Probabilistic Operator Algebra Seminar

Organizer: Dan-Virgil Voiculescu

Monday, 9:00–10:30 am, to attend via Zoom email David Jekel (daj@math.ku.dk) remote

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Aug 24 **Enli Chen**, TU Delft

Strongly Convergent Random Matrix Models for q-Gaussian Families

Let $(s_1^{(q)}, \cdots, s_r^{(q)}$ be a finite q-Gaussian family. We construct explicit finite-dimensional random matrix models that converge strongly to this family for $|q| < \sqrt{2} - 1$. Thus, for every noncommutative polynomial evaluated at the random matrix models, both its normalized trace and its operator norm converge to the corresponding quantities for the q-Gaussian family in probability. The construction combines two ingredients. First, we consider normalized sums of graph-product semicircular variables indexed by Erdos-Renyi random graphs with an additional Clifford twist when $q < 0$. We prove quantitative operator-norm estimates for the resulting approximate q-Toeplitz relations, as well as an asymptotically sharp degree one Khintchine inequality. In particular, the normalized semicircular sum has limiting norm $\frac{2}{\sqrt{1-q}}$, which is the norm of the standard q-Gaussian variable. Using ultraproduct methods , we upgrade these estimates to complete multivariable strong convergence. Second, we use a refined tensor-GUE strong-convergence theorem to transfer these operator models to finite-dimensional random matrices. A key feature is uniformity for bounded-degree polynomials with matrix coefficients whose dimensions may grow beyond the size of the random matrices. As operator-algebraic consequences, in the above range of q, the associated q-Gaussian C^*-algebras are MF and, when there are at least two generators, their Brown-Douglas-Fillmore extension semigroups are not groups. This talk is based on recent joint work with Martijn Caspers.