

Speaker: Kari Heine (University of Bath)

Date: 27/02/2026 at 13:15 in 4 West 1.7 (Wolfson Lecture Theatre)

Title: Augmented Island Resampling Particle Filter for Particle MCMC

Abstract:

The ability to carry out computations in parallel is paramount to efficient implementations of computationally intensive algorithms. We investigate the applicability of the Augmented Island Resampling Particle Filter (AIRPF) - an algorithm designed for parallel computing - to particle Markov Chain Monte Carlo (PMCMC), and show that it produces a non-negative, unbiased estimator of the marginal likelihood making it suitable for PMCMC. Moreover, we extend the stability results previously shown for the so-called α SMC algorithm to cover AIRPF. As a corollary, the error of AIRPF can be bounded uniformly in time by controlling the effective number of filters, which is a diagnostic analogous to the effective sample size. Such control can be implemented by adaptively constraining the interactions between the parallel filters. We demonstrate the superiority of AIRPF over independent Bootstrap Particle Filters, not only numerically, but also theoretically. In this context, we extend the previously proposed collision analysis approach to derive an explicit expression for the variance of the marginal likelihood estimate, and establish an unexpected connection between the filter network topology and the marginal likelihood variance in terms of Fibonacci sequence.