TIME SERIES PREDICTION USING LOCAL MODELLING: A COMPARISON OF DIFFERENT APPROACHES

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Predicting the future evolution of dynamical systems is a major goal in many areas of science. Often the underlying dynamical equations are unknown and only a single-channel time series is available. If the time series originates from a deterministic dynamical system, prediction methodologies based on embedding and attractor reconstruction using local statistical models constructed from the data are well-established. A variety of approaches for building local models from data has been proposed: local polynomial models based on nearest neighbours and radial basis function models. More recent additions include the quite general and flexible framework of cluster-weighted modelling also referred to as probabilistic network [1] and adaptive local polynomial models [2].

The present study compares/contrasts all these different approaches both on known mathematical systems and on real observations including measurements from an electronic circuit. Both best guess and probabilistic prediction is considered.

[1] Gershenfeld N. A., Schoner B., Metois E., 1999: Cluster-weighted modeling for time series prediction and characterization, Nature 397, 329-332.

[2] Kwasniok F., Smith L. A., 2004: Real-time construction of optimized predictors from data streams, Physical Review Letters, in revision.