All seminars will commence at 12:10pm in room M/0.34, The Mathematics Building, Cardiff University, Senghennydd Road (unless otherwise stated).

Please contact Dr Timm Oertel for more details regarding Operational Research/WIMCS lectures and Dr Andrey Pepelyshev for more details regarding Statistics lectures.

# Seminars

| Date | Speaker | Seminar |
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| 13 July 2016 | Lenny Fukshansky (Claremont McKenna) | Lattices from Abelian groups, spherical designs, and packing density maxima<br><br>Abstract: Lattices are fundamentally important in discrete geometry, cryptography, discrete optimization and computer science. The lattice sphere packing problem asks for a lattice that maximizes the packing density function among all lattices in a given dimension. A systematic approach to this problem involves understanding what properties a lattice should have to be a strong candidate for such a maximum. I will discuss such properties, including a connection to spherical designs, which are certain highly symmetric point configurations on spheres. I will then exhibit a construction of a family of lattices from finite Abelian groups, which have interesting geometric properties and produce local maxima for the packing density function in infinitely many dimensions. This is joint work with A. Böttcher, S. R. Garcia and H. Maharaj. |

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| 1 June 2016 | Chenlei Leng (University of Warwick) | Distributed sparse regression by decorrelating features<br><br>An attractive approach for down-scaling a Big Data problem is to first partition the dataset into subsets and then fit using distributed algorithms. Feature space partitioning can be effective for analysing datasets with a large number of features, but suffers from the failure of not taking correlations into account if done naively. In this paper, we propose a new embarrassingly parallel framework named DECO for distributed variable selection and parameter estimation. The trick is to apply a simple decorrelation step before performing sparse regression on each subset. The theoretical and computational attractiveness of DECO will be illustrated. This is joint work with Xiangyu Wang and David Dunson. |
| 25 May 2016 | Murad Taqqu (Boston University, USA) | A unified approach to self-normalized block sampling<br><br>The inference procedure for the mean of a stationary time series is usually quite different under various model assumptions because the partial sum process behaves differently depending on whether the time series is short or long-range dependent, or whether it has a light or heavy-tailed marginal distribution. We develop an asymptotic theory for the self-normalized block sampling, and prove that the corresponding block sampling method can |

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| | | provide a unified inference approach for the aforementioned different situations in the sense that it does not require the a priori estimation of auxiliary parameters.<br><br>This is joint work with Shuyang Bai and Ting Zhang. |
| 4 May 2016 | Yuzhi Cai (Swansea) | Density forecasting with TGARCH models for financial returns<br><br>This talk presents a novel density forecasting method based on a threshold GARCH (TGARCH) model and an associated value at risk (VaR) model for financial returns. Without estimating the TGARCH model directly, we proposed a Bayesian approach based on a working likelihood to the estimation of the VaR model. This estimation method allows a model that has multiple thresholds to be dealt with easily. As a result, the forecasting method allows us to obtain multiple-step ahead density forecasts for financial returns without using any information on the distribution of the innovation term of a TGARCH model. Since our method produces density forecasts, it also enables us to study the effect of the past financial returns on the entire distribution of the current return. Hence, any predictive quantity of interest can be obtained as by-products of our method. Compared with other models, much improved density |

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| | | forecasts have been obtained from our method. |
| 13 April 2016 | Matthias Ehrgott (Lancaster) | Generating deliverable treatment plans and beam angle optimisation in the presence of multiple objectives in radiotherapy treatment planning<br><br>External radiation therapy is one of the major forms of treatment of cancer.<br><br>Planning a radiation treatment for a patient involves making trade-offs between the main goals of radiotherapy, namely to irradiate the tumour according to some prescription to affect tumour control and to avoid damage to surrounding healthy tissue. This conflict permeates all aspects of treatment planning from the selection of beam angles to the optimisation of fluence maps to the sequencing of the gantry for treatment delivery. In this talk I will first describe a matheuristic approach to incorporate multi-objective fluence optimisation in the beam angle optimisation problem. The second part of the talk will cover a column generation approach to the multi-objective fluence map optimisation problem, which achieves a reduction of the number of apertures and total fluence required to deliver a Pareto-optimal treatment. |

