UiO : University of Oslo

Department of Mathematics
Section of Statistics and Biostatistics

Seminar Series in Statistics and Biostatistics

17.09.2018, 13:45 @ Seminar Room 819, Niels Henrik Abels hus, 8th floor

Geoff Nicholls: Calibrating approximate Bayes coverage

Abstract: Consider Bayesian inference and suppose the prior and likelihood are both exactly correct - that is, nature really does draw the parameter theta according to pi(theta) and the data y according to p(y|theta). If we make a Bayesian credible set C_y(alpha) of size 1-alpha from the posterior in the usual way then it covers the true value of the parameter theta with probability 1-alpha. In this ideal setting we have exact coverage. In a paper from 2004 with the snappy title "Getting it Right", Geweke uses this property to test an MCMC sampler targeting a given posterior distribution. By correct here we mean the Monte Carlo sampler is generating samples distributed according to the intended posterior distribution, so in the case of MCMC this means the algorithm is both correctly implemented and the "burn-in" is large enough to give representative samples from the target. The test is usually made in the non-parametric form suggested by Cook in 2006. This is not simply a test for MCMC stationarity but for the MCMC target distribution itself. Passing the test doesn't guarantee the samples have the correct distribution, just that we cannot detect any departure. However it seems in practice a fairly stringent check When we use Monte Carlo methods to fit complex models to large data sets we may need to make additional approximations. This may involve approximation of the likelihood as well as other alterations to the algorithm itself. The Monte Carlo is a black box taking as input data and returning as output samples distributed approximately according to the posterior. Recently several papers have suggested the Geweke test might be used to quantify the damage done by these additional approximations - can we detect a difference between the Monte Carlo output and the true target distribution? If not, that is surely a good thing. We review this recent work, and suggest some additional methods for quantifying the bias introduced by approximations made within Monte Carlo algorithms, focusing on calibrating the damage done to the exact Bayes coverage.

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Professor Geoff Nicholls, B.Sc. (Physics, Canterbury, New Zealand), MA, PhD (HEP, Cambridge, UK), teaches probability, statistics and applied mathematics. Geoff Nicholls joined the Statistics Department in 2005 from the Mathematics Department of the University of Auckland in New Zealand. Geoff took his BSc at the Physics Department of the University of Canterbury in Christchurch, New Zealand, and his PhD at Clare College, Cambridge, where he studied particle physics in the Department of Applied Mathematics and Theoretical Physics.

Geoff is working on Monte-Carlo based Bayesian statistical inference for problems with computationally demanding prior and likelihood evaluations. Practical computational methods for making Bayesian model comparison for complex stochastic systems are needed. Research is driven by problems from a range of application areas, including Geoscience, Linguistics, Genetics and Archaeology.

Next seminar

17.09.2018 @ 14:15
Giuliana Cortese (University of Padova)

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