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
10 July 2017	Dr Kirstin Strokorb (Cardiff School of Mathematics)	Stability and Dependence in Extreme Value Theory Extreme value theory is a branch of probability and statistics that aims to provides theoretically sound procedures for extrapolation beyond the range of available data (and also to understand the limits of such procedures). In the first part of this talk I will explain: (i) why stability properties such as max-stability or threshold-stability are naturally considered as modelling assumptions to justify two non-parametric approaches to such problems (ii) address some of the difficulties for understanding dependence between extreme observations

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		In the second part I will present joint work with Ilya Molchanov, where we identify some connections between Extreme value theory, Random sets and Properties of risk measures enabling us to recover and extend several results from the literature from a unifying perspective.
5 July 2017	Dr Tom Beach(Cardiff School of Engineering)	To be announced.
14 June 2017	Dmitrii Silvestrov (Stockholm)	Asymptotic Expansions for Stationary and Quasi-Stationary Distributions of Nonlinearly Perturbed Markov Chains and semi-Markov Processes New algorithms for computing asymptotic expansions for stationary and quasi-stationary distributions of nonlinearly perturbed Markov chains and semi-Markov processes are presented. The algorithms are based on special techniques of sequential phase space reduction and some kind of “operational calculus” for

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		Laurent asymptotic expansions applied to moments of hitting times for perturbed semi-Markov processes. These algorithms have a universal character. They can be applied to nonlinearly perturbed semi-Markov processes with an arbitrary asymptotic communicative structure of the phase space. Asymptotic expansions are given in two forms, without and with explicit bounds for remainders. The algorithms are computationally effective, due to a recurrent character of the corresponding computational procedures. The related references are [1-2]. References [1] Gyllenberg, M., Silvestrov, D.S. (2008). Quasi-Stationary Phenomena in Nonlinearly Perturbed Stochastic Systems. De Gruyter Expositions in Mathematics, 44, Walter de Gruyter, Berlin, ix+579 pp. [2] Silvestrov, D., Silvestrov, S. (2016). Asymptotic expansions for stationary

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		distributions of perturbed semi-Markov processes. In: Silvestrov, S., Rancic, M. (Eds). Engineering Mathematics II. Algebraic, Stochastic and Analysis Structures for Networks, Data Classification and Optimization, Chapter 10. Springer Proceedings in Mathematics & Statistics 179, Springer, Cham, 151 -- 222.
12 June 2017	Nikita Zvonarev (St. Petersburg State University)	Fisher Scoring in Low-Rank Signal Estimation The problem of signal estimation is considered. We suggest an algorithm of construction of MLE/LS signal estimation. The algorithm is based on low-rank approximation and suggests a stable solution of the corresponding optimization problem.
31 May 2017	Prof. Anatoly Zhigljavsky(Cardiff University)	Simplicial variances, distances and correlations with a view towards big data I will describe a brand-new approach for defining variances, distances and correlations for high-

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		dimensional data and argue that the new concepts may have serious advantages over the classical ones, especially if points of a multivariate sample lie close to a linear subspace.
10 May 2017	Martin Kunc (Warwick)	To be announced.
19 April 2017	Martin Lotz (University of Manchester)	Randomized dimension reduction in optimization and topological data analysis This talk reviews some recent and current work on extracting information from random projections of data. We first discuss a phase transition phenomenon in convex optimization: the probability that convex regularization succeeds in recovering a signal from few random measurements jumps sharply from zero to one as the number of measurements exceeds a certain threshold. After explaining the geometric and probabilistic ideas behind this phenomenon, we show how they can also be applied to problems in other fields

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		such as topological data analysis.
22 March 2017	James Woodcock (Cambridge)	Modelling active transport and health: state of the science and future directions The last decade have seen a growth of studies modelling how a shift to active transport can affect population health. Results have generally shown the potential for substantial benefits but uncertainties remain around impacts for different subgroups and on the generalisability of the results to lower and middle income settings. Correspondingly as the science matures there is a move to more rigorous methods and use of new data. In this talk I will consider how research is addressing these issues with a focus on how we model population physical activity exposures and risks, and how we estimate changes in injury risk with changes in active travel volume.

