Statistical and Computational Inverse Problems with Applications

Part 1: Introductions & practicalities

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Kuopio Inverse Problems Group

http://venda.uef.fi/inverse/

Finnish Centre of Excellence in Inverse Problems

https://wiki.helsinki.fi/display/inverse/Home

Practical issues

- Lectures and exercises
  - Lectures 12 h (minimum attendance 80% = 10 h)
  - (Matlab) exercises (Return by **September 7**, email: Aku.Seppanen@uef.fi)
  - No final examination
- Material
  - Slides will be available in Koppa-portal
  - m-files of many examples will be also available

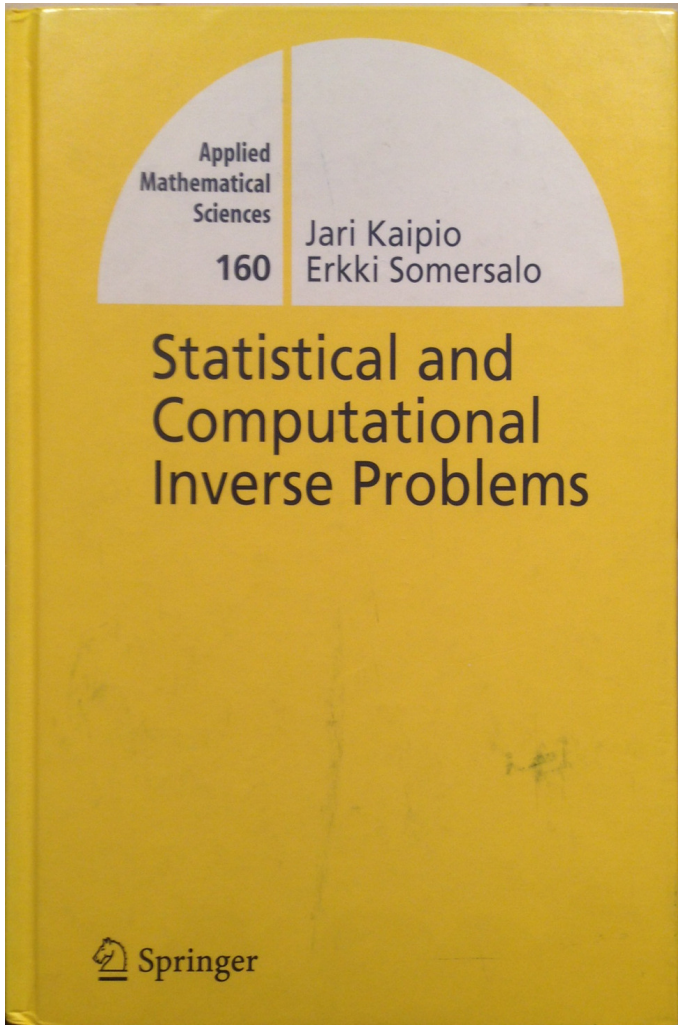
Contents of the course

1. Introductions & practicalities
2. Introduction to inverse problems and example applications
3. LS estimation
   - Linear LS estimation
   - Generalized LS estimation
   - Non-linear LS estimation
4. Deterministic inversion framework
   - Generalized Tikhonov regularization

5. (Stationary) Bayesian inverse problems
   - Basics of random variables
   - Bayesian inverse problems; (full) posterior estimate, point estimates (MAP, CM), spread estimates
   - MAP estimate: minimization problem, connection to Tikhonov regularization when Gaussian models
   - Integration problems: MCMC
   - EIT examples: different prior models, implementation, examples
   - Approximation error modeling
6. Non-stationary inverse problems

Book by Kaipio & Somersalo

- J. P. Kaipio and E. Somersalo: Statistical and Computational Inverse Problems, Applied Mathematical Sciences 160, Springer-Verlag, ISBN: 0-387-22073-9, 2005.



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