The InterUniversity Attraction Pole Network IAP-P7/06 (Belspo)
The Université catholique de Louvain (UCL)
The Université de Liège (ULg)
The Universidade de Santiago de Compostela (USC)

jointly organize a

Winter School in Statistics

January 28-29, 2016

Programme

28 January 2016

08:30 - 09:00:	Welcome coffee
09:00 - 11:15:	Mark Girolami (Univ. Warwick) Simulation based statistical inference from dynamical systems - (PART I)
11:15 - 11:30 :	coffee break
11:30 - 12:30 :	Paul Eilers (Univ. Rotterdam) Recent developments in P-splines for multi-dimensional smoothing - (PART I)
12:30 - 13:45 :	Lunch break
13:45 - 15:00 :	Paul Eilers (Univ. Rotterdam) Recent developments in P-splines for multi-dimensional smoothing - (PART I)
15:00 - 15:15 :	coffee break
15:15 - 17:30 :	Richard Samworth (Univ. Cambridge) High-dimensional statistical inference - (PART I)

29 January 2016

08:30 - 09:00:	Welcome coffee
09:00 - 11:15:	Mark Girolami (Univ. Warwick) Simulation based statistical inference from dynamical systems - (PART II)
11:15 - 11:30 :	coffee break
11:30 - 12:30 :	Paul Eilers (Univ. Rotterdam) Recent developments in P-splines for multi-dimensional smoothing - (PART II)
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15:15 - 17:30 :	Richard Samworth (Univ. Cambridge) High-dimensional statistical inference - (PART II)

Abstracts

COURSE 1 : Simulation based statistical inference from dynamical systems

By Prof. Mark Girolami (Department of Statistics, University of Warwick)

MCMC remains the workhorse for almost all applications of Computational Statistics where an intractable measure requires to be probed for the purposes of statistical inference mainly, though not exclusively, in the Bayesian framework. Contemporary applications of statistical modelling and inference in science and engineering are presenting some spectacular challenges for MCMC in the form of highly complex measures, very high dimensional measures, and complex models which themselves are challenging to simulate from.

This series of lectures will be motivated by some of the challenging statistical applications that are emerging from the sciences, engineering and economics. The development of simulation methods from first and second order diffusions will be detailed as will the adoption of Lagrangian and Hamiltonian Dynamical systems in designing efficient MCMC methods. Finally some time will be devoted to more advanced themes based on exploiting geometric structures in the design of sampling based methods.

COURSE 2: Recent developments in P-splines for multi-dimensional smoothing

By Prof. Paul. H.C. Eilers (Erasmus Medical Centre, Rotterdam)

P-splines have become popular for one-dimensional smoothing. The combination of a regression framework, using B-splines, and a simple to implement penalty makes them a versatile tool. This carries over to higher dimensions if we combine tensor products of B-splines with sums of one-dimensional penalties.

In recent years there have been many developments in this area, many of them inspired by an equivalence between mixed models and P-splines. Also special algorithms have been developed to deal with data on large grids, saving orders of magnitude in memory use and computation time. Tensor product P-splines have found application in, among others, smoothing of mortality tables, multidimensional density estimation and analysis of agricultural field trials.

The first day of the course will have an introductory character, while the second day will offer technical details and advanced material.

COURSE 3 : High-dimensional statistical inference

By Prof. Richard Samworth (Statistical Laboratory, University of Cambridge)

Lecture content :

- Classical theory : Review of the linear model, Cochran's theorem, geometry of orthogonal projections, hypothesis testing, examples.

- Modern high-dimensional statistics : Ridge regression, model selection via, e.g., information criteria. Definition of the Lasso and its geometry.

- Theoretical properties of the Lasso: Prediction and estimation properties, selection consistency.

- Extensions and complementary pairs stability selection: Brief discussion of other penalty functions, other models, e.g. grouped variables. I will then use the remaining time to give an exposition of some of my own work in this area. Complementary Pairs Stability Selection is a technique for improving the performance of any existing variable selection algorithm, by aggregating the results of applying it on subsamples of the data.

List of participants

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