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Particle-based online estimation of tangent filters with application to parameter estimation in nonlinear state-space models

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Abstract

This paper presents a novel algorithm for efficient online estimation of the filter derivatives in general hidden Markov models. The algorithm, which has a linear computational complexity and very limited memory requirements, is furnished with a number of convergence results, including a central limit theorem with an asymptotic variance that can be shown to be uniformly bounded in time. Using the proposed filter derivative estimator, we design a recursive maximum likelihood algorithm updating the parameters according the gradient of the one-step predictor log-likelihood. The efficiency of this online parameter estimation scheme is illustrated in a simulation study.

Keywords Parameter estimation · Recursive maximum likelihood · State-space models · Tangent filter · Sequential Monte Carlo methods · Central limit theorem · Particle filters

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