# Mutual Information Based Input Variable Selection Algorithm and Wavelet Neural Network for Time Series Prediction

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**Abstract.** In this paper we have presented an Integrated Wavelet Neural Network (WNN) model and Mutual Information (MI)-based input selection algorithm for time series prediction. Based on MI the proper input variables, which describe the time series' dynamics properly, will be selected. The WNN Prediction model uses selected variables and predicts the future. This model utilized for time series prediction benchmark in NN3 competition and sunspot data. Comprehensive results show that integrated Mutual information based input variable selection algorithm and wavelet network based prediction model, which uses selected variable from lagged value, outperforms other models in prediction of time series.

## 1 Introduction

Predicting the future in chaotic, high dimensional and nonlinear dynamic systems is a complicated task and needs a lot of efforts [1,2]. To do an efficient prediction, it is necessary to develop advanced algorithms and prediction models. One way, to have a good prediction model in high dimensional and complicated problems, is providing proper data. To do this, relevant variables from input data set must be selected. Relevant input variables selection is one of the most important problems in modeling and prediction tasks. The objectives of input selection algorithms are finding a subset of inputs from original input dataset, which describe system dynamics properly [2,3]. In the prediction tasks proper inputs means selecting the most valuable variables from high dimensional input variables which have maximum dependency with prediction variable and have minimum redundancy. Ding and Peng [4] presented a feature selection algorithm based on minimum redundancy. Peng et al. [5] proposed max-dependency, max-relevance, and min-redundancy criteria and used first order feature selection algorithm for variable Selection. Yousefi et al.[1] presented greedy input selection algorithm for feature selection and used LLNF (Local Linear Neuro Fuzzy) Model for time series prediction. Vahabei et al. [6] used greedy input selection algorithm and LLNF for load forecasting. The LLNF model as general function approximator can be used as a general framework to predict the main patterns of the time series due its great performance in prediction of nonlinear and chaotic time series[1].

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