CC PUB #243

May 1998

Nonparametric Time Series Prediction Through Adaptive Model Selection

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Abstract

We consider the problem of one-step ahead prediction for time series generated by an underlying stationary stochastic process obeying the condition of absolute regularity, describing the mixing nature of process. We make use of recent results from the theory of empirical processes, and adapt the uniform convergence framework of Vapnik and Chervonenkis to the problem of time series prediction, obtaining finite sample bounds. Furthermore, by allowing both the model complexity and memory size to be adaptively determined by the data, we derive non-parametric rates of convergence through an extension of the method of structural risk minimization suggested by Vapnik. All our results are derived for general L_p error measures, and apply to both exponentially as well as algebraically mixing processes.