

# 『清华信息大讲堂』2008 年第 7 讲（总第 26 讲）

报告题目: **Nonlinear Models in Time Series  
and Dimension Reduction**

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时间: **2008年11月13日（周四） 2:00pm-3:00pm**  
地点: **中主楼 511**

## **Abstract:**

Linear models have played a significant role in statistic analysis. Examples include principal component analysis in dimension reduction and autoregressive and moving average models in time series. I will talk about nonlinear alternatives/improvements to them. There are two components:

1. I introduce a nonlinear time series model. The key idea is to fit a model via penalization, where the penalty term is an unbiased estimator of the integrated hessian of the underlying function. Such a Hessian based penalty term is novel in nonparametric methodology. The underlying model assumption is very general: it has hessian almost everywhere in its domain. Numerical experiments demonstrate that our model has better predictive power: if the underlying model complies with an existing parametric / semiparametric form (e.g., a threshold autoregressive model (TAR), an additive autoregressive model (AAR), or a functional coefficient autoregressive model (FAR)), our model performs comparably; if the underlying model does not comply with any pre-existing form, our model performs better in near all simulations.
2. I describe how a nonlinear underlying surface (in particular, a compact manifold) can be uncovered via numerical methods. A matrix perturbation analysis is carried out to derive its convergence property and rate of convergence.

The potential applications in financial time series (e.g., electricity prices in U.S.) will be discussed.

## **Biography:**

Professor Huo received a B.S. degree in mathematics from the University of Science and Technology, Heifei, China, in 1993 and the M.S. degree in electrical engineering and the Ph.D. degree in statistics from Stanford University, Stanford, CA, in 1997 and 1999, respectively. He is an Associate Professor with the School of Industrial and Systems Engineering, Georgia Institute of Technology, Atlanta. His research interests include dimension reduction and nonlinear methods. Dr. Huo represented China and received first prize in the Thirtieth International Mathematical Olympiad (IMO), which was held in Braunschweig, Germany, in 1989. He is an IEEE senior member, won Georgia Tech Sigma Xi Young Faculty Award in 2005, and was interviewed by Emerging Research Fronts.