Bayesian inference in multivariate nonlinear state-space models

Assertions (Stellingen)

ACCOMPANYING THE THESIS

Bayesian Inference in Multivariate Nonlinear State-Space Models

BY

Yuliya Shapovalova

1. Approximate methods, as for example Variational Bayes, should be applied carefully: they bring a lot of computational advantage but have less theoretical guarantees than 'exact' sampling methods like Markov Chain Monte Carlo. (Chapter 2)

2. The variance of the estimated likelihood with Sequential Monte Carlo for stochastic volatility models is different in the different points of the parameter space; it is in particular sensitive to the variance parameter in the model. (Chapter 2)

3. Hamiltonian Monte Carlo methods exploit differential geometry and open new opportunities for the sampling techniques, however, in the context of stochastic volatility it seems to be necessary to couple HMC with Sequential Monte Carlo to achieve a good estimate of the variance of the latent process. (Chapter 2)

4. Design of the proposal distribution in MCMC can be crucial for the proper performance of the algorithm in multivariate and high-dimensional problems. (Chapter 3)

5. Modeling multivariate correlation structure for count data can be mathematically cumbersome, state-space models provide an intuitively straightforward approach for this task. (Chapter 4)

6. State-space models provide a flexible and intuitive framework for multivariate modeling; however, their estimation in a reasonable time frame remains a challenge. (Chapter 2 – 4)

7. One of the reasons why teaching and knowledge utilization are essential — they help scientists to remain in touch with the real world.

8. The importance of knowledge should not be underestimated, and practical applications should not be the only drivers of science: the theoretical findings of today can change the reality of tomorrow.

9. "Computer science can't offer you life with no regret. But it can, potentially, offer you just what Bezos was looking for: a life with *minimal* regret." — Brian Christian and Tom Griffiths (2016). *Algorithms to Live By: The Computer Science of Human Decisions*.