Oppenheim Workshop on Random Systems

(held in conjunction with the Oppenheim Lecture)

Date: 25 to 26 October 2023

Venue: Department of Mathematics
Seminar Room 1 (S17-04-06)
National University of Singapore

Jointly organized by

NUS National University of Singapore | Department of Mathematics, Faculty of Science

NUS National University of Singapore | IMS Institute for Mathematical Sciences

Programme

Wednesday 25 October 2023	
9.30 am to 10.20 am	**Martin Hairer** Title: TBA Abstract: TBA
10.20 am to 10.50 am	Coffee/Tea Break
10.50 am to 11.40 am	**Atul Shekhar** Title: On the Behaviour of Schramm Loewner Evolutions in The Kappa Parameter Abstract: Schramm Loewner Evolutions are processes appearing as scaling limits of various statistical mechanics models. A natural question is whether SLEs are continuous with respect to the underlying kappa parameter. While it is natural to expect a positive answer (motivated by the connection of SLE with Liouville Quantum Gravity), a complete answer is still open. We will address the related problem of continuity of the associated welding homeomorphism of SLEs. Secondly, we will also consider the case of variable kappa and give a complete answer to these problems. This talk is based on joint works with D. Belyaev, Y. Yuan and V. Margarint.
11.50 am to 12.40 pm	**Apoorva Khare** Title: Probability Inequalities Over Left-Invariant Metric Semigroups Abstract: We explore how two classical stochastic inequalities extend beyond the Banach space setting. The Hoffmann-Jorgensen inequality can be stated using only a binary associative operation and a distance function. Thus, we prove a generalized variant that (i) holds in a very primitive mathematical setting: left-invariant metric monoids. The result moreover (ii) extends prior versions (even for real variables), and (iii) unifies previously disparate Banach space variants in the literature. We then present two variants of the Khinchin-Kahane inequality: one for all abelian metric groups; and a second, sharp version for all such groups which are also "normed". In parallel, we also discuss several situations in which (semi)groups with a metric satisfying certain conditions, automatically get endowed with an even richer structure. This has led -

	via probability - to an analysis-characterization of abelian torsionfree groups. (Partly joint with Bala Rajaratnam, and also - as D.H.J. Polymath - with Tobias Fritz, Siddhartha Gadgil, Pace Nielsen, Lior Silberman, and Terence Tao.)
12.40 pm to 2.00 pm	Lunch Break (S17 Level 4, Outside Math Staff Lounge)
2.00 pm to 2.50 pm	**Francesca Cottini** Title: Gaussian Limits for Polynomial Chaos and 2D Directed Polymers Abstract: We will present a general and novel criterion, based only on second-moment assumptions, to show the convergence towards a Gaussian limit for polynomial chaos, i.e. multilinear polynomials of independent random variables. This result is motivated by the study of 2d directed polymers and of the related 2d Stochastic Heat Equation, for which many convergence results were proved in recent years. Our criterion allows us to recover these results in a simpler way and, furthermore, to obtain novel Gaussian limits for the partition function of directed polymers under the subcritical regime and slightly beyond, too.
3.00 pm to 3.50 pm	**Xue-Mei Li** Title: Fluctuations of Solutions of Multiplicative Stochastic Heat Equations Abstract We shall discuss a scaling limit theorem for Stochastic Heat Equations with long range dependent non-integrable correlations.
3.50 pm to 4.20 pm	Coffee/Tea Break
4.20 pm to 5.10 pm	**Giuseppe Cannizzaro** Title: Weak Coupling Scaling of Critical Spdes Abstract: The study of stochastic PDEs has known tremendous advances in recent years and, thanks to Hairer's theory of regularity structures and Gubinelli and Perkowski's paracontrolled approach, (local) existence and uniqueness of solutions of subcritical SPDEs is by now well-understood. The goal of this talk is to move beyond the aforementioned theories and present novel tools to derive the scaling limit (in the so-called weak coupling scaling) for some stationary SPDEs at the critical dimension. Our techniques are inspired by the resolvent method developed by Landim, Olla, Yau, Varadhan, and many others, in the context of particle systems in the supercritical dimension and might be well-suited to study a much wider class of statistical mechanics models at criticality.

6.00 pm	Leave for Restaurant
6.30 pm to 8.30 pm	Dinner at Long Beach at Dempsey Hill
Thursday 26 October 2023	
9.30 am to 10.20 am	**Santiago Saglietti** Title: Scaling Limit of The Heavy-Tailed Ballistic Deposition Model With P-Sticking Abstract: Ballistic deposition is a classical model for interface growth in which unit blocks fall down vertically at random on the different sites of $\mathbb{Z}$ and stick to the interface at the first point of contact, causing it to grow. We consider an alternative version of this model in which the blocks have random heights that are i.i.d. and heavy-tailed, and where each block sticks to the interface at the first point of contact with probability p (otherwise, it falls straight down until it lands on a block belonging to the interface). We study the scaling limits of the resulting interface for the different values of p and show that there is a phase transition as p goes from 1 to 0.
10.20 am to 10.50 am	Coffee/Tea Break
10.50 am to 11.40 am	**Lingfu Zhang** Title: Geodesics in Last-Passage Percolation Under Large Deviations Abstract: In KPZ universality, an important family of models arises from 2D last-passage percolation (LPP): in a 2D i.i.d. random field, one considers the geodesic connecting two vertices, which is defined as the up-right path maximizing its weight, i.e., the sum/integral of the random field along it. A characteristic KPZ behavior is the 2/3 geodesic fluctuation exponent, which has been proven for some LPPs with exactly solvable structures. A topic of much recent interest is such models under upper- and lower-tail large deviations, i.e., when the geodesic weight is atypically large or small. In prior works, it was established that the geodesic exponent changes to 1/2 (more localized) and 1 (delocalized) respectively. In this talk, I will describe a further refined picture: the geodesic converges to a Brownian bridge under the upper tail, and a uniformly chosen function from a one-parameter family under the lower tail. I will also discuss the proofs, using a combination of algebraic, geometric, and probabilistic arguments.

	This is based on one forthcoming work with Shirshendu Ganguly and Milind Hegde, and one ongoing work with Shirshendu Ganguly.
11.50 am	Leave for lunch
12.15 pm to 2.00 pm	Lunch at Café on the Ridge