BISP8

Eighth Workshop on
BAYESIAN INFERENCE IN STOCHASTIC PROCESSES

Predictive characterization of priors for Bayesian inference for Markov exchangeable processes

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Bayesian inference for Markov chains, or for Markov exchangeable processes, has been greatly developing in the recent years. Perhaps the most powerful constructions of priors for Markov exchangeable processes are based on predictive characterizations, that is, the prior on the unknown transition matrix is characterized by the sequence of predictive distributions. These results rely on the seminal work by Diaconis and Freedman (1980) who gave a de Finetti-type representation theorem showing that recurrent Markov exchangeable probability laws can be represented as mixtures of Markov chains.

While the predictive approach is attractive and powerful, it is generally not easy to establish whether a given predictive rule defines a Markov exchangeable probability measure for a sequence of random variables.
In this work, we give conditions on the sequence of predictive distributions that are sufficient and necessary for defining a recurrent, Markov exchangeable probability law for the observable process.

We illustrate their application in several examples, including reinforced urn schemes for defining nonparametric priors for conditional Markov chains and for Bayesian inference in hidden Markov models.

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