

# **A particle filter approach to Bayesian sequential design with a focus on model discrimination**

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## **Abstract**

A particle filter algorithm will be presented that can be used for Bayesian sequential design in the presence of model and parameter uncertainty. Our focus is on sequential design for model discrimination but the algorithm can also be applied when one has different design objectives. Particle filters are run in parallel for each model and the algorithm relies on a convenient estimator of the marginal likelihood of each model. Approximating posterior model probabilities in this way allows us to use, for example, model discrimination utilities derived from information theory that were previously difficult to compute for all but the simplest of models. The development and extension of such utilities for implementation in continuous data settings will be discussed. We motivate our research by the application of sequential design to a number of real world examples where a number of rival nonlinear models are contemplated.

**Keywords:** Optimal design; Sequential Monte Carlo; Utility functions.