Probability
Probabilité
(Org: **Antal Jarai** (Carleton; Bath, UK) and/et **Yiqiang Zhao** (Carleton))

OMER ANGEL, UBC, Vancouver
Colouring the Voronoi map

We consider the problem of colouring the planar map given by the Voronoi tessellation corresponding to a Poisson process in $\mathbb{R}^2$. We seek colouring rules that are isometry invariant and are factors of the Poisson process. We prove that six colours suffice.

With Benjamini, Gurel-Gurevich, Meyerovitch, and Peled.

RALUCA BALAN, University of Ottawa
The stochastic heat equation with fractional-colored noise

We consider the stochastic heat equation $u_t - \Delta u = \dot{B}$ in $(0,T) \times R^d$, with additive noise. The noise $\dot{B}$ is a Gaussian process, which is fractional in time, with Hurst index $H \in (1/2, 1)$, and colored in space, with spatial covariance kernel f. Our main result gives the necessary and sufficient condition for the existence of the solution. When f is the Riesz or the Bessel kernel of order α, this condition is $H > (d-\alpha)/4$. This is a relaxation of the condition $H > d/4$ encountered when the noise is white in space. When f is the heat or the Poisson kernel, the solution exists for any d and H. The case of the equation with multiplicative noise is examined in the second part of the talk.

Based on joint work with Ciprian Tudor.

DAVID BRYDGES, University of British Columbia, 1984 Mathematics Road, Vancouver, BC, V6T 1Z2
Self-avoiding walk and the renormalisation group

In five or more dimensions the scaling limit of self-avoiding walk is proven to be Brownian motion. This is conjectured to also hold in four dimensions. I will describe progress in a program to prove this conjecture.

LUNG-CHI CHEN, Department of Mathematics, University of British Columbia, Vancouver, BC, V6T 1Z2
Limit distribution for long-range oriented percolation

In this talk, I would like to introduce long-range oriented percolation with index $\alpha > 0$ and present the Fourier transform of the properly-scaled normalized two-point function converges to $e^{-C|k|^{\alpha \wedge 2}}$ for some $C \in (0, \infty)$ above the upper-critical dimension $\mathrm{dc} \equiv 2(\alpha \wedge 2)$. Moreover, the constant C exhibits crossover at $\alpha = 2$, which is a result of interactions among occupied paths.

MIKLOS CSORGO, Carleton University, 1125 Colonel By Drive, Ottawa, ON, K1S 5B6
Random walk and Brownian local times, Wiener sheets: an interplay

Let $S(0) = 0$, $S(i)$, $i = 1, 2, \ldots$, be a simple symmetric random walk on the line, and let $X(k,n) := \#\{i : 1 \le i \le n, S(i) = k\}$, $k = 0, \pm 1, \pm 2, \ldots$ be its local time process. Let $\{W(t), t \ge 0\}$ be a standard Brownian motion, and let $\{L(x,t), -\infty < x < \infty, t \ge 0\}$ be its local time process. The study of the asymptotic behaviour of the centered local time processes $\{X(k,n) - X(0,n)\}$ and $\{L(x,t) - L(0,t)\}$ has played a significant role in the development of the local time theory of random walks and that of Brownian local times. A glimpse of these developments will be attempted in their historical context,

leading up to a strong approximation of the local time difference $\{X(k,n) - X(0,n)\}$ by a Wiener sheet and an independent Brownian motion, time changed by an independent Brownian local time. The latter is based on E. Csáki, M. Csörgő, A. Földes and P. Révész (2008), Annales de l'Institut Henri Poincaré–Probabilités et Statistiques, to appear.

DON DAWSON, Carleton University
Percolation in a hierarchical random graph

We consider the question of percolation on a class of infinite random graphs based on a hierarchical structure and related mean-field limits.

This is joint work with Luis Gorostiza.

PIERLUIGI FALCO, Dept. of Mathematics, University of British Colombia, 1984 Mathematics Road, Vancouver, BC, V6T 1Z2
Universal formulas for nonuniversal statistical models

The critical, nonuniversal properties of the Eight Vertex, Ashkin–Teller and XYZ models are widely expected to be described by the quantum field theory obtained as formal scaling limit. On the basis of this assumption, Kadanoff, Luther and Peschel conjectured universal scaling formulas that relate nonuniversal critical indexes. So far these conjectures had remained unproven. We present a constructive, renormalization-group approach that allows us to prove some of them under the condition of small coupling.

Work in collaboration with G. Benfatto and V. Mastropietro.

SHUI FENG, McMaster University
Two-Parameter Poisson–Dirichlet Distribution

Several results are presented involving the asymptotic behaviour of the two-parameter Poisson–Dirichlet distribution. Some dynamical models will also be discussed.

