

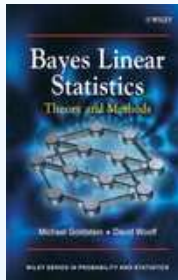
Statistics and Probability group

homepage: <http://www.dur.ac.uk/mathematical.sciences/stats/>



Overview of research subjects within the group

- Bayes linear methods
 - An alternative to the fully Bayesian approach — in Bayes linear methods probability distributions are not fully specified, but instead work with expectations and variances.

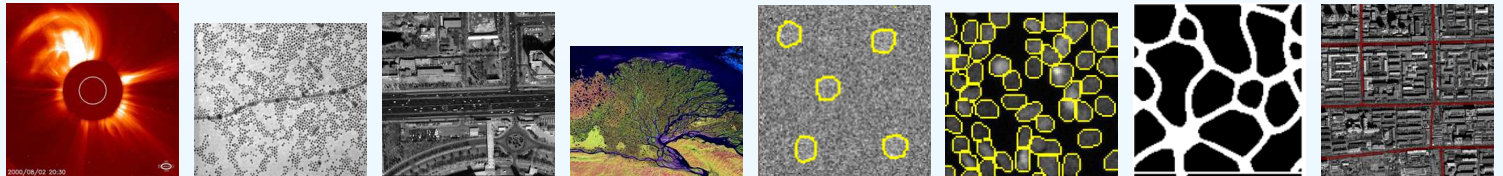


M. Goldstein and D. Wooff, Wiley, 2007

- Uncertainty analysis for large scale physical problems
 - Analysis of computer simulators for complex models of physical systems (*e.g.* an ecosystem).
 - Forecasting the global climate, rapid climate change, modelling of oil reservoirs, plankton concentration in the ocean, etc.

Overview of research subjects within the group

- Bayesian shape modelling and spatial statistics
 - Modelling of geometric structures and spatial regularities with Markov random fields, phase fields, random contours. . .
 - Many applications, particularly to image analysis and understanding (solar physics, nanophysics, biology, medicine, geology. . .)



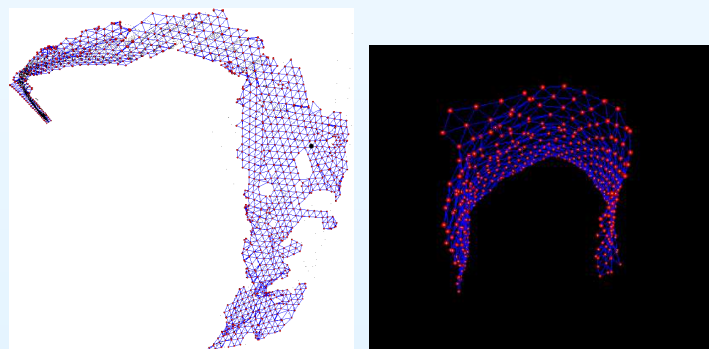
- Mathematics and algorithmics of Bayesian estimation
 - Reparameterization-invariant estimation via the geometry of the space of probability distributions
 - ‘Graph cut’ optimization algorithms: theory and analysis using statistical physics techniques

Overview of research subjects within the group

- **Imprecise/Interval probability**
 - Quantify uncertainty by use of lower and upper probabilities ('bounds on probabilities') instead of precise values
 - Robust decision making under serious uncertainty and incomplete preferences
 - Nonparametric predictive inference (NPI): a new statistical approach based on only a few structural assumptions: many open research challenges (Statistics and Operations research)
- **Reliability**
 - For example, statistical modelling for reliability of off-shore wind turbines (in collaboration with Durham Engineering Department)

Overview of research subjects within the group

- Mathematics of statistical computation
 - Novel MCMC algorithms
 - Exact computation in contingency tables
 - Sensitivity analysis for Bayesian inference
 - Computation of multivariate normal orthant probabilities
- Smoothing of high-dimensional data structures
 - Nonparametric regression
 - Dimension reduction and data visualization



Overview of research subjects within the group

- **Environmental statistics and risk assessment**
 - Food safety, dietary and ecological risks from pesticides, carcinogens, risk assessment and quantification of uncertainty.
 - Collaboration with the Food and Environmental Research Agency, York.
- **Probability and stochastic processes**
 - Estimation of noisy dynamics, with applications in biology
 - Random walks and their applications *e.g.* in computer science, biology and physics
 - Communication and queueing networks
 - Interacting particle systems
 - Percolation and random graphs
 - Limit theorems and large deviations

Postgraduate opportunities

- PhD
 - Studentship on *any subject* proposed by a member of staff (funded by the department with awards granted by Research Councils, *e.g.* EPSRC)
 - Studentship on a *fixed subject* in connection with industry (please ask in January 2011)
- MSc
 - MSc by **research**, available at Durham
 - **Taught** MSc in Statistics/OR; **not** available at Durham, but excellent (funded!) opportunities elsewhere
- **More Info**
 - on Postgraduate opportunities at Durham:
<http://www.dur.ac.uk/mathematical.sciences/stats/postgrad/>
 - on Postgraduate opportunities at UK institutions:
<http://maths.dur.ac.uk/stats/pg/home.html>

Environment

- 20 full-time PhD students
- 4 part-time PhD students

Apart from their own study and research, PhD students get in touch with modern developments in key statistical areas through

- Weekly seminars
- Weekly postgraduate seminars
- Conferences
- Two 'Training Weeks' per year, alternately at Durham and Newcastle
- Access to further (external) PhD training courses (in particular, APTS)

Interested?

- If there is interest, a **follow-up meeting** will be organised (this term) in which members of the Stats/Prob group will explain possible PhD subjects in more detail.
- For the 2011/12 intake, we recommend to apply as early as possible—say, shortly before or after Christmas.
- Interested? Let us know: (p.g.statistics@durham.ac.uk).