Past seminars

Date	Speaker	Seminar
15 February 2017	Alexander Stewart (UCL)	Evolution and the dynamics of social behavior Abstract: Understanding the dynamics of social behavior is very much a puzzle for our time. On the one hand, this puzzle is critical to understanding how human behavior is changing as we update and expand our social networks in unprecedented ways. On the other hand, these complex dynamics can (perhaps) be understood, due to recent expansion in

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		empirical data and computational power. An evolutionary perspective is vital to this effort, providing a framework for understanding how and when behavioral change will spread through a population. However, in order to provide this perspective we must develop mechanistic models of behavioral changes at the individual level that explain the emergence of social phenomena, such as social norms or

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		collective identities, at the level of groups and populations. I will discuss ongoing attempts to model some of the complex social behaviors found in humans such as cooperation, using evolutionary game theory, and some insights this approach yields about the emergence and stability of social norms. I will then briefly discuss how these game theoretic models can be connected to experiments to test qualitative

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		predictions about human social behaviour.
30 November 2016	Ivan Papić (Osijek University)	Heavy-tailed fractional Pearson diffusions Heavy-tailed fractional Pearson diffusions are a class of sub-diffusions with marginal heavy-tailed Pearson distributions: reciprocal gamma, Fisher-Snedecor and Student distributions. They are governed by the time-fractional diffusion equations with polynomial coefficients depending on

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		the parameters of the corresponding Pearson distribution. We present the spectral representation of transition densities of fractional Fisher-Snedecor and reciprocal - gamma diffusions, which depend heavily on the structure of the spectrum of the infinitesimal generator of the corresponding non-fractional Pearson diffusion. Also, we present the strong solutions of the Cauchy problems associated

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		with heavy-tailed fractional Pearson diffusions and the correlation structure of these diffusions. This is a joint work with N. Leonenko (Cardiff University, UK), N.Suvak (University of Osijek, Croatia) and Alla Sikorskii (Michigan State University and Arizona University, USA).
16 November 2016	Joerg Kalcsics (University of Edinburgh)	Structural Properties of Voronoi Diagrams in Facility Location Problems with

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		Continuous Demand Authors: Igor Averbakh, Oded Berman, Jörg Kalcsics, Dmitry Krass In most facility location models customer demand is assumed to be discrete and aggregated to a relatively small number of points. However, in many urban applications the number of potential customers can be in the millions and representing every customer residence as a separate demand point is usually

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		infeasible. Thus, it may be more accurate to represent customer demand as spatially distributed over some region. We consider the conditional market share problem where locations of n facilities are fixed and we seek to find the optimal location for the (n+1)st facility with the objective of maximizing its market share. We assume that demand is uniformly distributed over a convex polygon, facilities can

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		be located anywhere in the polygon, and customers obtain service from the closest open facility under rectilinear distances. Once the locations of all facilities are specified, the market area of a facility is given by its Voronoi cell in the Voronoi diagram generated by the facilities. The main difficulty when optimizing the location of the new facility is that it is generally impossible to represent the objective function in closed form; in fact, the

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		representation depends on the structure of the Voronoi diagram, i.e., the position and the geometry of the cell boundaries. Unfortunately, this structure can change drastically with the location of the new facility. In this talk we derive structural properties of Voronoi diagrams for the rectilinear distances and show how to use them to identify regions where the resulting Voronoi diagram is "structurally identical" for

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		every point in a region. Given such regions, we can derive a parametric representation of the objective function which is valid for any location in the region. This, in turn, allows us to optimize the location of the new facility over this region using classical non-linear programming techniques. While the optimization techniques are specific to the particular model being considered, the structural results we derive, as well as our general approach, are quite

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		universal, and can be applied to many other location models as well.
2 November 2016	Laszlo Vegh (LSE)	Rescaled coordinate descent methods for Linear Programming Simple coordinate descent methods such as von Neumann's algorithm or Perceptron, both developed in the 50s, can be used to solve linear programming feasibility problems. Their convergence rate depends on the condition measure of the

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		problem at hand, and is typically not polynomial. Recent work of Chubanov (2012, 2014), related to prior work of Betke (2004), has gathered renewed interest in the application of these methods in order to obtain polynomial time algorithms for linear programming. We present two algorithms that fit into this line of research. Both our algorithms alternate between coordinate descent steps and rescaling steps, so that

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		either the descent step leads to a substantial improvement in terms of the convergence, or we can infer that the problem is ill conditioned and rescale in order to improve the condition measure. In particular, both algorithms are based on the analysis of a geometrical invariant of the LP problem, used as a proxy for the condition measure, that appears to be novel in the literature. This is joint work with Daniel Dadush

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		(CWI) and Giacomo Zambelli (LSE).
19 October 2016	Oleg Klesov (National University of Ukraine)	Generalized renewal processes and Pseudo-regularly varying functions. Read the full abstract.