Speaker: Diwei Zhou

Institute: University of Wolverhampton

Title: "Weighted non-Euclidean statistics for tensor field processing"

Abstract: In diffusion magnetic resonance imaging (diffusion MRI) there has been substantial interest in the development of methods for processing diffusion tensor fields, taking into account the non-Euclidean nature (positive semi-definiteness and symmetry) of the tensor space. Specifically, effective smoothing and interpolation of the tensor field is important for advanced applications of diffusion MRI such as fibre tracking. These motivate the development of weighted non-Euclidean methodologies for diffusion MRI. Our methods are illustrated on both synthetic and real diffusion tensor data from a human brain.

Speaker: Jiajia Yan

Institute: University of Wolverhampton

Title: "robust methods for diffusion tensor estimation"

Abstract: Signal variability of diffusion tensor imaging is influenced by various contributions, such as thermal noise, spatial and acquisition-related artefacts. The widely used methods, including linear and non-linear least squares, constrained and non-constrained, take into account the signal variability produced by thermal noise but ignore other causes. For example, cardiac pulsation, bulk head motion, respiratory motion, or even hardware imperfection may influence the results. In such cases, least squares methods are not reliable in detecting the outliers. Therefore, we introduce robust methods to reduce the effect of possible outliers.

Speaker: Ragnar Norberg

Institute: Universite Lyon 1 and LSE

Title: "Hedging theory without agonizing pain"

Abstract: An investment portfolio is uniquely determined by an exposure process specifying the number of shares held in risky assets and a cost process representing deposits into and withdrawals from portfolio account. The portfolio is a hedge of a contractual payment stream if the payments are currently deposited on or withdrawn from the portfolio account and the terminal value of the portfolio is 0 (ultimate settlement of the contractual liabilities). The purpose of the hedge is stated as an optimization criterion for the investment strategy. Certain quadratic loss criteria lead to the same optimal exposure process but different optimal cost processes, special cases being mean-variance hedging and risk minimization. These results are preserved if the value of the portfolio is required to coincide with a given adapted process, a case in point being the capital requirement introduced through regulatory regimes like Basel II and Solvency II. Working under a martingale measure allows simple proofs based on

orthogonal projections. Finally the following problem is formulated and solved in the case with a finite number of driving random factors: how to design the very assets (e.g. insurance derivatives) in a multi-factor framework, the purpose being to optimize the hedging performance on the average across a population of hedgers pursuing optimal individual hedging strategies with given assets. The presentation aims at a broad audience with a working knowledge of stochastic processes theory.

Speaker: Summeetpal S. Singh

Institute: Cambridge University

Title: "Parameter Estimation for Hidden Markov Models with Intractable Likelihoods"

Abstract: Approximate Bayesian computation (ABC) is a popular technique for approximating likelihoods and is often used in parameter estimation when the likelihood functions are analytically intractable. Although the use of ABC is widespread in many fields, there has been little investigation of the theoretical properties of the resulting estimators. In this paper we give a theoretical analysis of the asymptotic properties of ABC based maximum likelihood parameter estimation for hidden Markov models. In particular, we derive results analogous to those of consistency and asymptotic normality for standard maximum likelihood estimation. We also discuss how Sequential Monte Carlo methods provide a natural method for implementing likelihood based ABC procedures.

Speaker: Boris Polyak

Institute: Institute of Control Sciences, Moscow, Russia

Title: "Robust Eigenvector of a Stochastic Matrix with Application to PageRank"

Abstract: We discuss of robust dominant eigenvector of a family of stochastic matrices. Our focus is on application to ranking problems, where the proposed approach can be seen as a robust alternative to the standard PageRank technique. The robust eigenvector computation is reduced to a convex optimization problem. We also propose a simple algorithm for robust eigenvector approximation which can be viewed as a regularized power method with a special stopping rule.