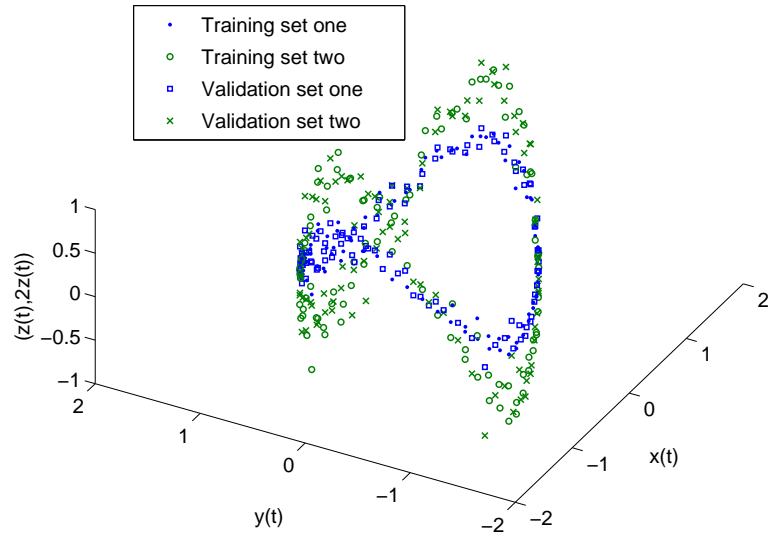
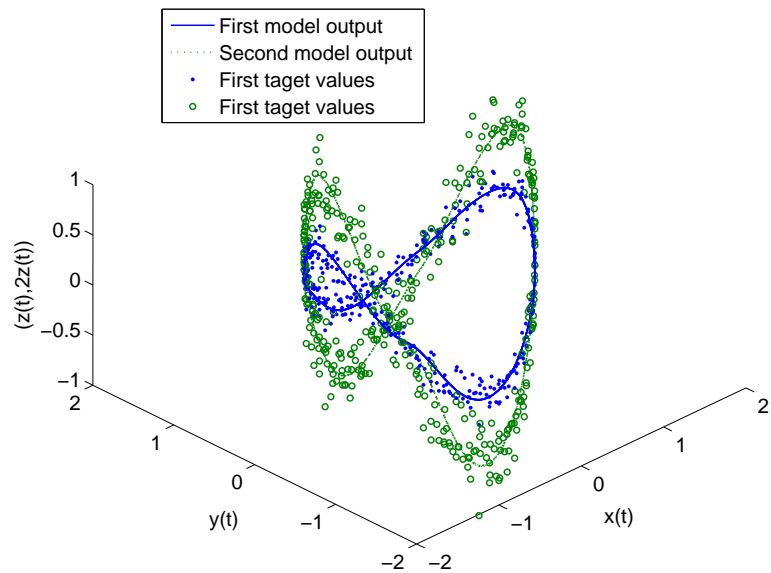

Supplement to “Modeling Multivariate Time Series on Manifolds with Skew Radial Basis Functions” by Arta A. Jamshidi and Michael J. Kirby, *Neural Computation* Vol. 23, No. 1 (January 2011), pp. 97–123.

URL: http://www.mitpressjournals.org/doi/abs/10.1162/NECO_a_00060

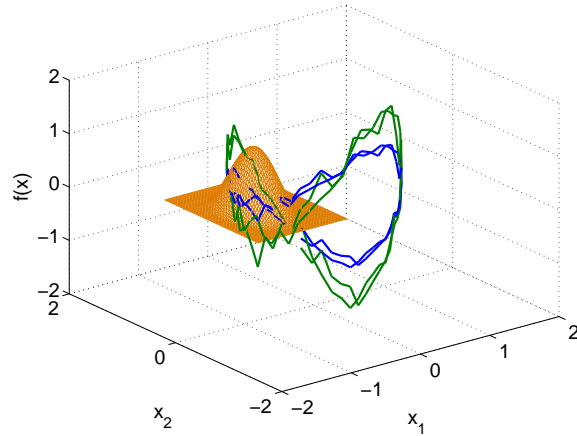


(a) Plots of the training and validation data sets for multivariate Pringle data set.

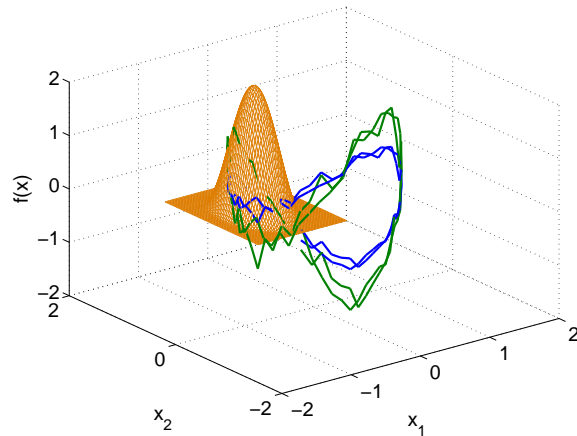


(b) The testing data set and the output of the four mode model.

