ALEXANDRE BOUCHARD, University of British Columbia

Approximation of intractable integrals using non-reversibility and non-linear distribution paths

In the first part of the talk, I will present an adaptive, non-reversible Parallel Tempering (PT) allowing MCMC exploration of challenging problems such as single cell phylogenetic trees. A sharp divide emerges in the behaviour and performance of reversible versus non-reversible PT schemes: the performance of the former eventually collapses as the number of parallel cores used increases whereas non-reversible benefits from arbitrarily many available parallel cores. These theoretical results are exploited to develop an adaptive scheme to efficiently optimize over annealing schedules.

In the second half, I will talk about the global communication barrier, a fundamental limit shared by both reversible and non-reversible PT methods, and on our recent work that leverage non-linear annealing paths to provably and practically break that barrier.

My group is also interested in making these advanced non-reversible Monte Carlo methods easily available to data scientists. To do so, we have designed a Bayesian modelling language to perform inference over arbitrary data types using non-reversible, highly parallel algorithms.

References:

- Non-Reversible Parallel Tempering: a Scalable Highly Parallel MCMC Scheme. Saifuddin Syed, Alexandre Bouchard-Côté, George Deligiannidis, Arnaud Doucet. https://arxiv.org/pdf/1905.02939.pdf

- Software: https://www.stat.ubc.ca/ bouchard/blang/