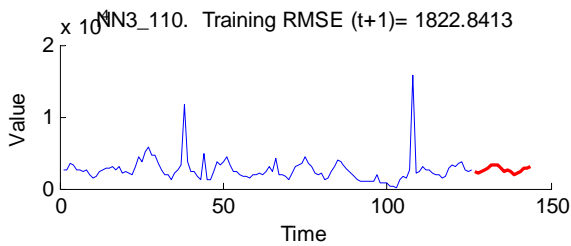
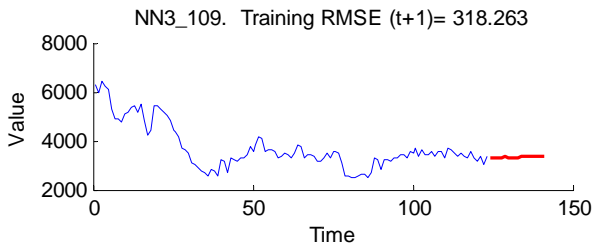
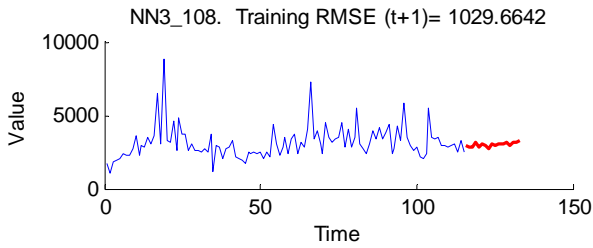
III. RESULTS

The training RMSE in for $t+1$ prediction in all data and the prediction value plots are shown below: (Blue line = training data. Red line = predicted values for $t+1$ to $t+18$)





[2] Song, Q., and Kasabov, N., Dynamic Evolving Neuro-Fuzzy Inference System (DENFIS): On-Line Learning and Application for Time-Series Prediction Proceedings of the 6th International Conference on Soft Computing, October 1-4, 2000, Iizuka, Japan, 696-702



IV. CONCLUSION

We have used DENFIS as proposed by Song and Kasabov (2002) for these predictions. The training error was low on majority of datasets with the exception of dataset NN3_103, NN3_108 and NN3_110.

V. REFERENCE

[1] Kasabov, N., and Song, Q., DENFIS: Dynamic Evolving Neural-Fuzzy Inference System and its Application for Time Series Prediction, IEEE Transactions on Fuzzy Systems, vol. 10, no.2, April, (2002) 144-154.