MINYI HUANG, Carleton University, Ottawa, Ontario
Mean Field Stochastic Differential Games Involving A Major Player

We consider linear-quadratic-Gaussian (LQG) games with a major player and a large number of minor players. The major player has significant influence on others. The minor players individually have negligible impact, but they collectively contribute mean field coupling terms in the individual dynamics and costs. To overcome the dimensionality difficulty and obtain decentralized strategies, the so-called Nash certainty equivalence methodology is applied. The control synthesis is preceded by a state space augmentation via a set of aggregate quantities giving mean field approximation. Subsequently, within the population limit the original game is decomposed into a family of two-player limiting games as each locally seen by a representative minor player. Next, when solving these two-player limiting games, we impose certain interaction consistency conditions such that the aggregate quantities initially assumed coincide with the ones replicated by the closed-loop of a large number of minor players. This procedure leads to decentralized strategies for the original LQG game, and it is shown that the set of strategies is a decentralized ϵ-Nash equilibrium.

GAIL IVANOFF, University of Ottawa, 585 King Edward, Ottawa, ON, K1N 6N5
Optimal detection of a change-set in a spatial Poisson process

We generalize the classic change-point problem to a "change-set" framework: a spatial Poisson process changes its intensity on an unobservable random set. Optimal detection of the set is defined by maximizing the expected value of a gain function. In

the case that the unknown change-set is defined by a locally finite set of incomparable points, we present a sufficient condition for optimal detection of the set using multiparameter martingale techniques. Two examples are discussed.

XIAOYUE JIANG, Louisiana State U.

MICHAEL KOZDRON, University of Regina, 3737 Wascana Parkway, Regina, SK, S4S 0A2
Using SLE *to explain a certain observable in the 2d Ising model*

The Schramm–Loewner evolution (SLE) is a one-parameter family of random growth processes that has been successfully used to analyze a number of models from two-dimensional statistical mechanics. Currently there is interest in trying to formalize our understanding of conformal field theory (CFT) using SLE. S. Smirnov recently showed that the scaling limit of interfaces of the 2d critical Ising model can be described by $\mathrm{SLE}(3)$. The goal of this talk is to explain how a certain non-local observable of the 2d critical Ising model studied by L.-P. Arguin and Y. Saint-Aubin can be rigorously described using $\mathrm{SLE}(3)$ and Smirnov's result.

MANJUNATH KRISHANPUR, University of Toronto
Random matrix-valued analytic functions

We introduce the notion of singular points of random matrix-valued analytic functions and present some exact results as well as asymptotic results on the distribution of singular points. The former lead to some determinantal processes in the hyperbolic plane, while the latter lead to certain generalizations of the circular law.

RAFAL KULIK, University of Ottawa, 585 King Edward, Ottawa, ON, K1N 6N5
Adaptive wavelet regression in random design for long memory processes

We investigate global performance of non-linear wavelet estimation in random-design regression models with long memory errors. Convergence properties are studied over a wide range of Besov classes and for a variety of L^p error measures. The setting is as follows. We observe $Y_i = f(X_i) + \sigma(X_i)\epsilon_i$, $i = 1, \ldots, n$, where $X_i, i \geq 1$, are (observed) independent identically distributed (i.i.d.) random variables with a distribution function G, $\epsilon_i, i \geq 1$ is a stationary Gaussian dependent sequence with a covariance function $\rho(m) \sim m^{-\alpha}$, $\alpha \in (0, 1)$ and $\sigma(\cdot)$ is a deterministic function.

For nonlinear wavelet estimator we obtain the rates under L_p risk. Furthermore, we construct an estimator for $f - \int f$. This estimator has better convergence rates than the estimator of f.

Our obtained rates of convergence agree (up to the $\log$ term) with the minimax rates of Yang, 2001. Results reveal a dense, an intermediate and a sparse zone. In particular, in the latter two zones nonlinear estimators are better than linear ones. This phenomena was observed before in i.i.d. setting (Donoho, Johnstone, Kerkyacharian, Picard, ...).

From a probabilistic point of view the main new ingredient of our proof is a large deviation result for long memory sequences. The idea comes from martingale approximation as in Wu and Mielniczuk, 2002. It is also based on a *smoothing dichotomy* heuristic. Estimators of high-frequency coefficients should behave as if the random variables ϵ_i were independent. Estimators for low-resolution levels are influenced by long-memory. This has immediate consequences for the estimator of f. The dichotomous effect is suppressed when we consider the estimator of $f - \int f$.