Figure 1: The training, validation and testing data sets and the output of the multivariate algorithm on multivariate Pringle data set.

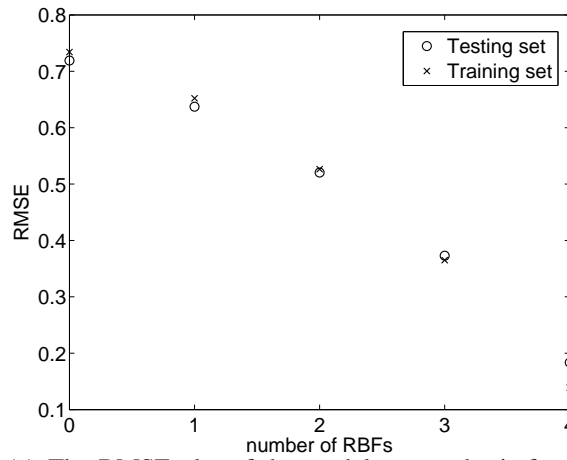


(a) The first RBF in relation with the training data set for the first time series.

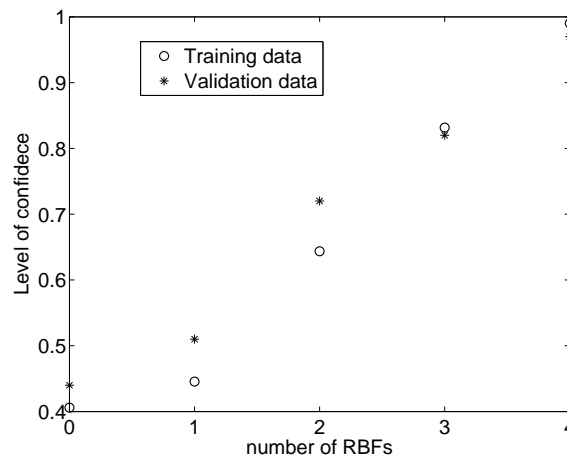


(b) The first RBF in relation with the training data set for the second time series.

Figure 2: The first RBF allocated by the algorithm for the case where $m = 2$. Hanning RBF was used in this fit. The residuals of the four mode model pass the IID test.



(a) The RMSE plot of the model as new basis functions are added. The training stops after four basis functions have been added since the confidence level (see graph (b) below) of the hypothesis test exceeds 95%.



(b) The confidence level of the fitted model on the training (circles) and the validation (stars) data sets as the new basis functions are added to the model.

Figure 3: The performance of the multivariate RBF algorithm as basis functions are added. Both the RMSE error and the confidence level of the IID hypothesis test are shown. The raw data set used in this example is the multivariate pringle as shown in Figure 1.

