# LTCC Advanced Course: Advanced Computational Methods in Statistics

- Basic details:
    - core audience: Statistics, Machine Learning, Applied Probability and Numerical Analysis
    - course format: advanced/optional (10h) 5x2hr lectures.
- Description
    - keywords: Simulation, Variance reduction, Monte Carlo methods, Importance Sampling, Markov Chain Monte Carlo, Sequential Monte Carlo
    - syllabus:
        1. Introduction to simulation
            - basics of Monte Carlo
            - variance reduction
        2. Importance Sampling
            - some basics, asymptotic variance,
            - sequential importance sampling
        3. Markov Chain Monte Carlo (MCMC)
            - Metropolis-Hastings, Gibbs sampling
            - some basics on theory and practice
        4. Sequential Monte Carlo (SMC)
            - particle filtering for state space models
            - sampling for fixed dimensional state spaces
            - particle MCMC
    - Relevant introductory textbooks
        - Robert and Casella (1999) Monte Carlo Statistical Methods, Springer
        - Liu (2001) Monte Carlo strategies in scientific computing, Springer.

  Prerequisites:
    - Basic knowledge of Statistics and Probability.
    - Basic knowledge of programming in any language appropriate for scientific computing.
    - Familiarity and exposure to Markov Chains or stochastic processes will be useful.

  Format:

There will be exercises/mini-courseworks posed as homeworks. There will be no separate problem sheets. The problems will require the use of some programming.

Lecture/computer session/tutorial/discussion split: 10/0 /0 /0 /0

Lecturer details

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