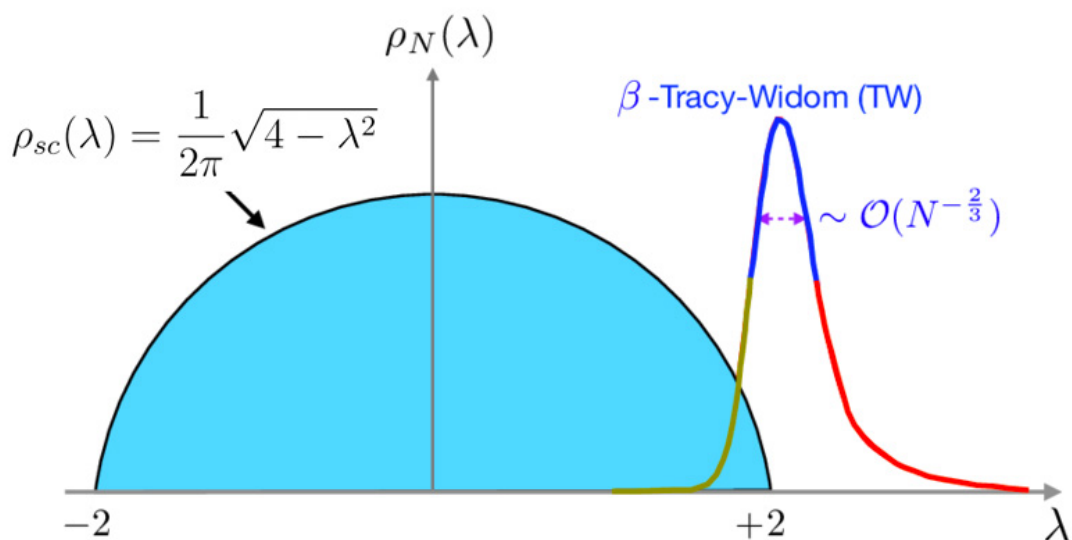




自由概率随机矩阵与 KPZ 普适性研讨会

2025 年 11 月 1-3 日

11 月 1 日		
9:00-10:00	王汉超	On the eigenvalues of inhomogeneous symmetric random matrix
10:20-11:20	许媛媛	Optimal decay of eigenvector overlap for non-Hermitian random matrices
14:00-15:00	Joe Thomas	Recent applications of strong convergence to spectral gaps
15:10-16:10	尹晟	Strong and weak convergences of noncommutative rational functions in random matrices
16:30-17:30	袁望钧	Strong convergence for tensor GUE random matrices
11 月 2 日		
9:00-10:00	陈凯伦	Applications of random walks on Hecke algebras
10:20-11:20	廖羽晨	Space-time joint laws of the KPZ fixed point
14:00-17:00		自由讨论

会议地点：中国科学技术大学东区数学科学学院新楼 308

主办单位：中国科学技术大学数学科学学院

组织者：刘党政，廖羽晨，谷艳东

报告题目与摘要

1. 报告人：王汉超 山东大学

题目：On the eigenvalues of inhomogeneous symmetric random matrix

摘要：In this talk, I will present some of our recent progress on the eigenvalues of symmetric random matrices, including tail bounds for eigenvalue gaps in random symmetric matrices and small-ball probabilities for the k -th smallest eigenvalue.

2. 报告人：许媛媛 中国科学院数学与系统科学研究院

题目：Optimal decay of eigenvector overlap for non-Hermitian random matrices

摘要：We consider the standard overlap of any bi-orthogonal family of left and right eigenvectors of a large random matrix with centred i.i.d. entries and we prove that it decays as an inverse second power of the distance between the corresponding eigenvalues. This extends similar results for the complex Gaussian ensemble from Bourgade and Dubach, as well as Benaych-Georges and Zeitouni, to any i.i.d. matrix ensemble in both symmetry classes. Based on a joint work with Giorgio Cipolloni and Laszlo Erdos.

3. 报告人：Joe Thomas Durham University

题目：Recent applications of strong convergence to spectral gaps

摘要：I will survey progress on the strong convergence phenomenon of random matrices and group representations. In particular, I will focus on the recent programme of applying and adapting strong convergence results and techniques to spectral problems on random graphs and manifolds.

4. 报告人：尹晟 哈尔滨工业大学

题目：Strong and weak convergences of noncommutative rational functions in random matrices

摘要：It is well-known that many random matrices have an asymptotical limit which can be described by free probability. Classical results use noncommutative polynomial as the test functions. In this talk, we will present a natural extension of the test functions to a larger class. Namely, we will consider the convergence of noncommutative rational functions evaluated at certain random matrices towards the corresponding evaluation at limit random variables. In the case that random

matrices have a strong convergent limit, the extension to rational functions can be done by the linearization combining with a control on norm. Furthermore, the convergence of norm can be shown to be preserved. In the case that random matrices may not strongly converge, an approach was developed later in a joint-work with Benoît Collins, Tobias Mai, Akihiro Miyagawa and Félix Parraud. Our approach builds on the control of cumulative functions by the rank of random variables.

5. 报告人：袁望钧 南方科技大学

题目：Strong convergence for tensor GUE random matrices

摘要：Haagerup and Thorbjørnsen (2005) proved that iid GUEs converge strongly to free semicircular elements as the dimension grows to infinity. Motivated by considerations from quantum physics -in particular, understanding nearest neighbor interactions in quantum spin systems -we consider iid GUE acting on multipartite state spaces, with components on some of the sites and identity on the remaining sites. In the case that the GUEs appear on more than half of the states, we show that under proper assumptions on the dimension of the sites, strong asymptotic freeness still holds. If the GUEs are allowed to be on the states without overlap, we show that they are strong asymptotic epsilon-free. Our proof relies on an interpolation technology recently introduced by Bandeira, Boedihardjo and van Handel (2023).

This is a combination of a joint work with Benoit Collins and an ongoing project.

6. 报告人：陈凯伦 新加坡国立大学

题目：Applications of random walks on Hecke algebras

摘要：Recently, random walks on Hecke algebras were recognized by A. Bufetov as a natural framework for the study of multi-species interacting particle systems. As a corollary, the Mallows measure can be viewed as the universal stationary blocking measure of interacting particle systems arising from random walks on Hecke algebras. Furthermore, the involution in Hecke algebras implies the color-position symmetry, which is a powerful tool for the asymptotic analysis of multi-species interacting particle systems. In this talk, we explore two facets of random walks on Hecke algebras. The first part focuses on the asymptotic behavior of the Mallows measure. In the second part, we consider applications of the color-

position symmetry, particularly in the context of shock fluctuations in the half-line open Totally Asymmetric Simple Exclusion Process (TASEP) and Asymmetric Simple Exclusion Process (ASEP).

7. 报告人：廖羽晨 中国科学技术大学

题目：Space-time joint laws of the KPZ fixed point

摘要：The KPZ fixed point, first constructed by Matetski-Quastel-Remenik, is a universal scaling limit for the so-called Kardar-Parisi-Zhang universality class, a large family of random growth models in $1+1$ (space + time) dimension. It can be described as a Markov process on the space of height functions with explicit transition probabilities (fixed time spatial laws). In this talk I will introduce this object and discuss the integrability around it. In particular I will show some new formulas describing the space-time joint laws of this two-dimensional random fields and discuss some applications of the complicated formulas. Based on joint work with Zhipeng Liu.