Information Geometric Nonlinear Filtering: a Hilbert Approach

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Nonlinear filtering is a branch of Bayesian estimation in which a "signal" process is progressively estimated from the history of a related "observations" process. Nonlinear filters are typically expressed in terms of stochastic differential equations for the posterior distribution of the signal, which is nearly always of infinite-dimension (in the sense that it cannot be represented by a finite number of statistics). The natural "state space" for a nonlinear filter is a suitably rich family of probability measures having an appropriate topology, and the statistical manifolds of Information Geometry are obvious candidates.

The talk will outline recent results on Hilbert manifold representations for nonlinear filters, concentrating on their information-theoretic properties. Finite-dimensional filters, and their role in approximation, will be briefly discussed.