Technische Universität Braunschweig

Vortrag im Gästeprogramm des GRK 2075

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Transport maps for Bayesian computation

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Institut für Statik, Seminarraum
Beethovenstrasse 51, 38106 Braunschweig

This lecture will discuss how deterministic couplings of probability measures, induced by transport maps, can enable useful new approaches to Bayesian computation. In particular, we will describe variational inference methods that construct a deterministic transport map from a reference distribution to the posterior, without resorting to MCMC. Independent and unweighted samples can then be obtained by pushing forward reference samples through the map. Making this approach efficient in high dimensions, however, requires identifying and exploiting low-dimensional structure. We will present new results relating the sparsity and decomposability of transports to the conditional independence structure of the target distribution. We will also describe conditions, common in inverse problems, under which transport maps have a particular low-rank structure. In general, these properties of transports can yield more efficient algorithms. As a particular example, we propose new variational algorithms for online inference in nonlinear and non-Gaussian state-space models with static parameters. These algorithms implicitly characterize---via a transport map---the full posterior distribution of the sequential inference problem using only local operations, while avoiding importance sampling or resampling. Other illustrative applications in the lecture will involve spatial statistics and partial differential equations.

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