NEAL MADRAS, York University, Department of Mathematics and Statistics, 4700 Keele Street, Toronto, ON, M3J 1P3
Wasserstein and Total Variation Convergence Rates of Markov Chains

When studying the rate of convergence of an ergodic Markov chain to its equilibrium distribution, the usual metric of "convergence" is total variation; however, for continuous state spaces, it is sometimes easier to work with the (typically weaker) Wasserstein metric. We show how one can convert bounds on Wasserstein convergence rates into bounds on total variation convergence rates (under certain checkable assumptions). We illustrate using two examples:

(a) a two-parameter Gaussian Bayesian estimation problem, and

(b) the random logistic model studied by Steinsaltz (Ann. Probab., 1999).

This is joint work with Deniz Sezer (Calgary).

DAVID McDONALD, University of Ottawa
How does the Wi-Fi protocol work?

The Wi-Fi protocol allows a varying and unknown number of users to access a base station without any centralized coordination. We will discuss the exponential back-off algorithm which makes this possible. We will also consider a mean field approximation to a system with N users which allows us to predict the performance of this system. We'll finish with a list of drawbacks of this protocol.

MATHIEU MERLE, Paris VII, 175, rue du Chevaleret, 75013 Paris, France
Coexistence for the planar Lotka–Volterra model

We show there exist parameters for which coexistence of the two species in the two-dimensional Lotka–Volterra model holds. The proof borrows many ideas from earlier results obtained recently by Cox, Durrett and Perkins. However, the proof of coexistence in the planar case is more involved than that of greater dimensions. In particular it requires a new convergence theorem for a well-chosen sequence of rescaled Lotka–Volterra models.

This is joint work with Ted Cox, Rick Durrett and Ed Perkins.

EDWIN PERKINS, Mathematics Dept., UBC, Vancouver, BC, V6T 1Z2
Pathwise Uniqueness for Stochastic Heat Equations with Holder Continuous Coefficients: the White Noise Case

We prove pathwise uniqueness for solutions of parabolic stochastic PDEs with multiplicative white noise if the coefficient is Hölder continuous of index $\gamma > 3/4$. The method of proof is an infinite-dimensional version of the Yamada–Watanabe argument for ordinary stochastic differential equations.

This is joint work with Leonid Mytnik.

LEA POPOVIC, Concordia University, Dept. of Mathematics and Statistics
Model Reduction for Multiscale Stochastic Networks

Stochastic models of cellular chemical reaction networks typically involve chemical species numbers and reaction rates varying over several orders of magnitude. In order to reduce the analytical and computational complexity of the model one can exploit the "multiscale" nature of these models arriving at approximate asymptotic models. In general, approximations will be "hybrid" in the sense that some components will be discrete, some diffusive, and some absolutely continuous. Systematic approaches to model reduction for systems on two time scales will be discussed.

JEREMY QUASTEL, Toronto

BRUNO REMILLARD, HEC Montreal

On signed measure valued solutions of stochastic evolution

We study existence, uniqueness and mass conservation of signed measure valued solutions of a class of stochastic evolution equations with respect to the Wiener sheet, including as particular cases the stochastic versions of the regularized two-dimensional Navier–Stokes equations in vorticity form introduced by Kotelenez.

This is joint work with Jean Vaillancourt.

WEI SUN, Department of Mathematics and Statistics, Concordia University, 1455 de Maisonneuve Blvd. West, Montreal, Quebec, H3G 1M8

On Representations of Non-Symmetric Dirichlet Forms

We present some structure results on non-symmetric Dirichlet forms. These include Beurling–Deny formula, an analogue of LeJan's transformation rule for the diffusion parts, and a Levy–Khintchine type formula for regular non-symmetric Dirichlet forms on R^d.

This is joint work with Ze-Chun Hu and Zhi-Ming Ma.

BARBARA SZYSZKOWICZ, Carleton University, 1125 Colonel By Drive, Ottawa, ON, K1S 5B6

The probable error of a mean and that of a change in a mean

Weighted approximations in probability of self-normalized and studentized partial sums processes will be reviewed and applied to studying the problem of change in the mean of random variables in the domain of attraction of the normal law.

The talk will be based on joint works by Miklós Csörgő, Barbara Szyszkowicz and Qiying Wang.

ADAM TIMAR, UBC

XIAOWEN ZHOU, Concordia Univesity, Montreal

Finiteness of the total occupation time for (α, β)-superprocess

Let X be the d-dimensional (α, β)-superprocess with Lebesgue initial measure, i.e., X is a superprocess with α-stable spatial movement and $(1+\beta)$-stable branching. For $\alpha = 2$ (super Brownian motion) Iscoe proved that its total occupation time $\int_0^\infty X_t(B)\,dt$ is finite a.s. if and only if $d\beta < 2$, where B denotes the unit ball. He further conjectured that the similar result should hold for $\alpha < 2$ with $d\beta < 2$ replaced by $d\beta < \alpha$. In this talk we want to give a partial answer to Iscoe's conjecture.