

LTCC Course - Spring 2010
Advanced Computational Methods in Statistics
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- Basic Details:
 - Core Audience: stats
 - Course Format: advanced/optional (10 h)
- Course Description:
 - Syllabus:

The course will start from elementary methods and will move quickly to give an overview over several advanced computational techniques that are useful in statistics. The following topics will be covered:

 1. (Parallel) Random number generation and transformation methods
 2. Variance reduction techniques (e.g. quasi Monte Carlo, importance sampling)
 3. Optimisation algorithms (EM algorithm, LARS, Stochastic Approximation)
 4. MCMC methods including Metropolis Hastings algorithm, Gibbs sampler, reversible jump algorithms and perfect sampling (coupling from the past)
 5. Bootstrap methods (including iterated bootstrap, bootstrap for dependent data)
 6. Particle filtering (Sequential Monte Carlo)
 - Prerequisites: Some elementary knowledge about stochastic simulation will be helpful due to the fast pace of the course.
 - Some reading material:

Asmussen & Glynn (2007) *Stochastic Simulation - Algorithms and Analysis*, Springer
Robert & Casella (2004) *Monte Carlo Statistical Methods*, 2nd Ed., Springer
Davison & Hinkley (1997) *Bootstrap methods and their application*, Cambridge University Press.
Doucet et al (2001) *Sequential Monte Carlo Methods in Practice*, Springer.
Bain & Crisan (2008) *Fundamentals of Stochastic Filtering*, Springer.
- Lecture material will be made available for download.