
**BISP8**

**Eighth Workshop on**
**BAYESIAN INFERENCE IN STOCHASTIC PROCESSES**

# Bayesian inference in stochastic partial differential equations and Gaussian process regression problems using infinite-dimensional Kalman filtering

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Stochastic equations that describe the evolution of a multi-dimensional random field in time are useful models in many applications, such as in fMRI brain imaging or weather prediction. We demonstrate how certain types of stochastic partial differential equations and Gaussian process regression problems can be directly converted into infinite-dimensional state space models. The reasoning for doing this is the appealing linear complexity in the number of temporal observations, which makes infinite-dimensional Kalman filtering an efficient choice for inference in this type of problems. We present how this is done in practice and illustrate the approach with examples.

**Keywords:**
spatio-temporal random field; stochastic partial differential equation; Kalman filter; Gaussian process regression.

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