Friday, February 24, 2023

1. William Roberson-Vickery, Student, UIC

   Talk's title: Intrinsic Noise on the Torus and The Stochastic Heat Equation

   Talk's abstract: We present existence and uniqueness results for the stochastic heat equation on the flat torus in d-dimensions as well as upper and lower bounds on the second moments of the solution. The driving noise is colored noise intrinsically defined on the torus, and it is possible to generalize this noise to other compact manifolds.

2. Puja Pandey, Student, U of Florida

   Talk's title: On the equivalence of statistical distances for isotropic convex measures

   Talk's abstract: In convex geometry and its probabilistic aspects, many fundamental inequalities can be reversed up to universal constants in the presence of geometric properties, for instance reverse isoperimetric inequality for convex bodies. In this talk we will see that distances between probability measures are equivalent for convex measures, which extends a result of Meckes and Meckes (2014). The class of convex measures contains fundamental distributions in probability and statistics. Examples include Gaussian distributions, uniform distributions on a convex set and more general log-concave distributions, as well as heavy tailed distributions such as Cauchy distribution. We will see that the convergence in total variation of an isotropic s-concave probability measures is equivalent to convergence in bounded Lipschitz, and is further equivalent to Renyi and Tsallis divergence with respect to Gaussian. This is joint work with Dr. Arnaud Marsiglietti.

3. Ratul Biswas, Student, Minnesota

   Talk's title: Free energy of the diluted Shcherbina-Tirozzi model with quadratic Hamiltonian

   Talk's abstract: The study of diluted spin glasses may help solve some problems in computer science and physics. In this talk, I shall introduce the diluted Shcherbina-Tirozzi (ST) model with a quadratic Hamiltonian, for which we computed the free energy at all temperatures and external field strengths. In particular, we showed that the free energy can be expressed in terms of the weak limits of the quenched spin variances and identified these weak limits as the unique fixed points of a recursive distributional operator. The talk is based on a joint work with Wei-Kuo Chen and Arnab Sen.

4. Emily Dautenhahn, Student, Cornell

   Talk's title: Heat kernel estimates on manifolds with ends with mixed boundary condition

Talk's abstract: The heat kernel is a fundamental object in several fields of mathematics, in particular, probability theory and the study of PDEs. In some spaces, we understand the heat kernel very well; in other spaces, its behavior is more elusive. In this talk we will be interested in understanding heat kernel estimates via several examples. We will look at the heat kernel on familiar spaces where it satisfies "standard" estimates in the form of two-sided Gaussian bounds, and on less familiar spaces, such as a connected sum of cones, where we have estimates of a different form. The talk will highlight the impact of boundary condition (Neumann, Dirichlet, or mixed) on heat kernel estimates and will touch on some of the probabilistic ways of thinking that go into these results. This is joint work with Laurent Saloff-Coste

Saturday, February 25, 2023

1. Hyunchul Park, Associate Professor, SUNY New Paltz

   Talk's title: Spectral heat content on a class of fractal sets for subordinate killed Brownian motions

   Talk's abstract: In this talk, we study the spectral heat content (SHC) for subordinate (time-changed) killed Brownian motions on an open set with fractal boundaries. Recently, there have been growing interests on SHC for jump processes, but most works are for domains with sufficiently smooth boundaries. In this talk, we will focus on studying a small time asymptotic behavior of SHC on domains with fractal boundaries when the underlying processes are subordinate killed Brownian motions via $\alpha/2$ -stable subordinator. There are three different decay regimes depending on the stability index α and the interior Minkowski dimension of the boundary of the underlying set. The main ingredients are the renewal theorem and a recent result on SHC on smooth domains. This is a joint work with Yimin Xiao.

2. Rohan Sarkar, Postdoc, UConn

   Talk's title: The van Dantzig problem, Lee-Yang property, and the Riemann hypothesis

   Talk's abstract: In this talk, we start by introducing the intriguing van Dantzig problem which consists in characterizing the subset of Fourier transforms of probability measures on the real line that remain invariant under the composition of the reciprocal map with a complex rotation. We first focus on the so-called Lukacs class of solutions that is the ones that belong to the set of Laguerre-Pólya functions which are entire functions with only real zeros. In particular, we show that the Riemann hypothesis is equivalent to the membership to the Lukacs class of the Riemann ξ function. We state several closure properties of this class including adaptation of known results of Pólya, de Bruijn and Newman but also some new ones. We proceed by presenting a new class of entire functions, which is in bijection with a set of continuous negative definite functions, that are solutions to the van Dantzig problem and discuss the possibility of the Riemann ξ

function to belong to this class. This is a joint work with Pierre Patie and Takis Konstantopoulos.

3. Chunyin Siu, Student, Cornell

   Talk's title: Expected Betti Numbers of Preferential Attachment Complexes

   Talk's abstract: The preferential attachment graph is a popular model for scale-free networks. We extend results on cycle counts and clique counts in the graph to describe the betti numbers of the graph's clique complex, which measures repeated higher-dimensional connections. We show the preferential attachment graph has much more complicated higher-dimensional connections than the Erdos-Renyi graph, by proving that the expected betti numbers are bounded between constant multiples of sublinear power functions.

4. Zoraida Rico, Postdoc, Columbia

   Talk's title: Covariance statistical estimation: heavy-tailed data and robustness

   Talk's abstract: We present an estimator of the covariance matrix of a random d-dimensional vector from an i.i.d. finite sample. Our sole assumption is that this vector satisfies a bounded Lp-L2 moment assumption over its one-dimensional marginals, for p greater than or equal to 4. Given this, we show that the covariance can be estimated from the sample with the same high-probability error rates that the sample covariance matrix achieves in the case of Gaussian data. This holds even though we allow for very general distributions that may not have moments of order greater than p. Moreover, our estimator is optimally robust to adversarial contamination. This result improves the recents works by Mendelson and Zhivotovskiy and Catoni and Giulini, and matches parallel work by Abdalla and Zhivotovskiy. This talk is based on a joint work with Roberto I. Oliveira (IMPA).

5. Andrew Chee, Student, Cornell

   Talk's title: C0-semigroups on the Weyl Chamber with examples
   Talk's abstract: Motivated by the ubiquity of determinantal structures in the mathematical physics literature, e.g. random matrices, statistical mechanics models, we propose to revisit and extend the seminal construction of Karlin-McGregor by developing a theory of C0-semigroups (non-necessarily Markovian) on the Weyl Chamber W(E). We take an operator theoretical approach and use the following three ideas : 1) a lifting procedure from E to W(E), 2) some classical and more recently introduced isospectral classifications schemes, 3) another view of semigroups on W(E) than the determinantal one. We illustrate our approach with some examples such as dynamical versions of the LUE ensemble and continuous and discrete Borodin-Muttalib biorthogonal ensembles and their Boson analogues. Joint work with Pierre Patie.