## **ISCI Seminar Series 2006**

## On Multifractal Property of Joint Distributions and Its Application to Bayesian network Inference

Bayesian Belief Network (BBN) is the currently dominant method for reasoning under uncertainty in Artificial Intelligence. Inferences with BBNs are either optimization, or marginalization, or both on the joint probability space.

We demonstrate that the joint probability distribution of a BBN is a multifractal in its most general form - a random multinomial multifractal. With sufficient asymmetry in individual prior and conditional probability distributions, the joint distribution is not only highly skewed, but also stochastically self-similar and has clusters of high-probability instantiations at all scales. Inspired by the multifractal properties, a sampling-and-search algorithm for finding the Most Probable Explanation (MPE) in BBN is developed and tested. The experimental result shows that these multifractal properties provide good heuristic for solving the NP-hard MPE problem.

Speaker: Dr. Hai-Peng Guo Time: 2:00 pm - 4:00 pm, Oct. 12th(Thursday), 2006 Venue: A103, LiZe Building

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