First Interdisciplinary Workshop on

Mathematics of Filtering and its Applications (MFA2011)

13-15 July 2011,Brunel University, West London, UK

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First Interdisciplinary Workshop on Mathematics of Filtering and its Applications (MFA2011)

The first interdisciplinary workshop on the mathematics of filtering and its applications will be held at Brunel University, UK from 13 July to 15 July 2011.

Workshop Aims and Objectives

The problem of estimating the latent states of a dynamical system from observed data often arises in many branches of physical and social sciences, including image processing, navigation, econometrics, finance and meteorology. Filtering refers to any method for obtaining such state estimates, recursively in time, by combining model predictions with noisy observations. While the solution to filtering problem for a linear dynamic system is well understood and has been studied extensively since 1960s, there is no single solution available for filtering in nonlinear systems which outperforms all the other possible solutions. For commonly occurring nonlinear model structures, the conditional distribution is often given by solution of a stochastic partial differential equation. This equation is usually quite difficult to solve numerically and is intractable if we need a solution in real time (as in the case of navigation applications) or if the state dimension is very large (as in the case of meteorology). Different Bayesian approximation methods exist for solving the nonlinear filtering problem arising in different fields such as image processing, meteorology and econometrics, each offering an application-specific compromise between estimation accuracy, computational burden and numerical robustness. Due to diversity of applications, the researchers from different fields rarely have an opportunity to meet to learn from each other about mathematical innovations in filtering in their respective fields. The workshop on the mathematics of filtering and its applications being organized at Brunel University will bring together British researchers from different application areas to share state-of-the-art knowledge about filtering in their respective fields and to provide a platform for further research interaction. The program for the workshop will include six invited lectures, contributed sessions along multiple streams (such as econometrics, bioinformatics and meteorology) and a conference dinner on 14th July.

Local Organisers

Dr Paresh Date, The Centre for the Analysis of Risk and Optimisation Modelling Applications (CARISMA), The Department of Mathematical Sciences, Brunel University, UK. (paresh.date@brunel.ac.uk)

Prof. Zidong Wang, School of Information Systems, Computing and Mathematics, Brunel University.

Invited Speakers (specialisation in brackets)

1. Prof. Brendan McCabe, Management School, University of Liverpool, UK. (econometrics)
2. Prof. Simon Godsill, Department of Engineering, University of Cambridge, UK (statistical signal processing)
3. Prof. Zidong Wang, School of Information Systems, Computing and Mathematics, Brunel University, Uxbridge, UK (bioinformatics)
4. Prof. Stephen Roberts, Department of Engineering Science, University of Oxford, Oxford, UK (pattern recognition)
5. Dr Lyudmila Mihaylova, Department of Communication Systems, Lancaster University, Lancaster, UK (target tracking).
6. Prof. P.J. Van Leeuwen, University of Reading, UK (meteorology)

Programme

WEDNESDAY 13 JULY

10:00 – 10.30 Registration and coffee

10:30-11:00 **Setting the Scene: An introduction to the workshop**

Dr Paresh Date, Brunel University, UK (Main Organiser)

11:00 - 12:00 **Advances in Bayesian Filtering Using Monte Carlo Methods**

Professor Simon Godsill, University of Cambridge, UK

12:00 - 13:15 Lunch break

13:15 - 14:45 Contributed sessions

13:15-13:45 Particle Filtering For Jump Diffusions

M. Pollock, A.M. Johansen and G.O. Roberts, Warwick University, UK

13:45- 14:15 Monte Carlo for Alpha-Stable Levy Processes

T. Lemke and S.J. Godsill, University of Cambridge, UK

14:15-14:45 Monte Carlo for Some Bi-Variate Marked Doubly Stochastic Poisson Processes

T. Peng, University of Verona, Italy

14:45 - 15:15 Coffee break

15:15-16:15 **Multiobjective Filtering with Randomly Occurring Incomplete Information**

Professor Zidong Wang, Brunel University, UK

THURSDAY 14 JULY

09:15 – 10:45 Contributed sessions

09:15-09:45 On the Normality of the Projection Parameters

A. Furlan, D. Marzorati and D. Sorrenti, University of Milan, Italy

09:45-10:15 Multiple Object Tracking with Probabilistic Relationships

L. Cattelani, C.E. Manfredotti and E. Messina, University of Milan, Italy

10:15-10:45 Intelligent Techniques in Bioinformatics

M.W.M. Al-Neama, Al-Azhar University, Egypt

10:45 - 11:15 Coffee break

11:15 - 12:15 **Gaussian Processes for Active Data Selection, Changepoints and Faults**