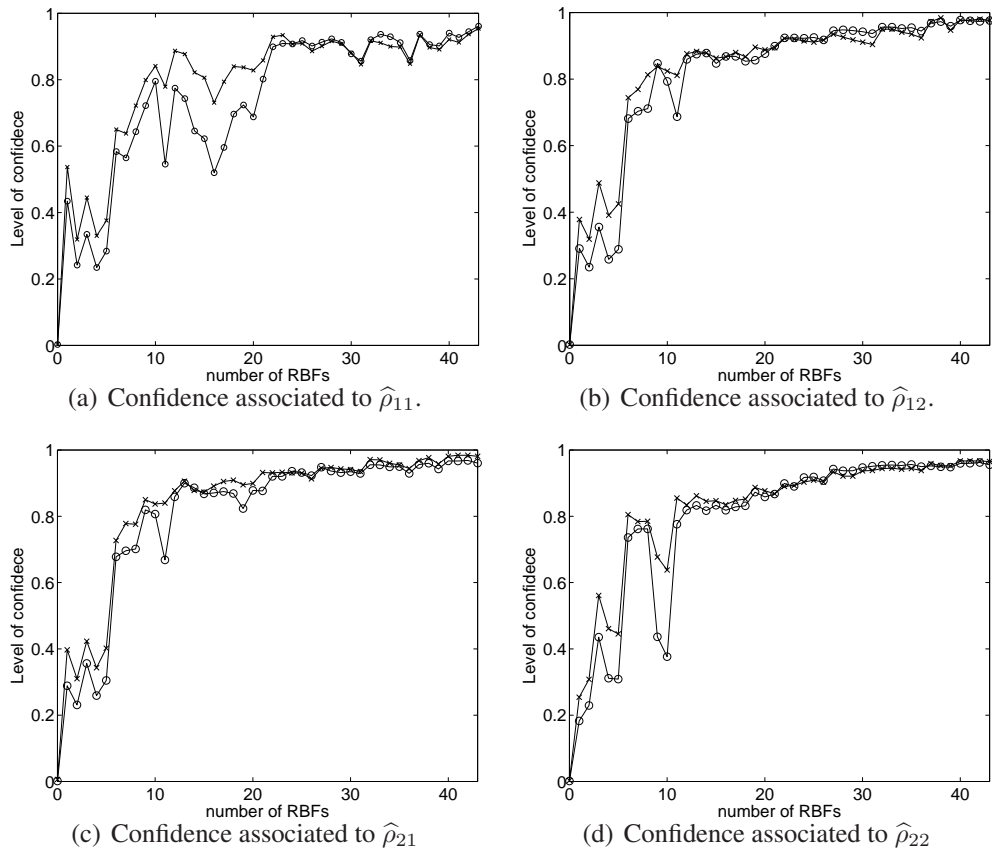
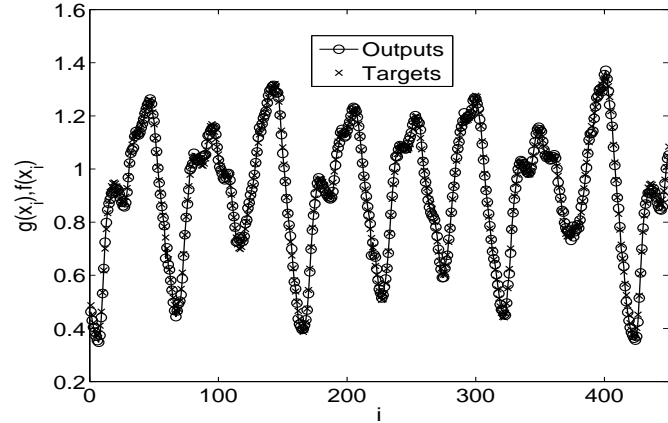
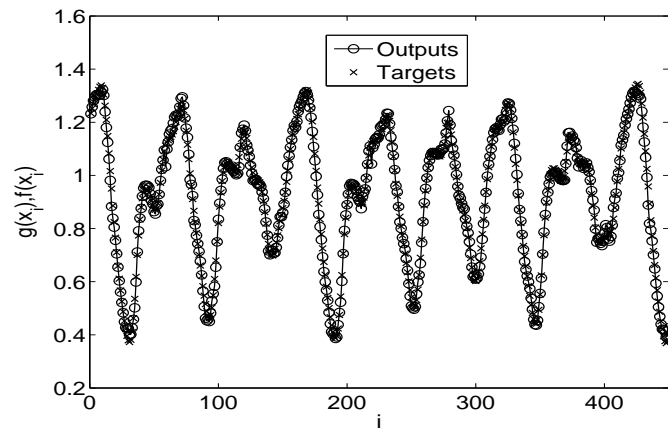


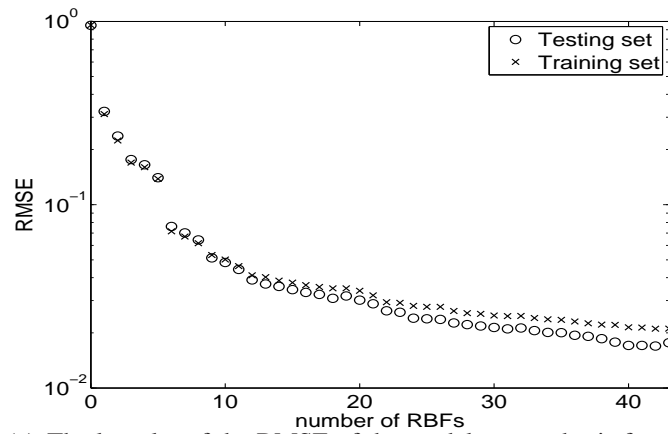
Figure 4: The confidence levels of the multivariate model as the new Arctan-Hanning sRBFs are added to the model for the case of 25-50 steps ahead prediction of noisy Mackey-Glass data set.



(a) Time evolution of the first component of the model output forecasting 25 steps ahead.



(b) Time evolution of the second component of the model output forecasting 50 steps ahead.



(c) The log plot of the RMSE of the model as new basis functions are added to the model.

Figure 5: The performance and the output of the two-variate sRBF fit for the case of 25-50 steps ahead prediction of noisy Mackey-Glass data set.