

Title:

The interplay between Estimation Theory and Information Theory

Speaker:

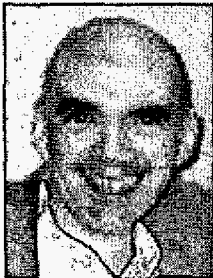
Sergio Verdu, Princeton University

Abstract:

For signals observed in Gaussian noise, there are several interesting intersections between information theory and linear and nonlinear minimum mean-square error (MMSE) estimation.

We unveil a new relationship between the input-output mutual information and the MMSE achievable by the optimal estimator of the input. This relationship holds for arbitrarily distributed scalar and vector signals, as well as for discrete-time and continuous-time noncausal MMSE estimation (smoothing).

We will also focus on two applications of these information theoretic results: the mercury/waterfilling formula for power allocation with arbitrary input constellations; and a universal continuous-time nonlinear filtering formula that couples the signal-to-noise ratios achievable by smoothing and filtering.

Biography:

Sergio Verdu was born in Barcelona, Catalonia, Spain, on August 15, 1958. He received the telecommunications engineering degree from the Polytechnic University of Barcelona, Barcelona, Spain, in 1980 and the Ph.D. degree in electrical engineering from the University of Illinois at Urbana-Champaign in 1984.

He is a Professor of Electrical Engineering, Princeton University, Princeton, NJ. He has held visiting appointments at the Australian National University, the Technion-Israel Institute of Technology, the University of Tokyo, the University of California, Berkeley, and the Mathematical Sciences Research Institute, Berkeley. He is the author of *Multiuser Detection* (Cambridge, U.K.: Cambridge University Press, 1998).

Prof. Verdu is a recipient of several paper awards including the IEEE Donald Fink Paper Award, a Golden Jubilee Paper Award from the Information Theory Society, the 1998 Information Theory Society Paper Award, and the 2002 Leonard G. Abraham Prize Award from the IEEE Communications Society. He also received a Millennium Medal from the IEEE and the 2000 Frederick E. Terman Award from the American Society for Engineering Education. He served on the Board of Governors of the Information Theory Society from 1989 to 1999, and was President of the Society in 1997. In addition to organizing several IEEE Workshops on Information Theory, he was Co-Chair of the Program Committee of the 1998

IEEE International Symposium on Information Theory, and Co-Chair of the 2000 IEEE International Symposium on Information Theory. He served as an Associate Editor for Shannon Theory of the IEEE Transactions on Information Theory. He served as Guest Editor of the 1998 Special Commemorative Issue of the IEEE Transactions on Information Theory, reprinted as the IEEE Press volume *Information Theory: Fifty Years of Discovery*. He is currently Editor-in-Chief of *Foundations and Trends in Communications and Information Theory*.