

# **A Comparison of Support Vector Machines and Artificial Neural Networks in Chaotic Hydrological Time Series Forecasting**

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Machine learning techniques are becoming very popular in time series prediction in many different areas over the conventional prediction approaches. Artificial Neural Networks (ANN) has been in practice for about 2 decades now whereas Support Vector Machines (SVM) came into practice only about 6-8 years ago. Many advantages of SVM over ANN from theoretical point of view have been listed in many references. However, more details are of interest to practicing engineers. For example, it is now known that ANN's convergence to local optima is not a practical issue, since these local optima are found to be close to optimal solutions most of the time. This paper compares ANN and SVM with respect to: (1) prediction accuracy and (2) computational time and effort needed to tune the model parameters. In this study, a noise added chaotic Lorenz time series (of 5% noise level; where noise level is the ratio of standard deviation of noise to standard deviation of noise free series signal), and a mean daily Mississippi River flow time series (measured at Vicksburg) are used. Multilayer perceptron (MLP) models are used for ANN predictions. It has been shown that the values suggested in literature for SVM model parameters do not necessarily provide best predictions. Therefore, a micro – Genetic algorithm is used to find optimal SVM parameters. Comparison between the two methods for prediction accuracies and the computational times showed that (1) both techniques are equally effective in prediction performance, and (2) the computational times are also comparable. For a given set of model parameters SVM is faster than ANN. However, good prediction accuracies require a search for optimal parameters. ANN requires time to determine its optimal architecture and other parameters (e.g. number of neurons, epochs etc.) while SVM requires tuning of its model parameters for optimal performance. Study shows that the total computational effort does not differ significantly between the two methods. It is observed that with large data record (a few hundreds or more) the prediction accuracy and computational effort of both ANN and SVM are similar.