Department of Decision Sciences

Statistics Seminar

Nonparametric credible sets

Aad van der Vaart
Leiden University

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Abstract

In the past decades Bayesian nonparametric methods have developed into a success story, first in practice and in the last ten years also backed up by theory. The theory mostly concerned contraction rates of posterior distributions in a frequentist-Bayes framework, where the Bayesian model defines the posterior distribution, but the data are assumed to have been generated from a fixed distribution. The general highlight is that posterior distributions in nonparametric problems such as density or regression function estimation can contract to a given truth at the frequentist optimal rate of recovery. A hierarchical Bayesian framework can even deliver this when the regularity of the parameter is unknown (so-called adaptation). A question is whether there are equally comforting conclusions about uncertainty quantification through a nonparametric posterior distribution. Is the spread in the posterior (or the lack of spread), possibly measured by a credible set, a good basis for expressing estimation error? Recent results show that Bayesian oversmoothing, by specifying a prior that models the parameters as more regular than it really is, can have disastrous consequences. The big question concerns the performance of hierarchical Bayesian procedures (or the closely related empirical Bayesian ones). The matter is complicated by the fact that non-Bayesian confidence sets also may run into trouble, not only in a philosophical sense, but in practice.

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Via Röntgen 1 - 20136Milano

Tel. 02 5836.5632
Fax 02 5836.5630