Professor Stephen Roberts, University of Oxford, UK

12:15 - 13:15 Lunch

13:15 – 15:15 Contributed sessions

13:15-13:45 Quantifying Forecast Uncertainty in Dynamical Systems Using The Particle Filter

R. D. Wilkinson and M. Vrettas, University of Nottingham, UK

13:45-14:15 Stochastic Volatility Model with an Exogenous Control News Flow Process

S. Sidorov and V. Balash, Brunel University, UK

14:15-15:15 Interval Prediction Models: Identification and reliability (60 minute session)

M.Campi, University of Brescia, Italy

15:15 - 15:45 Coffee break

15:45-16:45 **Particle Filters in High-Dimensional Geophysical Systems**

Professor Peter Jan Van Leeuwen, University of Reading, UK

19:00 **Workshop dinner (Darwin room, Hamilton Centre)**

FRIDAY 15 JULY

09:15 – 10:45 Contributed sessions

09:15-09:45 The Higher Order Sigma Point Filter: A new heuristic for nonlinear time series filtering

K. Ponomareva and P. Date, Brunel University, UK

09:45-10:15 Inference in State-Space Model with Point Process Observations: Algorithms and Applications

K. Yuan and M. Niranjan, Southampton University

10:15-10:45 Time Varying Co-Integration and the Kalman Filter

T. Yigit, Bilkent University, Turkey

10:45 - 11:15 Coffee break

11:15 - 12:15 **Sequential Monte Carlo Methods for Localisation in Wireless Sensor Networks**

Dr Lyudmila Mihaylova, University of Lancaster, UK

12:15 - 13:15 Lunch break

13:15-14:45 Contributed sessions

13:15-13:45 Application of Kalman Filter for Debt Issuance Optimization

P. Date, A. Canepa and M. Abdel-Jawad, Brunel University, UK

13:45-14:15 Estimation of an Asset Price Model Modulated by a Higher Order Markov Chain

R.Mamon, University of Western Ontario, Canada

14:15-14:45 Algorithmic Trading with Particle Filters

H. Christensen and J. Murphy, University of Cambridge, UK

14:45-15:15 Coffee break

15:15-16:15 **Nonparametric Probability Forecasts via State Space Models**

Professor Brendan McCabe, University of Liverpool Management School, UK

16:15 Close

Accomodation can be arranged at the University at cost. Please see: www.optirisk-systems.com/mfa#accom

Registration Form For MFA2011

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☐ First Interdisciplinary workshop on Mathematics Of Filtering and its Applications (MFA2011)
13 - 15 July 2011, Brunel University, West London

Conference Registration Fee:

☐ PhD students -
£50.00 (or £16.67/day) + VAT @ 20%

☐ Post Doc & Academics -
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£350.00 (or £150/day) + VAT @ 20%

Please specify any dietary requirements:

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Registration Details:

The registration fee for the event covers the following: Attendance, copy of the abstracts, coffee breaks and conference dinner. Accommodation is not included. The delegates who need accommodation are requested to contact Brunel Conference services, Brunel University, Uxbridge UB8 3PH (phone: 01895 238353, Fax: 01895 269745, Email: conference@brunel.ac.uk) directly, through which en suite, on-campus accommodation can be booked. Please mention MFA2011 while booking accommodation. Detailed delegate information will be sent to you approximately two weeks before the event. Payment is required in advance of the event or at the latest, paid at the event. All invoices carry a 10% surcharge, which is payable if the fee remains unpaid on the day of the event.

What happens if I have to cancel?

Confirm your CANCELLATION in writing up to 15 working days before the event and receive a refund less a 10% + VAT service charge. Regrettably, no refunds can be made for cancellations received less than 15 working days prior to the event and the invoice will remain due. SUBSTITUTIONS are welcome at any time. The organisers reserve the right to amend the programme if necessary. INDEMNITY: Should for any reason outside the control of OptiRisk Systems Ltd., the venue or the speakers change, or the event be cancelled due to industrial action, adverse weather conditions, or an act of terrorism, OptiRisk Systems Ltd. will endeavour to reschedule, but the client hereby indemnifies and holds OptiRisk Systems Ltd. harmless from and against any and all costs, damages and expenses, including attorneys fees, which are incurred by the client. The construction validity and performance of this Agreement shall be governed by all aspects by the laws of England to the exclusive jurisdiction of whose court the Parties hereby agree to submit.

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