Tyrone E. Duncan
The University of Kansas
E-mail: duncan@math.ku.edu

Mutual Information and Estimation

Mutual information is a basic quantity in information theory that also has applications in a number of other areas. Two calculations associated with mutual information are expressed in terms of two different estimation errors. The mutual information for a stochastic signal and an observation of this signal with noise for two distinct models is expressed as a filtering error. Furthermore, the rate of change of the mutual information with respect to a parameter that scales the signal is expressed as a smoothing error. This latter computation uses some methods from Malliavin calculus. One model of the observation of the signal is a sum of a stochastic signal and a fractional Brownian motion. The two results about the mutual information are obtained for all values of the Hurst parameter which indexes the family of fractional Brownian motions. The second model of the observation of the signal is a discontinuous Levy process where the rate parameter is a function of the signal.