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| 16 March 2016 | Mathias Henze (FU Berlin) | Tight asymptotic estimates for the quantitative discrete Helly-number of the integral lattice<br><br>Given a discrete subset $S$ of $\mathbb{R}^n$, let $c(S,k)$ be the smallest number $t$ such that for every finite system of linear inequalities that has exactly $k$ solutions in $S$, there exists a subsystem of at most $t$ inequalities that still has exactly $k$ solutions in $S$.<br><br>This number was introduced for $S=\mathbb{Z}^n$ by Aliev et al.~(2014) in order to study a quantitative version of Doignon's integer variant of the classical Helly theorem. K. Clarkson was the fi rst to notice that using Doignon's theorem one can obtain a probabilistic algorithm for integer linear programming. Following this approach, the quantitative version has been applied to finding the l best integer feasible points of an integer program.<br><br>The initial estimate $c(\mathbb{Z}^n,k)\in O(k)$ by Aliev et al.~was recently improved to a sublinear bound by Chestnut et al., who also determined the asymptotic growth of $c(\mathbb{Z}^2,k)$ to be $k^\frac13$. Via the theory of Helly-numbers of set families we show that $c(S,k)$ admits a variety of different interpretations, for example, by the maximum number of vertices of a polytope containing $k$ non-vertex points of $S$, or by the maximum number of facets of an inclusion-maximal polyhedron containing |

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| | | $k$ points of $S$ in its interior. Based on these interpretations, we show that for the integral lattice the asymptotic behavior of $c(\mathbb{Z}^n,k)$ is given by $\Theta(k^\frac{n-1}{n+1})$, and we determine $c(\mathbb{Z}^n,k)$ for small values of $k$ exactly. For general discrete sets $S$ we derive an upper bound of $c(S,k)\in O(k\cdot h(S))$, where $h(S)$ is the Helly-number of $S$.<br><br>This is joint work with G. Averkov, B. Gonz\'{a}lez Merino, I. Paschke, and S. Weltge. |
| 2 March 2016 | Paul Smith (Southampton) | Calibration estimators in official statistics<br><br>Model-assisted estimation has been in use in surveys for a long time under different names. I will trace some examples showing its evolution, and give a summary of modern calibration estimation as used by National Statistical Institutes in the production of official statistics. I will consider the reasons for calibration and the properties of the resulting estimates from both theoretical and user points of view, and give a range of examples demonstrating particular challenges and issues, and some developments where calibration estimation may continue to improve official outputs. |

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| 24 February 2016 | Professor Indrajit Ray (Cardiff Business School) | Information-Revelation and Coordination using Cheap Talk: Theory and Experiment |
| 17 February 2016 | Professor Theodore Turocy (East Anglia) | Two-bidder all-pay auctions with interdependent valuations: Equilibrium, complexity, competitiveness, and behaviour<br><br>We present results from two related papers. In the first paper, we analyze symmetric, two-bidder all-pay auctions with interdependent valuations and discrete type spaces. Relaxing previous restrictions on the distribution of types and the valuation structure, we present a construction that characterizes all symmetric equilibria. We show how the search problem this construction faces can be complex. In equilibrium, randomization can take place over disjoint intervals of bids, equilibrium supports can have a rich structure, and non-monotonicity of the equilibrium may result in a positive probability of allocative inefficiency when the value of the prize is not common. Particular attention is paid to the case in which an increase in a bidder's posterior expected value of winning the auction is likely to be accompanied by a corresponding increase for the other bidder. Such environments are "highly competitive" in the sense that the bidder's higher |

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| | | valuation also signals that the other bidder has an incentive to bid aggressively.<br><br>In the second paper, we focus on the relationship between monotonic equilibrium and those "highly competitive" cases. Having a high assessment of the value of the prize is good news, but only if the other participants in the contest are not too likely to<br>believe the same. In a laboratory experiment, we study behavior in both private-values and common-values settings. We vary the degree of correlation between types. While bidding is consistently aggressive across treatments, we find general support of the comparative statics of Bayes-Nash equilibrium for private values. In constrast, behavior in common values settings in which bidders have very noisy information about the value of the prize differs greatly from the equilibrium predictions. |
| 10 February 2016 | Evangelos Evangelou (Bath) | The Value of Information for Correlated GLM<br><br>In portfolio optimisation, one could potentially invest in several projects with an uncertain amount of revenue depending on the outcome of each project. Initially, the investor has a preliminary estimate about the outcome of each project and a prior value for the whole investment but is given the option to purchase some information (i.e. data) from some projects. When the projects are correlated, these data can be used to |

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| | | update the expected outcome of all projects and derive a posterior value for the investment. The information provided by the data has some value to the investor who must decide whether it is worth purchasing them.<br><br>In this talk we will consider the case where the outcome of each project is modelled by an exponential family. When the distribution is non-Gaussian, the value of information does not have a closed form expression. Using Laplace's approximation for intergrals we will derive an approximation to the value of information and examine the sensitivity of the approximation under different parameter settings and distributions. The method will be illustrated using a spatial decision problem.<br><br>Joint work with Jo Eidsvik (NTNU) |